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Keynotes

Towards the end of disability?

Bernard Dan, Inkendaal Rehabilitation Hospital and Université Libre de Bruxelles

Throughout history, disability has been an object of scorn, stigmatisation, rejection, fascination, and also of reflection on the human condition and life in society. The difficulties are necessarily defined in relation to situations and ways of functioning that are most prevalent in society. Many cultures have seen disability as a manifestation of occult powers, punishment, or trials. For some civilisations, however, disability may confer exceptional abilities. A much more recent perspective views disability as the consequence of health problems, and focuses on their impact with the aim of remedying them through therapies and technical aids. In contrast to this medical approach, a social model considers that disability is created by society, as a result of environmental conditions that prevent full participation in society. Addressing the problem must therefore target the barriers to participation, both in the physical organisation of the environment and in ideology and culture. There is now a growing recognition that the complexity of the concept of disability arises from the interaction between the characteristics of a person (not only the components of their health) and those of the society in which they live. This perspective opens up the recognition, understanding and research of shared human experience and individual differences. Technological advances, ethical questions about human enhancement, and cultural changes point to a time when disability will no longer be a defining category - for better or for worse for people with disabilities.

Children´s risky play – thrilling experiences and developmental benefits

Ellen Beate Hansen Sandseter, Queen Maud University College of Early Childhood Education

A natural part of children’s physical active play involves engaging in play that is a bit scary and somewhat risky (i.e., risky play). Children actively seek this thrilling kind of play, and nearly all children love the quivering feeling of butterflies in their tummy when they encounter something they do not know if they can manage or what the consequences of their actions will be. This presentation will focus on what risky play is, and why it is important for children’s experiences, development, and learning. Through risky play children build self-confidence, physical/motor competence, social skills, psychological resilience, and risk management skills. Nevertheless, within an increasingly safety focused society, our desire to protect children has invaded their daily lives. The presentation will also discuss how this has resulted in a culture of caution among educators, teachers and parents, as well as restrictive rules and laws on children's play environments.

When children outperform young adults: Examinations into the neural underpinnings of childhood advantages in motor learning

Bradley King, University of Utah

Changes in a specific behavior across the human lifespan are frequently characterized as an inverted-U trajectory. That is, young adults exhibit optimal performance, children are conceptualized as developing systems progressing towards this ideal state, and older adulthood is characterized by

performance decrements. However, as developmentalists, we know that not all behaviors follow this trajectory, as there are well-known instances in which children outperform young adults. This presentation will focus on recent behavioral and neuroimaging research that examines instances of childhood advantage in the domain of motor learning and memory consolidation. An overarching theme of this presentation is that investigations into the neuroplastic processes underlying childhood advantages in motor behavior offer a unique opportunity to increase our understanding of the developing brain.

Known but unloved: Motor difficulties in autism

Herbert Roeyers, Ghent University

Motor difficulties are increasingly being highlighted in several neurodevelopmental conditions, including autism, ADHD and dyslexia. Despite their prevalence, however, these motor problems are among the most neglected and least understood aspects of neurodevelopmental pathways and they are widely viewed as peripheral features of a condition. Much remains to be learned about their developmental impact or their potential as early diagnostic or prognostic markers. We discuss what is currently known about causes and consequences of motor challenges in neurodevelopmental conditions, with a primary focus on cascading developmental effects in individuals with autism. Since motor skills may be one of the domains in which developmental divergence is first seen, prospective longitudinal studies with infants at elevated likelihood for autism are likely to be very informative. We will share some findings and insights from our own infant cohorts which we followed from 5 months onwards until 3 year and later on into school-age.

A holistic approach to development: Implications for motor development research

David Stodden, University of South Carolina; Caterina Pesce, University of Rome "Foro Italica"

Research linking motor development to multiple domains of functioning across the lifespan continues to gain momentum and continues to garner attention in other academic domains and public entities. To capitalize on this momentum, it seems prudent to continue to integrate our collective, but sometimes siloed, research foci to comprehensively understand the integrative and cascading impact that "learning to move" and "moving to learn" have on physical, psychological, social, emotional, and cognitive development. All of these factors play a role for long-term health, well-being and achievement, yet our work is only beginning to scratch the surface with respect to its application. Pursuing this aspirational and ambitious goal also speaks to the continuation of our collective "bridge-building" with researchers in other academic disciplines and to establish and/or augment current and future initiatives with school, community, industry, and government partners. Thus, integrating motor development research in large-scale collaboratives may necessitate we rethink our collective role in future research on how we assess and promote development in the motor as well as other domains, and how we ensure knowledge transfer and translation, keeping in mind a focus on the feasibility and longer-term sustainability of implementation from a broader ecological perspective.

Symposia

S1 - International insights: Toddler motor skills across diverse cultures and early childhood education and care environments

Eline Coppens, Ghent University; Clarice Martins, Federal University of Paraíba, University of Porto; Arja Sääkslahti, University of Jyväskylä; Helena Sienaert, Matthieu Lenoir, Ghent University

Preliminary findings provided evidence of a decline in toddlers' (< 3yrs) motor competence (MC), mirroring the well-documented trend in older children. Given the crucial role of a sufficient level of MC as a foundation for healthy development, this symposium explores novel avenues to support MC development in toddlers. The first contribution entails a cross-cultural comparison, examining MC levels in Belgian toddlers in relation to their Brazilian counterparts and the American-Canadian reference sample of the year 2000. Preliminary data analysis indicates a notable distinction in fine motor skills, with Brazilian toddlers scoring lower than their Belgian counterparts. Additionally, across various aspects, it appears that overall performance tends to be less favorable among Brazilian toddlers in comparison to their Belgian peers and the American-Canadian reference sample. The second contribution focuses on the strengths and limitations of implementing traditional intervention programs to target toddlers' MC in. While the effects are positive, the sustainability of such programs seems to be comprised by various context-specific factors that must be considered during intervention design. Recognizing the pivotal role of childcare professionals, the third contribution delves into the role of early childhood educator training and the education level of childcare professionals in providing opportunities to support toddlers´ MC development. Furthermore, in the context of our exploration, the study will conduct a cross-cultural examination of early childhood education and care programs in Belgium, Brazil and Finland. In a related exploration, the fourth contribution delves into the design of the physical environment in the three countries to promote affordances that stimulate MC development. The importance of estimating and supporting individual toddlers' capacities to assess and manage risks during free play will also be discussed, enabling parents and childcare professionals to make the environment as safe as necessary, and to maximize toddlers' opportunities for free movement and motor development. The final part of the symposium aims to stimulate discussion on toddlers' MC support and gateways for further research.

Relevance

This symposium addresses the concerning decline in toddlers' MC across diverse cultures. Discussing intervention programs, cross-cultural early childhood education and care design, it aims to identify effective strategies. The evidence-based discussions may inspire future initiatives, fostering holistic approaches to enhance toddlers' MC and contribute to their overall healthy development.

S2 - A cross-country comparison of the impact of Developmental Coordination Disorder (DCD)

Amy De Roubaix, Ghent University; Ann Desmyter, Dyspraxis vzw; Jill Zwicker, University of British Columbia; Priscila Tamplain, University of Texas at Arlington; Charikleia Sinani, York St John University; Kine Johansen, Uppsala University; Kate Wilmut, Oxford Brookes University; Melissa Licari, Telethon Kids Institute

Developmental Coordination Disorder (DCD) is a common neurodevelopmental disorder affecting one in 20 children, yet it is under-recognised and under-supported. To raise awareness of the challenges associated with DCD and to improve support, an international campaign has been launched – Impact for DCD. National surveys have been completed across 6 countries to date, examining challenges relating to diagnosis, function, participation, education, therapy, and the socio-emotional impact on the child and family. Findings from this large-scale international dataset (based on N = 2000 children: Australia n = 443; Belgium n = 491; Canada n = 488; Sweden n = 106; United Kingdom n = 240; United States of America n = 232) will be shared, accompanied by parental lived experiences. Key findings across the countries will be presented, including barriers to diagnosis, the use of inconsistent terminology, limited funding for support, lack of awareness, and high rates of mental health issues. We will explore similarities and differences between countries and delve into possible underlying factors contributing to these findings and possible (inter)national solutions.

Relevance

The ‘ImpACT for DCD’ is a research initiative by academics and stakeholders to measure the IMPact of DCD and to assist in the initiation of the ACTion required for change. The results can support efforts for increased awareness and availability of services. It empowers individuals to know that they are not alone in facing these challenges.

S3 - Assessing Behaviors & Cognition 4 (motor, psychological, social-emotional, cognition)
Physical Education - ABC's 4 PE: A motor assessment focus

David Stodden, University of South Carolina; Ryan Hulteen, Louisiana State University; Aida Carbello Fazanes, University of Santiago de Compostela; Francesco Sgrò, University of Enna "Kore"; Ryan Sacko, The Citadel

ABC's 4 PE was developed to address current issues with assessment in the motor domain (i.e., lack of assessment feasibility, lack of required training, lack of lifespan tracking capability, cost of equipment, developmental and cultural validity) that impact our capability to facilitate large-scale assessment of motor competence and predict its impact on other critical developmental domains (physical fitness, physical activity, psychological, social-emotional, cognition) across childhood and adolescence. This assessment battery also is intended to advance measurement of motor development based on enhanced complexity of movement tasks and integration of multiple skills within individual assessments via a novel dual-task performance paradigm that requires increased cognitive demands. A collaboration of research teams from the U.S., Italy, and Spain will provide presentations involving four product-oriented motor competence assessments – Throw & Catch, Kick & Receive, Supine-to-Stand & Go, and Standing Long Jump – that uniquely combine object projection/control, locomotor, and functional coordination skills. Collectively, presentations will demonstrate a) developmental validity and sensitivity to discriminate change across childhood and adolescence using data from ages 8-25 yrs, b) global applicability (i.e., culturally inclusive) and ecological validity with comparisons of data samples from Spain, Italy, and the U.S., c) predictive utility with physical fitness, athletic talent identification, and executive functions. Physical Education (PE) continues to be the most appropriate, advantageous, yet virtually untapped environment to globally track development in multiple domains across childhood and adolescence. Thus, it is critical that PE teachers and practitioners are provided assessments that are feasible, do not pose a financial burden, and can be used across childhood and adolescence to better track holistic development.

Relevance

The long-term impact of motor development (or lack thereof) as an antecedent and foundation for multiple domains of functioning warrants large-scale data collection capabilities, which is critical for advancing our field. Issues that impact large-scale assessment capabilities in motor competence and other critical domains remain, specifically for PE teachers, and need to be addressed.

S4 – Combined action observation and motor imagery interventions improve motor skill development and (re)learning across the lifecourse

Adam Bruton, Brunel University; David Wright, Manchester Metropolitan University; Samantha Chye, Ashika Chembila Valappil, University of Roehampton; Neza Gril, Brunel University

Movement simulation techniques such as action observation and motor imagery can facilitate the development and (re)learning of motor skills. The combined use of these techniques, whereby a person is instructed to observe a motor action whilst simultaneously imagining the kinesthetic sensations associated with executing that action (i.e., AOMI) has become increasingly common over the last decade. This mini-symposium will provide insights into the current state of AOMI research, outlining basic research that has explored the neurophysiological mechanisms underpinning AOMI engagement, before reporting the outcomes of applied research studies that have tested the effects of AOMI interventions on movement outcomes. The first talk in this mini-symposium will introduce AOMI and provide a summary of a recent meta-analysis synthesizing evidence regarding the neurophysiological underpinnings and behavioral outcomes associated with AOMI engagement. The second talk will describe a home-based AOMI intervention study that aimed to improve motor learning in children with developmental coordination disorder. The third talk will discuss two laboratory-based studies reporting the effects of different types of AOMI intervention on novice athletes learning complex motor skills in sport. The fourth talk will report the findings from two transcranial magnetic stimulation experiments investigating the effects of different types of AOMI on corticospinal excitability in healthy younger adults. The fifth talk will summarize the findings from a scoping review of movement simulation techniques targeting improved mobility and balance in older adults, before reporting the findings from an intervention study investigating the acute effects of AOMI on sit-to-stand and stand-to-sit movements in community-dwelling older adults. Taken together, this mini-symposium will present an overview of contemporary research into the neurophysiological and behavioral effects of AOMI across the lifespan.

Relevance

The proposed mini-symposium explores the efficacy of AOMI interventions for motor skill development and (re)learning across the lifespan. The inclusion of both neurophysiological and behavioral research on AOMI interventions in children with DCD, healthy younger adults, and community-dwelling older adults will be of interest to both I-MDRC and ISRA-DCD members.

S5 - Validity evidence for the Physical Literacy in Children Questionnaire, a journey without an end

Lisa Barnett, Deakin University; Richard Tyler, Edge Hill University; Isaac Estevan, University of Valencia; Diao Yucui, Shandon Normal University; Mhairi MacDonald, Edge Hill University; Emiliano Mazzoli, Deakin University

The Standards for Educational and Psychological Testing, published by the American Educational Research Association (2014), outline five sources of validity evidence. These are: 1. Content of test (i.e., relationship between item images, wording and format with the intended construct), 2. Response processes (i.e., interpretation of items by target group), 3. Internal structure (i.e., how the relationships among test items and test components match to the construct), 4. Relations with other variables (i.e., the premise that the construct should relate (or not) to some other variables) and 5. Consequences of testing (i.e., there may be consequences of test use which follow from the interpretation of scores). The Physical Literacy in Children Questionnaire (PL-C Quest) was developed in 2020 (funded by the Australian Sports Commission) to measure children's self-reported physical literacy across the four domains of the Australian Physical Literacy Framework (APLF). This pictorial tool was designed to be gender neutral and appealing to children from different cultural backgrounds. As of January 2024, it has been requested for use by 52 universities, 22 countries and translated into 17 languages. It is important for validity to be tested in all intended populations and samples. In this symposium we will report on the PL-C Quest according to the Standards for the validity aspects of 3. Internal Structure, 4. Relations with other variables, and 5. Consequences of testing. We draw from child and youth samples from four countries (England, Spain, China and Australia).

Relevance

A central component of physical literacy is motor skill competence (actual and perceived). Developing motor skill competence is central to the I-MDRC mission. Measurement of physical literacy is in its infancy and therefore it is important to present emerging validity evidence for instrumentation.

S5.1 - The Physical Literacy in Children Questionnaire for Children in England: evidence for internal structural validity

Richard Tyler, Caitlin Miller, Edge Hill University; Lisa Barnett, Deakin University; Stuart Fairclough, Mhairi MacDonald, Edge Hill University

Background: Little is known about the current levels of children's Physical Literacy (PL) in England, implying a need to assess levels. A valid and reliable questionnaire-based holistic assessment of children's self-reported PL (PL-C Quest) has been developed in Australia. However, the validity and reliability of questionnaire measures assessing complex constructs such as PL are not automatically consistent when applied in different populations. Therefore, the present study aimed to evaluate the structural validity, test-retest reliability, and internal consistency of the PLC-Quest in school children in England. **Methods**: Data were collected from 670 primary school-aged children (52% girls; aged 10.0 ± 0.9 years). Children completed the PL-C Quest which consists of 30 pictorial items relating to PL elements under four PL sub-domains (physical, psychological, social, and cognitive). From these a convenience sub-sample of 66 children (54% girls; aged 10.1 ± 0.9 years) completed the PL-C Quest twice within 10-days. Structural validity (Confirmatory Factor Analysis) and internal consistency (Cronbach's Alpha) were assessed on the full sample and test-retest reliability (Intraclass Correlation) was calculated on the sub-sample. **Results**: Goodness of fit values for structural validity showed

acceptable model fit. All items (PL elements) significantly loaded on sub-domains and all sub-domains significantly loaded on to PL (higher order factor). Most items (28 out of 30) loaded on close or above the standard of $\lambda = 0.3$. Removing these two items did not significantly improve model fit. The model was both configurally and metrically invariant (the same for both boys and girls) showing validity of the PL-C Quest for both sexes. The PLC-Q also showed excellent test-retest reliability across the interval and a high level of internal consistency. **Conclusion**: Results suggest that the PL-C Quest demonstrates strong structural validity, reliability, and consistency for both boys and girls. Thus, this evidence supports its use to assess PL in school children in England/UK.

S5.2 - The impact of physical literacy survey administration in Spanish children: evidence of internal structural validity

Nuria Ortega-Benavent, Cristina Menescardi, Jorge Romera-Martínez, University of Valencia; Lisa Barnett, Deakin University; Isaac Estevan, University of Valencia

Background: Understanding children's and adolescents' engagement in physical activity relies on the perception of physical literacy. The validity and reliability of appropriate scales within the specific population of interest is crucial, considering the potential impact of administration methods. This study pursued a dual objective: 1) to assess the validity and reliability of the Spanish version of the Physical Literacy for Children Questionnaire (PL-C Quest) among children and adolescents and 2) to evaluate two administration formats of the scale. **Methods**: The research comprised two stages, utilizing double-dichotomous and four-point response style administration of the PL-C Quest within a cohort of 2004 (n1=916; n2=1088) students 8 to 14-years old who participated voluntarily. Both administration methods underwent scrutiny for validity (concurrent and predictive relations with other variables, structural validity), invariance (gender-based), and reliability (test-retest and internal consistency). **Results**: Both administration types demonstrated satisfactory internal consistency, excellent test-retest reliability and appropriate invariance. Predictive validity was moderate to large, and the structural validity was exhibited in terms of good fit indexes in the double-dichotomous ($\chi2(257) = 612.750$; CFI = .91; RMSEA = .04) and 4-point in a raw ($\chi2(360) = 1029.571$; CFI = .91; RMSEA = .04) versions. **Conclusions**: Both double-dichotomous and four-point response style administration of the PL-C Quest effectively capture perceived physical literacy among 8- to 14-year-old Spanish children and early adolescents.

S5.3 - A psychological network analysis of physical literacy in Chinese children: evidence for internal structural validity and relations with other variables

Yucui Diao, Shandong Normal Universtiy; Sitong Chen, Victoria University; Lisa Barnett, Deakin University; Jing Li, Shandong Normal University; Cuixiang Dong, East China Normal University

Background：Physical literacy (PL) is at the heart of childhood development; however, the most important intervention components are unclear. The study purposes were to explore the network structure that results from the interactions between elements of PL. **Methods**: A total of 1,520 children (girls, n = 752; 49.5%), aged 7 to 12 years (M = 9.6 ± 1.7) from eight provinces in China participated in PL self-report (Physical Literacy in Children Questionnaire) (four domains and 30 elements). Differences in the total PL score and each subdomain by child's sex, age groups (7-9,10-12) residence (urban, rural), out-of-school sports training and region (northern and southern China) were assessed using Mann-Whitney tests. The qgraph package and Network Comparision Test package were used for PL network estimation and network comparison between sex respectively. The

expected influence (EI) index was used to identify the core elements in the PL network. **Results**: Boys outperformed girls in both total PL scores and all four domains ($p<0.05$). Urban children reported higher total PL scores and three of four domain scores (psychological, social, and cognitive) compared to rural children. Younger children reported higher physical scores compared to older children ($p<0.001$). Children with out-of-school sports training reported higher PL total scores (and all four domains) compared to others ($p<0.05$). Southern children reported higher physical domain scores compared to northern counterparts ($p<0.01$). Core elements differed between boys (collaboration, engagement and enjoyment, self-regulation-physical, motivation) and girls (engagement and enjoyment, relationships, reaction time, strategy and planning) and between younger and older children. There were no significant differences in the PL network structure and network global strength between sex ($p>0.05$) and age groups ($p>0.05$) separately. **Conclusions**: Core elements of PL may be prioritized in PL interventions for children in primary school.

S5.4 - The association between physical literacy and physical activity in English children: Evidence of relations with other variables

Mhairi MacDonald, Edge Hill University; Lisa Barnett, Deakin University; Stuart Fairclough, RIchard Tyler, Edge Hill University

Background: Physical literacy (PL) is viewed as a critical precursor to physical activity (PA). Thus, the promotion of PL in children is fundamental for PA and its associated health and wellbeing benefits. However, there is limited literature which addresses the composite nature of PL and its association with PA. Therefore, the purpose of this study was to examine the associations between perceived composite PL scores and PA in school children in England. **Methods**: Primary School Children (n=670; aged 10.0±0.9 years; 52% girls) self-reported PL using The Physical Literacy in Children Questionnaire (PL-C Quest). Physical Activity was measured using wrist worn accelerometers for 24-hours over 7 consecutive days. Associations between perceived composite PL scores and PA (Total Physical Activity (Total PA), Light Physical Activity (LPA), Moderate Physical Activity (MPA), Moderate-Vigorous Physical Activity (MVPA), Vigorous Physical Activity (VPA), Average Acceleration, and Intensity Gradient) were determined using linear mixed models. Analysis accounted for school-level clustering and were adjusted for sex, socioeconomic status, maturity offset, and BMI z-score. **Results**: There were no significant sex differences in perceived PL scores. Boys spent significantly more time in moderate and vigorous PA ($p <.001$), the average accelerations and intensity gradient of boys were also significantly greater than girls ($p <.001$). Total PA (B=0.96), LPA (B=0.70), MPA (B=0.26), MVPA (B=0.37), VPA (B=0.10), Average Acceleration (B=0.19) and Intensity Gradient (B=0.001) were positively associated with perceived composite PL scores ($p <.005$-$<. 001$). **Conclusion**: Results suggest that perceived composite PL scores are associated with PA. With strongest association for total volume of PA (total PA) and diminishing magnitudes with increasing intensity of PA.

S5.5 - Coaches' perceptions of assessing physical literacy in First-Nation Australian children: evidence of consequences of testing

Emiliano Mazzoli, Chathurani De Silva, Lisa Barnett, Deakin University

Background: Physical literacy encompasses the physical, psychological, social, and cognitive skills relating to physical activity participation. Aligned with the Australian Physical Literacy Framework (APLF), the Physical Literacy in Children Questionnaire (PL-C Quest) is a pictorial tool designed to

measure children’s physical literacy. This study explored the perceptions of football coaches in regional and rural Australia regarding the feasibility, practicality, and utility of using the PL-C Quest and the derived scores in their practice. **Methods**: The PL-C Quest features an orange bunny-like cartoon character performing various activities in 30 scenarios, each corresponding to an APLF element. Each scenario includes two images, showing a proficient and a developing execution of the activity. Nine football coaches (n = 5 females; 56%), engaged in after-school football sessions, participated in semi-structured focus group discussions between March and October 2022. Discussions were audio-recorded, transcribed verbatim, and thematically analysed using NVivo 14. **Results**: Coaches found the PL-C Quest valuable for assessing children's perceptions beyond the physical domain, expressing interest in better understanding children’s psychological (e.g., confidence and self-regulation), social (e.g., ethics/sportsmanship and collaboration) and cognitive skills (e.g., tactics). Online administration via iPad was preferred over the paper version due to practicality and potential appeal to children. Coaches identified additional benefits, including evaluating the program impact and identifying areas for improvements in children, to inform future planning. **Conclusion**: Study findings suggest that the PL-C Quest could be useful to evaluate the impact of coaching programs. Coaches may use this tool to identify areas for improvement, to inform program planning for better outcomes. Future studies will need to investigate the implementation of the PL-C Quest in practice. We acknowledge Mr Jamie Morriss and Mr Raihan Anwar from the Moriarty Foundation for their support in this project. The Moriarty Foundation operates the John Moriarty Football program, the Australia’s longest-running and most successful Indigenous football initiative for 2–18-year-olds.

S6 - Highly intensive training: the need, feasibility and preliminary results in children with DCD

Silke Velghe, Evi Verbecque, Ingrid van der Veer, Shanti Sritharan, Katrijn Klingels, Hasselt University; Eugene Rameckers, Hasselt University, Maastricht University & Adelante Rehabilitation Centre

Children with Developmental Coordination Disorder (DCD) experience motor problems that affect their daily activities, participation and mental health. The international guidelines recommend task-specific training, emphasizing motor learning to treat these motor problems. Highly intensive training is commonly used in pediatric rehabilitation. It is often presented as therapy camps and defined as a minimum of 30 therapy hours with a minimum frequency of three times a week. There is mounting evidence of its effectiveness in different pediatric populations with motor disabilities (e.g. Cerebral Palsy, Spina bifida, Down Syndrome). Despite these promising results, current literature on the effects of highly intensive training in children with DCD is very limited. The aim of this mini-symposium is to focus on highly intensive training and give insight into how to apply this in children with DCD. First, we will discuss the elements of highly intensive training in the background of motor learning and physical training. Second, we will discuss previous examples of this intervention type in different populations, such as the 85-hour FitCare4U and BIMT program in the Netherlands and what principles can be translated to children with DCD. Third, we will explain the approach in “De Circus Doelen” (DCDGoals), a 40-hour training camp for children with DCD consisting of activities focusing on postural control and balance and currently performed in Belgium. Next to feasibility and preliminary results on motor outcomes such as postural control and individual goals, we will discuss the effects of self-perceived competence and parent perspectives on the experienced changes in family context. To end, a parent of a previous participant will share their experiences on the therapy camp DCDGoals.

Relevance

Highly intensive training is a promising approach in pediatric rehabilitation. This mini-symposium gives researchers, clinicians and parents evidence-based insights on how to translate this type of intervention to children with DCD by providing practical tools to design a highly intensive training intervention, thereby paving the way for the implementation in clinical practice.

S7 - The genetics of DCD

Hayley Mountford, University of Edinburgh, Oxford Brookes University; Yonas Hirutu, Oxford Brookes University

The underlying aetiology of developmental coordination disorder (DCD) is multifactorial, with both environmental and genetic factors thought to play a role. Several twin studies have shown that DCD is highly heritable (0.44-0.8), meaning there is a strong genetic contribution as to why some children develop DCD. Unlike equally common neurodevelopmental conditions such as dyslexia or attention deficit hyperactivity disorder (ADHD), there has been little research into the underlying biology of DCD, and the specific genes and molecular pathways remain unknown. A major challenge in performing genetic studies, is to obtain a large enough sample size to identify common variants that may contribute to DCD, and motor coordination more generally. This symposium will show how combining data from large, publicly available cohorts can be studied together in a meta-analysis, to increase power to discover the underlying genetic variation. Genetic studies will identify potential biological drivers of DCD; a crucial step towards understanding this common yet neglected neurodevelopmental condition and establishing genetics as a powerful method through which to unravel the biological basis of DCD.

S7.1 - The genetics of DCD: meta-analysis of cohorts to increase power

Hayley Mountford, University of Edinburgh, Oxford Brookes University; Yonas Hirutu, Oxford Brookes University; Elizabeth Corfield, Norwegian Institute of Public Health, Lovisenberg Diakonal Hopsital; Stian Valand, Norwegian Institute of Public Health; Helga Ask, Norwegian Institute of Public Health, University of Oslo; Alexandra Havdahl, Norwegian Institute of Public Health, Lovisenberg Diakonal Hospital, University of Oslo; Michelle Luciano, University of Edinburgh; Anna Barnett, Dianne Newbury, Oxford Brookes University

Background: Previous research shows genetics plays a role in why some children develop neurodevelopmental conditions, including DCD. Unlike equally common neurodevelopmental conditions, such as autism or dyslexia, little research has been conducted investigating the underlying biology of DCD. Therefore, the specific genes and molecular pathways of DCD remain unknown. Genome-wide association studies (GWAS) can be used to identify genetic variants associated with risk for specific conditions, e.g., poor motor coordination. In order to have the statistical power to identify subtle genetic effects, we need sufficiently large sample sizes. Sample size for DCD cases remains under powered, and therefore quantitative measures of childhood motor coordination difficulties are used as a proxy. **Methods**: We performed a GWAS meta-analysis to combine the outputs of separate GWA studies into one more powerful study. Our previously reported motor coordination GWAS analysis in the UK Avon Longitudinal Study of Parents and Children (ALSPAC, N=4,542) was combined with GWA studies of similar derived phenotypes in two novel large cohorts: The National Childhood Developmental Study (NCDS, N=6,410) and The Norwegian Mother, Father and Child Cohort Study (MoBa, N=27,053). **Results**: Our results revealed a number of genomic regions that were associated with motor coordination. Annotation of these associated regions uncovered potential biological pathways linked to motor coordination. **Conclusions**: This study provides a direct window into the biology of motor coordination difficulties through identification of associated regions of the genome; a crucial step towards understanding the biology of this common neurodevelopmental condition. Importantly, we still have insufficient numbers of diagnosed DCD cases within these three cohorts (ALSPAC, NCDS, MoBa) to perform a robust case-control study for DCD rather than motor coordination more generally.

S7.2 - Genetic Variants in Developmental Coordination Disorder (DCD): A genome-wide association study of motor coordination

Yonas Hirutu, Oxford Brookes University; Elizabeth Corfield, Norwegian Institute of Public Health, Lovisenberg Diakonal Hopsital; Stian Valand, Norwegian Institute of Public Health; Helga Ask, Norwegian Institute of Public Health, University of Oslo; Alexandra Havdahl, Norwegian Institute of Public Health, Lovisenberg Diakonal Hospital, University of Oslo; Michelle Luciano, University of Edinburgh; Anna Barnett, Dianne Newbury, Oxford Brookes University; Hayley Mountford, University of Edinburgh, Oxford Brookes University

Background: A Genome-wide association study (GWAS) is a statistical analysis used to identify genetic variants associated with complex traits. In the context of DCD, conducting a GWAS is vital to understand the underlying genetic contribution and shedding light on the biological pathways involved in coordination difficulties. **Methods**: A GWAS was conducted on The Norwegian Mother, Father and Child Cohort Study (MoBa, N=27,053) containing 13,423 males and 13,630 females. Fine- and gross- motor skills at age 5 years were assessed through 12 parent reported items from the Child Development Inventory. Responses were summed to generate a quantitative measure of motor coordination between 0 (substantial difficulties) and 12 (no difficulties). The GWAS output was used to calculate a polygenic score (PGS) for motor coordination in an independent UK sample – the Avon Longitudinal Study of Parents and Children (ALSPAC). Correlations between the PGS and two related measures; a quantitative measure of motor coordination, and a parental report of DCD/ dyspraxia, were estimated. **Results**: No regions met the threshold for genome-wide significance; however, we identified 28 suggestive loci ($p < 1x10\text{-}7$) with 41 genes contained within these suggestive regions. The motor coordination PGS was not significantly associated with motor coordination (0.17%) or parental report of DCD/ dyspraxia (0.91%) in the ALSPAC cohort. **Conclusion**: The absence of significant hits contributing to fine- and gross- motor coordination at age 5 underscores that we still lack the statistical power to unravel the genetic architecture of motor coordination and DCD. Our ability to predict ~1% of trait variance on DCD/ dyspraxia in ALSPAC cohort, although not at statistical significance, shows the potential for using PGS to examine shared genetic architecture between independent cohorts. These findings emphasize the necessity for meta-analysing large cohorts in research efforts to unravel the nuanced genetic variants influencing DCD and motor coordination.

S8 - DCD BIG IDEAS GROUP (DCD BIG): From big questions to new insights on understanding, recognising and treating DCD

Peter Wilson, Australian Catholic University; Bouwien Smits-Engelsman, North-West University; Frederik Deconinck, Ghent University; Carolyn Dunford, Melissa Prunty, Brunel University; Ludvik Valtr, Palacky University; Dido Green, Jonkoping University; Dorothee Jelsma, University of Groningen; Bert Steenbergen, Radboud University

The Big Ideas Group are an international collaborative dedicated to advancing DCD research in three major themes: (i) Profiling difficulties that these children experience across domains; (ii) Identifying interventions that are most effective in helping children develop their motor skills and build self-confidence and participation; (iii) Awareness raising in both the public and academic spheres. This symposium will summarise our work to date: (1) PROFILING. **Background**: To facilitate early identification of DCD and associated difficulties, we aimed to identify key constructs that should comprise an assessment profile for these children. **Methods**: Three large-scale systematic reviews and meta-analyses: (A) Comparison studies (DCD/TD) spanning all aspects of functioning; 126 eligible studies. Six clusters: (i) Motor, (ii) Sensory, (iii) Cognitive; (iv) Behavior, (v) Participation, and (vi) Fitness and Activity/Leisure. A meta-analysis showed moderate-to-large effect sizes across all domains, including behavior, quality of life and fitness. (B) Overview Review of DCD correlates, which reinforced this pattern of findings. (C) Review of contemporary digital tools/apps for motor-skill training. An analysis of 69 eligible studies will be presented, showing the promise of this field, but also highlighting the need for studies of the quality, validity, and cultural appropriateness of the apps. **Implications**: Taken together, we propose an assessment Toolbox for early identification of motor coordination problems, and comprehensive profiling of associated problems for the child with DCD. (2) INTERVENTION. **Background**: Interventions for DCD are diverse in their approach and implementation. This scoping review describes the differing methods and addresses the following key questions: What defines the approach? How and where is it delivered? At what stage of development is it presented? And, at what intensity and duration? **Method**: A comprehensive search including grey literature and not limited by language yielded 156 studies. Interventions were analysed by type, delivery and outcome measures. **Findings**: Results are used to guide formulation of core data sets for research and practice recommendations. (3) AWARENESS. **Background**: There is little awareness of DCD outside the academic world. **Method**: We summarise our roundtable consultation format and two recent submissions: Open Access publication (targeting a scientific and professional audience), article for The Conversation (in press), and 15-min video explaining DCD (general public). **Findings**. The spectrum of awareness-raising endeavours will be discussed.

S9 - Evaluating and stimulating motor competence in relation to the aquatic setting

Boris Jidovtseff, University of Liège; Eva D'Hondt, Vrije Universiteit Brussel; Teresa Stanley, Kristine De Martelaer, Karen De Rocker, Vrije Universiteit Brussel

This symposium will present our research into the development of children's aquatic skills and water safety. This is an important theme, as it touches on a major issue in child mortality worldwide and is the subject of growing educational concern, especially as in many countries access to swimming pools is becoming increasingly difficult due to infrastructure and maintenance costs.

S9.1 - Validation process and use of the pictorial scale of perceived water competence (PSPWC): past and future challenges

Jidovtseff Boris, University of Liège

Background: In 2017 a collective of researchers decided to develop a tool able to measure perceived water competence in children aged 4 to 8: the pictorial scale of perceived water competence (PSPWC). Water competence is a highly specific context that was not included into existing perceived motor competence tools and the PSPWC fills this gap. The aim of this work is to evaluate the tool and identify what remains to be done to improve. **Methods and Results**: All studies on PSPWC were analyzed for the purpose of this report. The tool was developed using a Delphi method, resulting in a pictorial scale of 17 situations, focusing on fundamental aquatic skills with a 3 levels scale system. The PSPWC psychometric analysis process explored facial validation by children, content validation by experts, internal consistency of items and test-retest reliability. Several studies have also examined the relationship between perceived and actual aquatic skills. These preliminary studies show that, overall, the tool has good psychometric qualities, but could benefit from a few improvements. The relevance of certain situations is questionable, while new dimensions could be added. The existence of a ceiling effect for children well familiar with water demonstrates the need to extend the tool to more complex skills. A modified, shorter version of the test was developed, adding a 4th level to reduce the ceiling effect. The tool remains focused on aquatic skills and has limitations that could be the subject of future development. The situations are specific to the swimming pool and make no reference to open water situations encountered by a large number of children. The identification of potentially dangerous situations could also be developed in the context of work on water safety. It might also be interesting to see how the tool could further integrate the dimensions of aquatic literacy. **Conclusions**: The analysis shows the relevance of the PSPWC as a whole, but also highlights the need to improve its discriminating nature and extend the dimensions covered to the context of water safety and aquatic literacy.

S9.2 - Identification of actual and self-perceived motor competence profiles in young children performing motor skills ON LAND versus IN WATER.

D'Hondt Eva, Kristine De Martelaer, David Van Holsbeeck, Mats Leemans, Vrije Universiteit Brussel; Eline Coppens, Ghent University

Background: The present study identified profiles in children based on their actual motor competence (AMC) and self-perceived motor competence (PMC) regarding skill performances in 2 different movement contexts (ON LAND vs. IN WATER). More knowledge on profile clustering in both contexts could be useful in stimulating children's overall movement experience in a positive way. **Methods and Results**: A total of 193 1st grade primary schoolchildren (46.6% boys, 6.73±0.42 yrs) participated in this study. Using validated and aligned instruments per movement context, their AMC

and PMC levels were determined (ON LAND: Test of Gross Motor Development 3rd version, Pictorial Scale of Perceived Movement Skill Competence for Young Children; IN WATER: Actual Aquatic Skills Test, Pictorial Scale of Perceived Water Competence). Only children with complete AMC and PMC data per context were eligible for further K-means cluster analyses. For both contexts, 5 profiles emerged being labelled based on relative levels of AMC-PMC within the sample. Children in the 'high-high' and 'low-low' clusters demonstrated convergent AMC and PMC levels compared to peers belonging to the other profiles. The 'average-high', 'low-average' and 'high-low' clusters included children with more divergent AMC and PMC levels compared to those in the convergent profiles. Almost 25% of participants belonged to the same type of profile across both movement contexts. **Conclusions**: Considering a person-centered approach in examining actual and self-perceived motor skill competence is meaningful in young children. By identifying individualized AMC-PMC profiles both ON LAND and IN WATER, professionals should consider tailoring their didactical approaches to that knowledge to foster a safe and sustained engagement in active play and sports in each of both movement contexts. Children with relatively low levels of AMC may need extra opportunities for motor development, where those with higher relative PMC against AMC levels may need prevention of being overconfident and the associated risk for injury and/or drowning. Children with lower relative PMC against AMC levels may benefit from increasing their self-confidence in view of the motivation towards being physically active.

S9.3 - Evaluating and stimulating motor competence in relation to the aquatic setting - Adult Perceived and Real Water Competency and Risk in Open Water

Stanley Teresa, Drowning Prevention Auckland; Kevin Moran, The University of Auckland, Drowning Prevention Auckland

Traditionally we have assumed that survivability from drowning is based on swimming motor competency, however, swimming ability alone is unlikely to offer much protection from drowning. The 15 water competencies (Stallman et al., 2017) offer a more holistic and complex understanding of proficiency needed. Adults' perceived water competence was measured against their actual water competence in closed and open water environments. Despite most adults (98%) being unable to swim more than 100 m in open water, more than half (59%) perceived themselves as good swimmers, and more than a quarter (27%) thought they could swim more than 200 m. Furthermore, most adults (98%) perceived they could float more than 5 minutes, however when tested only two percent could achieve that. In conclusion, reality gaps were found in water competence among adult groups, especially in open water settings. Differences between perceived and actual competence are likely to have resulted in underestimation of the risk and overestimation of their capacity to cope with that risk, providing a plausible explanation as to why so many adult 'swimmers´ drown.

S9.4 - Evaluation and stimulation of children's risk competence in aquatic recreation: challenges for research and education

De Martelaer Kristine, Linde Van Droogenbroeck, Eva D'Hondt, Vrije Universiteit Brussel

Background: In our pedagogical framework for teaching water competence, including risk competence, the central concept is 'developmentally appropriate beneficial risk'. This contribution will describe two recent tools for assessing individual aquatic risk competence. **Methods and Results**: The Individual Aquatic Risk Management for Children (IARM-C) tool was developed and validated in 3 subsequent phases. The first step was a selection of relevant aquatic situations with

possible risks for children based on the literature and discussed with experts, resulting in 10 aquatic situations (5 swimming pool and 5 open water) that were professionally drawn. After a pilot study for face validity small adaptations were made. A cross-sectional study with 70 children (6-12 years) was conducted to test their risk perception, assessment and decision making. Data collection was organized by means of one-on-one interviews. Six of the 10 pictured aquatic situations resulted in a correct risk perception for >80% of the children. Three of 5 open water aquatic risk situations scored quite low in perception of recognition: warning flag at sea, dangerous objects, and sandbank in the sea. In the second tool of the large sampled European Aquatic Literacy for All Children (ALFAC) project, elementary school children were shown two posters (swimming pool vs open water) with 10 pictured situations each (5 safe and 5 dangerous) and participants had to indicate on a 5-point Likert scale how risky every situation was for them. This tool was also validated in a pilot study and after small adaptations used in the ALFAC questionnaire in 7 countries. Thanks to the information on children's individual aquatic background, the link can be made between risk assessment and earlier aquatic experiences. **Conclusions**: Both tools, showing pictures of aquatic situations, are useful instruments for further research and education purposes of water competence, helping children to identify what they perceive as risk(s) and how to react individually and in a group of peers.

S9.5 - Effectiveness of an aquatic therapy program for children with mild motor difficulties

Karen De Rocker, Eva D'Hondt, Vrije Universiteit Brussel

Background: Recent literature demonstrates a downward trend in motor competence (MC) among children with mild motor difficulties (MMD), creating a need for specific interventions, targeting individual motor problems. Aquatic therapy (ATP) is a type of intervention that provides opportunities to teach motor skills in the water due to the buoyancy and greater freedom of movement. Despite some preliminary studies, the existing evidence for the use of an ATP improving MC on dry land in these children is rather scarce. Therefore, the purpose of this experimental study is to investigate whether and to what extent an ATP can improve the level of dry land MC in children with MMD. **Methods and Results**: From the 191 children screened out of 3 primary schools, 53 displayed a score below the 16th percentile, identifying them as (being at risk for) having MMD. Eventually, 21 of those children with MMD, 16 in the intervention group (50% boys) and 5 in the control group (60% boys), aged between 4 and 8 years, participated in our experimental study. The children in the intervention group received six weekly sessions (45 min per session) of aquatic therapy, based on the "Halliwick Method". The control group received no intervention. All participants from both groups performed the Körperkoordinationstest für Kinder (KTK) as well as the Beery VMI in order to investigate the effect(iveness) of the provided ATP on the dry land MC levels. Results showed a significant interaction effect between Time and Group for gross motor skill displaying a more pronounced improvement in gross motor skill competence over time compared to the control group based on the KTK's mean total Motor Quotients. Regarding fine motor skill competence, the intervention group also demonstrated a significant progression over time, which was not the case for the control group resulting into a strong trend towards a significant between-group difference in the Beery VMI's standard scores at POST-test in favour of the intervention group. **Conclusion**: Our six-week Water Specific Therapy was found to be effective in improving the level of MC on dry land in children with MMD, both in terms of gross and fine motor skills.

S10 - REACT project: What families, PE teachers, and communities need to know about children's growth, motor development, and health habits

Jose Maia, Sara Pereira, Carla Santos, Fernando Gaberloto, University of Porto

We aim to present the REACT project (Return-to-school after the COVID-19 pandemic: what families, physical education teachers, and communities need to know about children's growth, motor development, and health behaviors), and some of its most relevant outcomes in a sample of 1000 children aged 6-10 years from 25 schools living in the north of Portugal. Firstly, we will briefly introduce the REACT project, namely its aims, methodology, designs (cross-sectional and mixed-longitudinal), and educational goals. Secondly, we will present the “Meu Educativo” app – a highly useful approach to assess and monitor fundamental movement skills and their use in different countries. Thirdly, we will present data on the relationship between physical activity, obesity, sedentariness, sleep, and their links to children's fundamental movement skills. Fourthly, we will tackle the issue of teasing apart the associations between children and school predictors in motor performance using the promises of the multivariate multilevel model. Finally, we will present what we have done out of the box in scientific, educational, and political terms and briefly address what lies in the future.

Relevance

The REACT project has unique data on Portuguese children's growth, motor development, and health post-COVID-19. Further, an innovative technology to assess fundamental movement skills is available for physical education (PE) teachers and new pedagogical material. In sum, REACT provides relevant information for schools and communities to promote healthy developmental programs for children.

S11 - Data sharing yhrough the International Consortium On Motor Behavior In NEurodivergence (COMBINE)

Nicholas E. Fears, Louisiana State University; Priscila M. Tamplain, University of Texas at Arlington; Haylie L. Miller, University of Michigan

Many neurodivergent individuals have clinically-significant motor difficulties. These motor difficulties put neurodivergent individuals at higher risk for physical and mental health problems as well as lower quality of life. To improve health outcomes for neurodivergent individuals, we need to better characterize motor phenotypes across neurodivergent populations. To do this, we need large, international, transdiagnostic datasets on motor behavior in neurodivergent individuals. Our innovative approach is to create a Consortium On Motor Behavior In Neurodivergence (COMBINE) of international motor behavior researchers. We will use this consortium to create an international, transdiagnostic data repository of motor behavior data. The proposed workshop will educate attendees on the need for data sharing, the data sharing process, and the COMBINE project. We will host a 1.5-hour workshop covering four main areas; the COMBINE project introduction and need, the required and associated data, the legal framework for data sharing, and the data entry process. Drs. Miller, Tamplain, and Fears will introduce the project. Dr. Tamplain will cover the required and associated data and the decision-making process for including and excluding certain data. Dr. Miller will cover the legal framework for data sharing, the process for working with different institution’s legal teams. Dr. Fears will cover the data entry process, data validation, and error detection. This will be followed by a Q&A and networking session. We will have iPads available for researchers to sign up for the COMBINE mailing list and laptops available to view the data repository during this time. It is critical to investigate the phenotypes of motor difficulties within and between neurodivergent populations, especially to identify the population-based prevalence and clinical significance of these issues. This requires a large-scale, multi-site, transdiagnostic dataset on motor behavior in neurodivergent individuals. COMBINE will fill this gap by developing a dataset of motor behavior data across numerous neurodevelopmental conditions from and international team of motor behavior scholars.

Relevance

We need to share data to overcome limitations of small, single-population studies to improve generalizability of research, honor participants' time and effort, and help us draw conclusions about motor development in neurodivergent individuals. COMBINE will allow us to examine transdiagnostic characteristics so we can better inform motor interventions for neurodivergent populations.

Verbal and Poster Presentations

9 - Objective and subjective daily participation mediate the relationship between DCD and quality of life

Shahar Zaguri-Vittenberg, Miri Tal-Saban, Naomi Weintraub, The Hebrew University of Jerusalem

Background: Developmental coordination disorder (DCD) is associated with poor quality of life (QoL) across multiple domains. Moreover, individuals with DCD are most often characterized by poor objective daily participation (i.e., low frequency of engagement in activities, poor performance level) and decreased subjective participation (i.e., poor pleasure and global occupational experience derived from engagement in activities in daily routine). However, the effect of poor participation on the QoL of adults with DCD is not well understood. In this study, we examined the potentia¬¬l mediating role of objective and subjective daily participation measures in the relationship between DCD and QoL among adults. **Methods and Results**: 116 adults with (n = 55) a without (n = 61) DCD (aged 21–35 years; 46% males) underwent a test-battery to determine fulfillment of DSM-5 DCD criteria and completed QoL and participation questionnaires. The results showed that compared to their non-DCD peers, adults with DCD had significantly ($p < 0.05$) poorer physical, social, psychological, and environmental related QoL. Additionally, adults with DCD reported on poorer objective and subjective participation, manifested by an elevated need for help in daily activities, poor performance, as well as reduced pleasure and global occupational experience. Mediation analysis revealed that performance level fully mediated the link between DCD status and QoL, while pleasure during engagement in activities and global occupational experience only partially mediated this link. **Conclusions**: The results imply that both objective and subjective participation are possible underlying factors of poor QoL in adults with DCD. Hence, health-care professionals are encouraged to address both performance and subjective experiences during the engagement in activities to support the QoL of individuals with DCD in adulthood.

Relevance

Previous research suggests that individuals with DCD experience decreased quality of life (QoL). Yet, there is a limited understanding of the cause of this outcome. This study contributes to the understanding of the lower QOL, and specifically the mediating role of objective and subjective daily participation measures in the association between DCD status and QoL.

10 - Bio-psycho-social predictors of daily participation among young adults with DCD: a structural equation modeling analysis

Shahar Zaguri-Vittenberg, Naomi Weintraub, Miri Tal-Saban, The Hebrew University of Jerusalem

Background: Developmental coordination disorder (DCD) is associated with decreased daily participation as well as biological (e.g., executive dysfunction) and psycho-social challenges (e.g., low self-esteem and social support). However, the inter-relation among these factors in young adults with DCD is not sufficiently known. This study aimed to examine the effect of DCD on executive dysfunction and psycho-social challenges, as well as the possible mediating effect of these bio-psycho-social factors on the relationship between DCD and a range of daily participation measures. **Methods and Results**: Using a sample of 55 young adults (aged 21-35-years-old) with DCD and 61 without DCD, a structural equation modeling was performed to test both the direct and mediating effects of the bio-psycho-social factors (executive dysfunction, self-esteem and social support) on participation measures (need of assistance in performance, performance level, pleasure in performance and global occupational experience derived from engagement in activities in daily routine). Results showed that having DCD had a significant negative direct effect on all bio-psycho-social factors, as well as on the need of assistance in performance and performance level. Self-esteem and social support mediated the effect of DCD on all participation measures, while executive dysfunction mediated the effect of DCD on performance level and global occupational experience. **Conclusions**: The model revealed that the decreased participation of young adults with DCD is associated not only with their core motor deficits. It is also affected by their psycho-social (poor self-esteem and reduced social support) and biological characteristics (executive dysfunction). Hence, tailored interventions for this population targeting daily participation should consider all these factors.

Relevance

While the impact of DCD in adulthood was known to be associated with a range of bio-psycho-social factors, questions remained on the unique and shared impact of these factors on participation outcomes. This study's findings enhance the comprehension of the relationship between the challenges of DCD, offering paths for possible interventions to enhance the daily participation of this population.

14 - Keyboarding versus handwriting functions, among elementary school students with and without probable Developmental Coordination Disorder

Naomi Weintraub, Rina Khoury-Shaheen, The Hebrew University of Jerusalem

Background: Computers (via keyboarding) are usually recommended as an alternative writing mode for students with Developmental Coordination Disorder (DCD) who have handwriting difficulties. Yet, currently, there is no sufficient evidence to support this recommendation. This study compared the handwriting and keyboarding performance of elementary school students, both within and between students with probable DCD (pDCD) and typically developing (TD) students. **Methods and Results**: The sample included 48 fourth- and fifth-grade students (17 with pDCD and 31 TD), whose mother tongue was Arabic. Both groups had no physical, visual or neurological impairments, and did not receive special education services. Those with pDCD scored at or below the 16th percentile on the Movement Assessment Battery for Children 2nd Edition (MABC-2; Henderson et al., 2007). Students in the TD group scored above the 16th percentile. The students were individually administered standardized Arabic handwriting and keyboarding tests, as well as a test measuring reading speed (a possible confounding variable). After controlling for reading speed, the handwriting and keyboarding speed of students with pDCD was significantly lower than that of their TD peers. Handwriting legibility was also lower, but not keyboarding accuracy. Within each of the groups, handwriting speed was significantly higher than the keyboarding speed. **Conclusions**: These results suggest that students with pDCD with poor legibility may benefit from using computers via keyboarding, as they demonstrated comparable typing accuracy to their peers. Yet, it appears that keyboarding might not serve as an effective accommodation for students with slow handwriting. Considering that even TD students exhibited slower typing speed compared to handwriting, perhaps both groups may benefit from systematic keyboarding instruction.

Relevance

It is a common belief that computers may assist students with handwriting difficulties, including those with DCD. Yet, there is inadequate evidence to support this assertion, especially for young students, who are inexperienced computer users. This study provides data as to which students with DCD may benefit from computers as a writing tool, and who might require more effective accommodations.

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17 - Psychosocial implications of impaired motor competence in 12-yr-old boys and girls: the NW CHILD study

Anita Pienaar, North-West University

Background: The problems of children with an impaired ability to acquire and perform coordinated motor skills often extend beyond the motor domain to also include secondary mental and physical health issues. These mental and physical consequences are major concerns, especially as they relate to quality of life (QoL) factors. However, there is very little research available on the extent to which younger children with inadequate motor competence have an increased risk for emotional and behavioral problems and also if these QoL domains are differently affected in boys and girls. **Methods and Results**: A randomized, and stratified by school and gender, research design was followed to select the participants for this study. These cross-sectional analyses investigated motor competence in 12-year-old children (N=568; 246 boys, 222 girls) by means of the BOT-2 Short Form that categorized them into different motor competence groups and the PedsQL, that measures health-related QoL in the Physical, Emotional, Social, Academic, and Psychosocial functioning domains. Statistica for Windows was used to analyze the data. The comparison between children having below average or impaired motor competence (n=104) with those having average (n= 472) or above average (n=6) motor competence showed that the Physical health, Psycho-social health, and the Summary QH scores improved significantly with improved ($p<0.05$) motor competence in the group. These increases were also found in boys and girls with boys showing higher QoL scores than girls in all 3 sub-domains. The Psychosocial Health Summary score was also lower than the Physical health summary score in all competency groups in boys and girls. **Conclusions**: These findings underscore that the quality of life of children are influenced negatively by their motor competence, therefor timeous interventions are needed to improve motor impairments.

Relevance

Since participation in movement activities will become more difficult for children as they grow older, interventions for gross motor-impaired children should address both their physical and psychosocial problems, starting from an early age to improve their broader health status.

18 - Playful activities and cooperative games to improve the movement and inclusion of students with Developmental Coordination Disorder

Daniela Godoi, Carlos Alberto De Simone, Tiago Toledo, Ludinalva Mendes, Jorge Alberto Oliveira, University of São Paulo

Students with Developmental Coordination Disorder (DCD) present motor difficulties which impact activities of daily living and participation in Physical Education classes. Often, these students avoid games and sports because they notice their motor performance is lower when compared to their peers. Physical Education serves students with different levels of motor development, however when teachers are faced with a student with DCD, it is necessary to understand their motor and socio-emotional deficits for planning strategies to provide care to the student. At a private school in Brazil, Physical Education teachers who were faced with the motor deficits presented by a student with DCD, included in the curriculum planning of their 7th year elementary school class with 35 students and an average age of 12 years, classes for acquiring basic and combined motor skills, to expand the motor repertoire and promote self-awareness of the body in exercise situations. The strategies used focused on playfulness and exploration of movement concepts, through tasks with varied stimuli, starting from simple, individual exercises, without and with the use of materials, and gradually increasing the complexity of the exercises and the number of participants in the task. In the first part of the class, students moved around the court in different ways, changing direction and varying the rhythm of their steps. Balls of different weights, cores and sizes were added and, when picking up a certain ball, students had to perform a specific task. In the second part, cooperative games were played. Instructions and feedback were provided in predictable and simple languages, in addition to visual cues. The student with DCD, despite being slower in carrying out tasks, performed the exercises and participated in games with simple rules. Individual tasks, with little stimulus, increased the feeling of success and self-esteem of students with the disorder, and cooperative games were efficient for inclusion.

20 - Motor planning in early childhood: Is there hysteresis in posture selection in preschool children?

Cornelia Frank, Osnabrück University; Christoph Schuetz, Bielefeld University

In order to reduce planning costs, adults reuse posture plans in sequential actions. The objective of the present study was to examine whether this cost optimization principle, termed motor hysteresis, is already present at an early developmental stage. Using a sequential reaching task, we asked 22 preschool children (mean age = 5.1 years, 11 females) to open a column of slotted drawers in an ascending and a descending order. We documented which posture (over- vs underhand grasp) the child had selected for each drawer and order, and expected children to persist in the previous posture, if motor hysteresis existed in preschool children. A generalized linear mixed model (GLMM) with a logistic link function, fixed effects for 'order' and 'drawer height', and a random effect for 'participant' revealed a main effect of 'drawer height', $z = 6.468$, $p < .001$, $R2\beta^* = .005$ which indicates that children used an underhand grasp for the lower and an overhand grasp for the higher drawers. More importantly, the GLMM showed a main effect for 'order', $z = 3.363$, $p < .001$, $R2\beta^* = .001$, revealing that the children persisted in an overhand posture in the descending and in an underhand posture in the ascending sequences. The results show that, while children adapt their grasp posture to height, they persist in a former posture in a sequential reaching task. Motor hysteresis thus is already established in 4- to 6-year-old children. The findings of the present study are consistent with the results demonstrated in adults, and furthermore emphasize the importance of hysteresis as a cost optimization principle for motor planning from an early age on.

21 – The Detailed Assessment of Speed of Handwriting – Second Edition (DASH-2): An update with a focus on DCD

Anna Barnett, Beverley Scheib, Oxford Brookes University; Sheila Henderson, University College London

Background: Handwriting difficulties are common in DCD and can hamper progress throughout education. Slow handwriting and poor legibility often continue through adolescence and beyond, with a negative impact on learning. The Detailed Assessment of Speed of Handwriting (DASH for 9-16, DASH17+ for 17–25-year-olds) has been extensively used to identify difficulties with handwriting speed. The aim of this project was to revise the DASH, update the norms and examine the psychometric properties. Here, the focus is on the validity of the test for use with individuals with DCD. **Method**: In DASH-2 the age range has been extended to cover 8 to 25 years. The content of the five tasks remains similar to those in DASH/DASH17+. Revisions include four new sentences for copying and a second Free Writing topic in addition to the original, 'My Life'. The normative sample comprised 754 examinees from the UK and Australia/New Zealand. In parallel with the main project, part of the test validation process was a comparison between students with DCD and an age and gender-matched control group. The 33 participants, aged 8 to 25, met strict diagnostic criteria for DCD. **Results**: Since there were no significant country effects, new norm tables were developed which reflected significant increases in handwriting speed across the age range. The DCD group had significantly lower scores than the control group on all five tasks and the Total Standard Score. 36.4% of the group with DCD had scores that fell at or below the 5th percentile of the normative group, with a further 30.3% having scores between the 6th and 15th percentile. **Conclusions**: These results show the sensitivity of DASH-2 to the handwriting difficulties related to DCD, which are seen across all the DASH-2 tasks. Like its predecessors, DASH-2 provides a useful profile of performance under different writing demands to help understand the nature of handwriting difficulties and plan how best to support students with their writing.

Relevance

Up-to-date, robust tools help identify those with difficulties and plan appropriate support. This study shows that over 60% of those with DCD had difficulties with the DASH-2 tasks. Conversely, some students with DCD did not fall below the 15th percentile. DASH-2, therefore, offers a means of differentiating within a DCD population as well as pinpointing difficulties that require intervention.

22 – The Movement ABC-3 Checklist: A new focus on impact

Anna Barnett, Oxford Brookes University; Sheila Henderson, University College London

Background: The Movement ABC-3 Checklist now covers the same age range as the Movement ABC-3 Test across three age bands (AB1 for 3-6 years, AB2 for 7-11 years, AB3 for 12-25 years). At each age Band, a Checklist can be completed by a parent, teacher or other adult. At AB3 there is also a self-report version. Each Checklist includes a 'motor' section (covering Manual Dexterity, Aiming & Catching and Balance & Locomotion tasks) and a 'non-motor' section, to record other factors that may affect motor performance. The focus of this presentation is on a third section, a new feature designed to record the impact of motor challenges on everyday life. **Method**: The new section of the Movement ABC-3 Checklist which focuses on the impact of movement difficulties includes six questions on selected areas such as general self-esteem, relationships and family life. For each question, impact is rated as 'not at all' (0), 'a little' (1) or 'a lot' (2); these are summed to give a total impact score (maximum=12). Space is also provided to give examples of the impact at home, in education/the workplace and in sports/leisure activities. As part of the standardisation project, Checklists were completed for 30 individuals with DCD, with caregivers reporting on their child in AB1 and AB2 and by young people themselves at AB3. **Results**: Total impact scores ranged from 1-10. In the spaces provided, some respondents just wrote a few points in note form, whereas others completely filled the spaces with detailed and/or multiple examples provided. Illustrative data from individuals with DCD will be presented to indicate the value of this information alongside other data from the Movement ABC-3 Checklist. **Conclusions**: The new impact section of the Movement ABC-3 Checklist will help practitioners understand the extent and nature of impact of motor difficulties on the everyday lives of individuals. This provides useful information to aid in setting priorities and planning intervention.

Relevance

Most assessment instruments employed by professions involved with individuals with DCD and other motor disorders employ instruments which focus exclusively on motor competence. The Movement ABC-3 provides a more comprehensive view of how both motor and non-motor factors interact to affect the individual's ability to meet the motor challenges of everyday life.

24 - Effectiveness of a motor intervention for children with Autism Spectrum Disorder facilitated by college physical education students

Yuemei Lu, Xiaozan Wang, East China Normal University

Background: Children with Autism Spectrum Disorder (ASD) not only encounter difficulties in participating in physical activities (PA) but also struggle with social engagement, yet limited opportunities to play and develop related skills are available. College students majoring in physical education (PE), equipped with PE teaching skills, could be promising motor intervention providers. This project aims to investigate the effectiveness of a structured motor intervention, facilitated by college PE students, on the PA levels, motor competence, social skills, and emotional regulation of children with ASD. **Methods**: A quasi-experimental design was used. Ten children with ASD (9.55±2.85 years) received a 3-week-long, one-to-one, consecutive motor intervention delivered by 10 college PE students. Outcomes have been evaluated pre-, post-, and 4 weeks after the intervention. A repeated measures ANOVA has been utilized to examine the changes in the outcomes over time. **Results**: All 10 children with ASD completed this intervention. Significant differences were found in the Test of Gross Motor Development - Third Edition (TGMD-3) age equivalent score ($F(2,14) = 4.387$, $p = 0.033$) and percentile rank ($F(2,18) = 6.630$, $p = 0.008$) of locomotor skills over time. Regarding physical activity, type ($F(2,18) = 13.734$, $p = 0.000$), frequency ($F(2,18) = 17.319$, $p = 0.000$), and duration ($F(2,18) = 8.404$, $p = 0.003$) spent in moderate-to-vigorous physical activity (MVPA) and duration spent in light physical activity (LPA; $F(2,16) = 4.406$, $p = 0.030$) showed significant differences over time. In addition, enhancements in emotional regulation and social skills ($F(2,18) = 4.775$, $p = 0.022$) were observed across the three assessment points. **Conclusion**: The findings of this study highlight the positive impact of a structured motor intervention facilitated by college students majoring in physical education, revealing its potential to influence various aspects positively in children with ASD.

Relevance

The intervention not only demonstrates the positive impact of intervention facilitated by PE students but also suggests a practical solution to support children with ASD to engage in physical activities and develop related skills. By using college PE students as intervention agents, society can tap into a valuable resource for providing effective motor interventions to children with ASD.

25 - Effect of a sports camp upon quality-of-life indicators in youth with visual impairments

Pamela Beach, State University of New York at Brockport

Youth with visual impairments (VI) do not participate in adequate daily physical activity (PA), which can adversely impact health indices, fitness, and overall quality-of-life (QoL). However, little is known about the impact of physical activity upon quality-of-life in youth with VI. Thus, this study examined the effect of a week-long sports camp upon quality-of-life in youth with VI. Participants included 49 youth with VI aged 9 to 18 years. Thirty-three of the participants attended a week-long sports camp and 16 participants served as a control group. Participants completed pre- and post-tests using the VISION-QL and Pediatric Quality of Life Inventory (PedsQL™) surveys. Both instruments were adapted from existing validated surveys for other populations to tailor them specifically to evaluate youth with VI. To provide further context, two focus groups were conducted from the sports camp participants. The analysis revealed no significant differences between the groups in the post-test results, although the pre-test scores between the two groups did exhibit significance. Seven out of ten VISION-QL and PedsQL™ domains were significantly different between groups for the pre-tests, including educational implications, social integration, psycho-social well-being, family relationships, general functioning, about my health and activities, and how you get along with others. Additionally, ANCOVA analysis revealed significant group differences for the education ($F(1,30) = 4.16$, $p = .05$) and social ($F(1,30) = 7.39$, $p = .011$) subscales, wherein the intervention group had higher scores than the control group. Considering many of the youth with VI attending the sports camp had previous experiences at sports camps, the benefits of physical activity were likely illustrated more in the comparison of the pre-tests rather than across the intervention period. These findings indicate the importance of regular physical activity upon quality-of-life in youth with VI.

Relevance

This study holds substantial significance for the importance of physical activity and health promotion. Youth with VI often have higher levels of sedentary time and decreased motor competence, health-related fitness, and physical activity levels than their sighted peers. More opportunities to engage youth with VI in physical activity with their peers to increase their QoL.

26 - Perceived motor skill teaching competence in parents of children with CHARGE syndrome

Melanie Perreault, Pamela Beach, Lauren Lieberman, State University of New York at Brockport; Madison Kent, Russell Sage College; Brooke Wolff, State University of New York at Brockport

Children with CHARGE syndrome (CS) develop fundamental motor skills at a slower rate compared to children without disabilities. Although structural constraints are a primary concern, parental influence has been shown to play a contributing role. Previous research indicates that parents of children with CS practice motor skills with their child more often than parents of children without disabilities, and the amount of practice parents participated in with their child had a positive influence on their child's motor competence. However, little is known about how competent parents of children with CS feel about teaching motor skills to their children. Thus, the purpose of the study was to determine the perceived motor skill teaching competence (PTC) of parents of children with CS and its relationship with their child's motor competence. Thirty children with CS (Mage=8.23 years, SD=2.39) and their parents participated in the study. The children were assessed on six motor skills (run, hop, slide, one-arm strike, kick, overarm throw) from the brief form of the TGMD-3. Their parents completed a modified version of the Child Movement Skills Research: Parent Questionnaire that assessed their PTC for the same six motor skills. The analysis revealed that parents had more PTC for the run, kick, and overarm throw; however, parent PTC for these skills had minimal to no relationship with their child's motor competence. Interestingly, the motor skills the parents felt less competent teaching (hop, slide, one-arm strike) had significant positive relationships with their child's competence on two or more skills. Overall, the results indicate that parents feel less competent teaching more complex fundamental motor skills; however, competence with teaching these skills appears to be an important factor in increasing their child's motor competence. Thus, it is important to provide parents with resources to aid their knowledge of how to teach these motor skills to their child with CS.

Relevance

This study focuses on environmental constraints that could potentially influence the development of fundamental motor skills in children with CS, a population that shows consistent delays in motor skill competence in comparison to peers without disabilities.

27 - Recognition of movement qualities of children with developmental coordination disorder: An exploratory study

Srilatha Girish, MGM Institute of Physiotherapy; Kavitha Raja, JSS College of Physiotherapy; Asha Kamath, Prasanna School of Public Health

Background: Considerable focus has been dedicated to improving movement skills in children diagnosed with developmental coordination disorder (DCD), yet there is a lack of emphasis on the specific manifestation of motor skill deficits. The key challenge is early identification of distinct movement characteristics in children with DCD to proactively prevent their impact on daily activities and academic performance. The objective of the study was to profile movement characteristics of children with DCD between 6-15 years of age. **Methods**: The study employed qualitative grounded theory to assess 16 children with DCD and TD children (1:3 ratio) for movement patterns. Kinovea software analyzed 15 fundamental movement skills (FMS) until saturation. FMS were systematically deconstructed, transcribed into codes using Laban movement analysis syntax, and grouped into themes. Themes and codes formed concepts, revealing latent motor skill deficit patterns. A theory emerged through triangulation of video analysis, literature review, and conceptual mapping. **Results**: Out of 2286 children aged 6-15 initially identified, 16 were diagnosed with DCD, and 48 TD children were selected for movement profiling. The movement profiles of children with DCD predominantly exhibited the following characteristics. (1) Reliance on visual input predominantly for the accomplishment, (2) constraint movement pattern, (3) recruitment of inappropriate, uncoordinated, and inconsistent use of remote body segments with respect to space, and (4) strenuous movement pattern indicating insufficient power generation and inefficient energy dissipation. **Conclusion**: Children with DCD displayed vastly varying patterns as compared to their TD peers in most of the FMS. Thus, it could be extrapolated that children with DCD exhibit a deficit in the planning of movement which in turn could be due to difficulties in either generating idea of movement to be performed, sequencing the idea, or executing the sequence efficiently.

Relevance

Children with DCD exhibit diverse movement abnormal movement pattern. Early abnormal movement traits may cause lasting neural variations, leading to uneven profiles. This may imply a potential deficit in movement planning, linked to challenges in generating, sequencing, or executing movement efficiently.

28 - Changes in preschoolers' perceived physical and motor competence following a mastery-based motor skill intervention

Leah Robinson, Kara Palmer, Lu Wang, Zhongzhe Ouyang, University of Michigan; David Stodden, University of South Carolina

Background: A child's perceived competence, especially in physical and motor skills, is vital for early development. An inflated sense of perceived competence encourages children to stay active and engaged in physical activities. Research indicates that motor interventions based on Achievement Goal Theory (AGT) effectively enhance young children's perceived physical and motor competence. This study explores the influence of the Children's Health Activity Motor Program (CHAMP), a mastery-based motor skill intervention rooted in AGT, on preschoolers' immediate and long-term perception of their physical and motor competence. **Methods and Results**: The study involved 203 children aged 3 to 5 years from the United States. Perceived physical competence (PPC) was assessed using the Physical Competence Subscale of Harter and Pike Pictorial Scale of Competence and Social Acceptance and perceived motor competence (PMC) was assessed using the Digital-Scale of Perceived Motor Competence. Both PPC and PMC were assessed at three time points: baseline, post-intervention, and 6-month follow-up. At baseline, there were no significant differences in PPC or PMC between the two groups (CHAMP, n=105, and control, n=98; $p>0.05$). After the intervention, results revealed that the CHAMP group exhibited better PMC compared to the control group ($p<0.05$). However, there was no significant difference in PPC at the post-intervention assessment. Interestingly, at the 6-month follow-up, the previously observed difference in PMC scores between the CHAMP and control groups became nonsignificant ($p\geq0.05$). Furthermore, there was still no notable evidence of a significant difference in PPC at the 6-month follow-up. **Conclusions**: The evidence suggests that the CHAMP intervention has a positive impact on PMC scores However, it does not appear to significantly affect PPC based on the study findings.

Relevance

Motor and physical competence are integral to children's holistic development, impacting health, well-being, and social skills. A deeper understanding of intervention effects, especially sustained ones, is crucial, with academic and practical implications. Unraveling the intricate links can guide the development of more effective programs for an active and healthier lifestyle in children.

29 - Do children with motor impairments have lower levels of physical activity and physical literacy than their typically developing peers?

Lydia Stagianni, National and Kapodistrian University of Athens; Apostolos Stagiannis, 12th primary school of Neo Irakleio; Vasiliki Kaioglou, National and Kapodistrian University of Athens; Antonios Kambas, Democritus University of Thrace; Thomas Kourtesis, International Hellenic University Fotini Venetsanou, National and Kapodistrian University of Athens

Background: It is well known that the intercorrelated constructs of physical literacy (PL) and physical activity (PA) are both essential components of children's health and development. However, although there is a growing body of research addressing the PA and PL behaviors of typically developing children, little is known about how physically active, and literate are children facing motor impairments. Therefore, the purpose of this study was to offer insight into these children's perceived PL and PA levels. **Method and Results**: Ninety-seven students of 5th and 6th grades (mean age=11.57± .49 years) from Athens, Greece, were assessed for their motor competence, by their physical education teacher, using the M-ABC Checklist, and they filled (a) the PL-C-Quest, and (b) PAQ-C to assess their perceived PL, and PA, respectively. According to the M-ABC checklist, 66 children were typically developing, 15 were at risk for motor impairments, and 15 faced definite motor impairments. The ANOVAs applied revealed significant differences between the above groups both in the total score of the PAQ-C ($F=16.16$, $p < .001$, $\eta2= .26$) and the PL-C Quest ($F=10.13$, $p < .001$, $\eta2= .18$), as well as in the motor ($F=16.72$, $p< .001$, $\eta2=.26$) and the psychological ($F=3.75$, $p= .027$, $\eta2=.07$) subscales of the PL-C Quest, with typically developing participants presenting higher PA and PL scores compared to their peers in the motor impairment groups. Children at risk or with definite motor impairments presented similar scores ($p >.05$). Lastly, differences between groups were not observed for the social and cognitive subscales of the PL-C-Quest ($p > .05$). **Conclusions**: Children with motor impairments present lower levels of participation in PA as well as lower PL levels compared to typically developing children. PA and PL development are equally important for every child; thus, children facing motor difficulties need additional support to make improvements in their PA and PL journey.

Relevance

Since children facing motor impairments are not as physically active and literate compared to typically developing children, emphasis should be given on effective interventions based on children's needs and potential that will target their PA and PL behaviors. The school community, and particularly Physical Education, could be an important facilitator of this educational procedure.

30 - Effects of conditioned and non-conditioned small-sided games on young female footballers' motor behaviour

Asier Gonzalez-Artetxe, University of the Basque Country; Oihan Esnal-Arrizabalaga, Sara Lombardero, Sociedad Deportiva Eibar; Asier Los Arcos, University of the Basque Country

In team sports, like football, where social uncertainty constrains players' decision-making, adaptability is the key to learning. Small-sided games (SSGs) are playing form activities used daily that confront footballers with competitive decisional and conditional demands. Coaches alter the relevant features of football within their SSGs to challenge players to adjust their motor behaviour according to what they are pursuing. Adding extra rules that condition how players interact may lead the players towards the behaviour desired by the coach. This study therefore explored how conditioned and non-conditioned SSGs affect female footballers' motor behaviour and the evolution of these tasks over time. Fourteen under 14 (U14) footballers played two 4 × 6-minute six vs six plus goalkeepers SSGs with all the regulatory conditions called (offside included) on a 50 m long × 30 m wide pitch (107 m2 × player) in two training sessions: 1) free without additional restrictions and 2) conditioned by a new rule that constrains the relationship between players: touching the adversary before receiving the ball implies gaining the ball back. Players' motor behaviour was assessed by tactical (mean distances [m] between partners and adversaries) and conditional (average total and high-speed running [above 4.33 m/s] distances [m] travelled for the bouts) measures. Footballers played more separated from their teammates (free: 14.6 ± 2.53 m; conditioned: 14.4 ± 2.72 m; $p < .001$) and their opponents (free: 14.1 ± 1.74 m; conditioned: 13.4 ± 1.90 m; $p = .035$), and they ran much more (free: 560 ± 59.9 m; conditioned: 533 ± 52.9 m; $p < .05$) but not at high speed (free: 21.0 ± 20.1 m; conditioned: 20.7 ± 19.8 m; $p > .05$) during the non-conditioned SSG. Distances between players decreased ($p < .05$) from the first to the last bout of the free SSG, whereas these barely varied during the conditioned SSG. Players travelled similar distances overall and at high speed during the four bouts of both SSGs. Young female footballers played closer together and ran less in the conditioned SSG than in the free SSG. Tactical and conditional responses remained similar over the conditioned SSG, while the interpersonal distances were shorter as the free SSG evolved.

Relevance

This study focused on the neglected scope of female academy football. Evaluating the effects of conditioning SSGs and their evolution may assist coaches in designing and programming training content according to their goals. By modifying the social relationship between players, coaches can encourage their pupils to play closer together, run less and behave similarly throughout the entire task.

31 - Understanding DASH17+ performance differences between adults with and without ADHD using fNIRS

Nancy Getchell, Elham Bakhshipour, University of Delaware

Background: We utilized a multimodal assessment strategy to examine how adults with and without Attention Deficit Hyperactivity Disorder (ADHD) performed on the Detailed Assessment of Speed of Handwriting (DASH17+) while concurrently collecting kinematic and prefrontal cortex oxygenation measures. **Method**: A total of 32 participants with (17) or without ADHD (15) performed the DASH17+ on a Wacom digitizer while we simultaneously collected prefrontal cortex oxygenation data using functional near-infrared spectroscopy (fNIRS). Performance data were analyzed using MoveAlyzer software to calculate handwriting biomechanics. **Results**: Overall DASH performance scores did not differ between groups or within the different subtests (copy best, copy fast, free writing). At the same time, the ADHD group had significantly less frequent short pauses and lower values of oxyhemoglobin than the non-ADHD group. Further, several biomechanical measures statistically differed between the groups. **Conclusion**: Despite scoring similarly to the control group on DASH17+, ADHD participants have a harder time altering the handwriting biomechanics when the demands of the task change. In addition, the cognitive demands of the same tasks differed between participants with and without ADHD. Finally, prefrontal cortex oxygenation changes between tasks, within tasks, and even from one trial block to another that are not reflected in the DASH17+ assessment alone.

Relevance

We have shown that performance scores alone on the DASH17+ do not reveal significant differences that adults with and without ADHD have in both how they write (i.e. biomechanics) and the cognitive load required to perform the standardized assessment. This suggests that a multimodal approach when assessing handwriting is important when assessing clinical populations.

33 - The impact of difficulty manipulation and feedback frequency on the acquisition and retention of fine-motor coordination tasks in children

Yousri Elghoul, University of Sfax

Background: Learning skilled movement is intimately connected to functional task difficulty (TD) and influenced by the information available and interpretable. Recent study reported that TD affects motor learning, based on the manipulation of the distance to the target in a dart-throwing task (Elghoul et al., 2022). Contradictory evidence suggests that motor learning may be independent of the difficulty level. The study aims to investigate the structure of relationships between cognitive measures and their association with difficulty perception and accuracy during the acquisition and retention of a novel fine-motor coordination task. **Methods and Results**: Thirty-four right-handed school children (age = 10.7 ± 0.89 years, body height = 151 ± 8.79 cm and body mass = 41.61 ± 10.49 kg; mean ± SD) volunteered for this study. They were divided into two main groups: a constant difficulty group (CONST) with subgroups receiving 50% knowledge of results (KR, 50%KR; n = 11) and 100% KR (100%KR; n = 10), and a progressive difficulty group (PROG) with subgroups receiving 50%KR (n = 11) and 100%KR (n = 12). During post-test sessions, progressive condition (for accuracy), the predictors (Executive Function, Stroop Corrected Word Number and PD) explained 56% of the variance. During the retention sessions, a multiple regression analysis for accuracy in the progressive condition revealed that the predictors explained 40% of the variance in the criterion. Notably, the significant partial regressors were flexibility (Average Time: $\beta = -0.46$, $p < 0.01$) and working memory (Corsi Forward: $\beta = -0.67$, $p < 0.01$). **Conclusions**: The present study reveals that variable practice, relative to progressive difficulty, seems to lead to more effective learning compared to the constant difficulty strategy. Importantly, the influence on the level of challenge posed to the learner during practice is more determinant. This allows for a learner-appropriate level of cognitive effort to maximize learning benefits.

Relevance

The insights gained regarding optimal learning conditions for children's motor skills have wide-ranging implications for education and development. This knowledge empowers teachers and practitioners to improve motor learning by integrating variable practice and adjusting difficulty levels. Moreover, this study contributes to a deeper understanding of these fundamental aspects of child development.

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34 - The effect of proprioceptive intervention on eating, sleeping and movement among children with special needs aged one to three years

Orit Bart, Tel Aviv University

Background: Occupational performance in the first years of life focuses on eating, sleeping and movement. A significant percentage of children with special needs face difficulties in these areas which have an impact on their development. There are recommendations for the use of proprioceptive stimulation as part of occupational therapy treatment. The goal of this study is to examine the effect of proprioceptive stimulation on eating functions, sleeping habits and movement in children with severe developmental disabilities aged 1-3 years. **Methods and Results**: The study population included 8 children in a daycare center for children with special needs. Assessments were conducted at 4 time periods: (1) Before intervention, (2) At the beginning of the intervention, (3) After intervention and (4) Follow-up. An eating questionnaire (Pediatric Eating Assessment Tool;PediEAT), sleep questionnaire (Children's Sleep Habits Questionnaire; CSHQ) and the Adaptive Behavior Assessment System (ABAS) were completed by parents or caregivers. During intervention, the children received occupational therapy intervention that incorporated mainly proprioceptive stimulation. The intervention included 12 sessions; 20-30 minutes long administered once a week. The children's movements were recorded and coded by two "blind" occupational therapists. At the end of the intervention period, a significant improvement in eating skills ($p = 0.035$), adaptive behavior ($p = 0.050$) and long-term movement ($p = 0.002$) were presented. These gains were also maintained during the follow-up period, a month after the end of the intervention. No change in the sleeping habits of the subjects was found. **Conclusions**: This research demonstrated that proprioceptive stimulation has a positive effect on adaptive behavior, eating function and movement in young children with complex difficulties. Our study provides a methodological and empirical basis for further investigation of the efficacy of proprioceptive therapy.

Relevance

Our study provides scientific evidence regarding the effectiveness of an intervention method based on proprioceptive stimulation. This intervention was found to be effective in promoting eating abilities, movement and adaptive behavior of children with severe developmental difficulties.

35 - Psychometric properties of the Italian Little Developmental Coordination Disorder Questionnaire (LDCDQ-IT)

Barbara Caravale, Sapienza University; Silvia Baldi, Melograno Clinical Psychology and Rehabilitation Association; Anna Di Norcia, Maria Teresa Giannini, Di Brina, Sapienza University; Tanya Rihtman, Oxford Brookes University

Background: Early identification of Developmental Coordination Disorder (DCD) in children is fundamental to provide the best chance of improving their outcomes. The Little Developmental Coordination Disorder Questionnaire (LDCDQ) is an easy parental screening tool designed to identify preschool children who may be at risk of DCD (Rihtman, 2011). We aimed to generate an Italian translation and cross-cultural adaptation of the LDCDQ (LDCDQ-IT) and test its psychometric properties. **Methods**: At first, the LDCDQ was translated according to guidelines (Beaton, 2000) and the cross-cultural adaptation process was carried out by an expert committee. In the second phase, parents of 352 typically developing (TD) children (mean=47 months, SD=6.53) and 24 children at risk for motor coordination difficulties (mean=50 months, SD=6.57) completed the LDCDQ-IT. A sub-sample of parents (n=52) repeated the LDCDQ-IT after 2 weeks for test–retest reliability. Ninety children were also assessed using the Movement Assessment Battery (M-ABC-2). **Results**: The LDCDQ-IT showed high internal consistency (α=0.96) and good test–retest reliability with 14 items (out of 15) with high ICC indices ranging from 0.766 to 0.959. Children's age and gender did not influence total scores. The correlation obtained between the LDCDQ-IT and MABC-2 total scores (r=0.515; p=.001) suggests concurrent validity of the LDCDQ-IT. Using a cut-off score of ≤66, overall sensitivity and specificity were 79% and 28% respectively (AUC=0.79). **Conclusions**: The LDCDQ-IT is a reliable tool and can support identification of Italian children aged 3-4 years at risk of developing DCD.

Relevance

Due to the intervention opportunities afforded through early identification, the LDCDQ-IT has the potential to promote early intervention in pre-school children at risk of DCD, prevent long-term sequelae, and improve outcomes.

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37 - Development and pretesting of a new tool: Motor Learning Parenting Questionnaire (MOPA-Quest)

Arto Laukkanen, University of Jyväskylä

Background: There is a lack of theory-guided and validated measures of motor learning related parenting. This study aimed to develop and pretest feasibility, internal consistency and face-validity of a new tool: Motor Learning Parenting Questionnaire (MOPA-Quest). **Methods**: MOPA-Quest was theoretically based on parental structure, defined as organization of physical and social environments to facilitate the development of child's competence. It comprised a total of 15 items, consisting of five items of three Fundamental Movement Skills (FMS): running, jumping with both legs, and overhand throwing. Parental structure was operationalized as the frequency of providing encouragement, positive feedback, logistic support, co-participation, and modelling for facilitating FMS learning. Each item was answered on a Likert scale of 1 to 7 (1 = never; 6 = daily; 7 = doesn't need parental support as does run / jump / throw a lot anyway). Feasibility and face validity were examined using open-ended questions, and internal consistency using Cronbach alphas. The MOPA-Quest was pre-tested in 14 respondents who reported to be or to has been a parent of a child under school age (6-7-years). Seven of the respondents were also researchers. **Results**: Cronbach alphas suggested acceptable internal consistency for running (0.886), and jumping (0.874) and moderate internal consistency for overarm throwing (0.519) items. The questionnaire was perceived overall clear and understandable, and the items essential for parenting of FMS learning. However, differences in practice of FMS between winter and summer seasons were perceived to complicate answering. Also, modelling of running was found ambiguous. Additionally, parents raised the meaning of independent practice, restrictions and limitations, health and developmental issues, and suitable equipment essential for FMS learning. **Conclusions**: MOPA-Quest is a promising tool for investigating parental support for FMS learning. Further development and validation is warranted.

Relevance

A questionnaire focusing on parenting practices facilitating child motor skill learning has the potential to positively impact both individual families and society as a whole by promoting awareness and research of parenting practices relevant for motor skill learning and by fostering early interventions for children who may be at risk of motor skill delays.

38 - Exploring the presence and impact of sensory differences in children with Developmental Coordination Disorder

Catherine Purcell, Jennifer Keating, Sarah Gerson, Ross Vanderwert, Catherine Jones, Cardiff University

Background: Children with Developmental Coordination Disorder (DCD) can experience sensory differences. There has been limited exploration of these differences and their impact on children with DCD. Therefore, the aims of this study were: 1) To explore the presence and impact of sensory differences in children with DCD compared to children without DCD; 2) To examine whether sensory differences are related to motor ability, Attention Deficit Hyperactivity Disorder (ADHD), or autistic traits. **Method**: Parents of children (8-12 years) with (n= 23) and without (n= 33) DCD used standardised questionnaires to report on their children's sensory differences, autistic traits, and ADHD traits. Motor abilities were assessed through the Movement Assessment Battery for Children-2. **Results**: Children with DCD had significantly higher levels of sensory differences than children without DCD. Sensory differences also had a greater impact on daily activities for children with DCD. Higher levels of ADHD and autistic traits, but not motor ability, were independent predictors of higher levels of sensory difference. **Conclusion**: Children with DCD experience high levels of sensory differences, which impact on their daily lives. These sensory differences may be a marker for additional neurodivergence in children with DCD. Practitioners should consider the sensory needs of children with DCD.

Relevance

Children with DCD have increased hyperresponsivity, increased hyporesponsivity and increased sensory interests, repetitions and seeking behaviors compared to children without DCD. Sensory differences in children with DCD therefore need to be considered in the formulation of support during the diagnostic process and the functional impact of any sensory differences should be considered.

39 - Assessment Battery for Children with Developmental Coordination Disorder (ABCD): Preliminary report of tool development and clinical application

Srilatha Girish, MGM Institute of Physiotherapy; Kavitha Raja, JSS College of Physiotherapy; Saumen Gupta, Sikkim Manipal College of Physiotherapy

Background: Developmental Coordination Disorder (DCD) significantly impacts children's academic and psychosocial development, with current assessment tools lacking specificity in the Indian cultural context. Urgently, a culturally sensitive evaluation tool is needed to fill the literature gap and accurately identify DCD in India. The objective was to develop an assessment tool for evaluating motor skill deficits that is applicable to the Indian context. **Method**: The Assessment Battery of Children with DCD (ABCD) was developed with literature and child development expertise, featuring age-appropriate items in key domains in in hand manipulation, sensory-motor coordination, and motor diversity. Scoring, based on consensus, considered time and movement quality errors. Face validation involved two therapists, and teacher input shaped the test version. Construct validity was established with 60 typically developing children, and normative values were set with 127 children. Concurrent validity compared ABCD with M-ABC-2 in 40 children, while test-retest reliability involved 20 children over a seven-day interval. **Results**: Adequate sampling was confirmed with a KMO measure of 0.7, supported by Bartlett's test for PCA. Both ABCD-FV and ABCD-SV demonstrated good construct validity (item reliability > 0.9, separation index > 3). Infit/outfit MNSQ values were satisfactory, with ABCD-SV at 0.69-1.09/0.72-1.16 and ABCD-FV at 0.71-1.50/0.71-1.51. The person-item map illustrated ability scores and item difficulty. ABCD-FV exhibited a significant effect size (> 0.8) for motor skill changes. Tool items were validated against M-ABC-2, with ICC values ≥ 0.7, and ABCD-FV showed good test-retest reliability (ICC = 0.79). **Conclusion**: ABCD tool includes ABCD-SV (12 items) and ABCD-FV (20 items) with total scores converted to age percentiles. Each item is rated on a 5-point Likert scale. DSM-5 criterion A is assessed through total test percentiles.

Relevance

The ABCD study is vital for society as it provides a culturally sensitive tool to identify DCD in Indian children. This comprehensive assessment enhances early intervention, improving academic and psychosocial outcomes and contributing to the overall well-being and societal participation of individuals with DCD.

40 - Participation in sports can promote physical fitness and motor competence: is it true for greek girls?

Irene Kossyva, Vasiliki Kaioglou, Komanthi Kouloutmpani, Fotini Venetsanou, National and Kapodistrian University of Athens

Background: In childhood, sport participation should be a means to promote important factors for lifelong physical activity (PA), such as motor competence (MC) and fitness. Given that girls typically present lower levels of PA compared to boys, the reinforcement of their MC and fitness is imperative. As such, the purpose of this study was to investigate the association of girls' engagement in sport with their MC and fitness levels and to compare the contribution of different sports to meet this end. **Methods and Results:** The participants were 220 Greek girls (age=10.1±1.2 years) regularly engaged in artistic swimming (n=20), rhythmic gymnastics (n=31), artistic gymnastics (n=43), tennis (n=24), Greek traditional dance (n=49), track & field (n=28), and basketball (n=25). The CAMSA (an obstacle-type test encompassing seven motor skills) and the PACER (20m shuttle run), both included in the Greek version of the Canadian Assessment of Physical Literacy-2 (CAPL-2) were used to assess MC and cardiorespiratory fitness (CF), respectively. Separate ANCOVAs were performed to detect potential associations of MC and CF with sport type after controlling for age, while frequency tabulations by sport were produced to classify participants into the CAPL-2 interpretive categories for their MC and CF level (beginning, progressing, achieving, excelling). Several differences between sports were observed in both analyses ($p<.05$) (track & field and artistic gymnastics corresponded to higher MC and CF scores). Nevertheless, most importantly, only 2.2% of participants presented sufficient level (achieving/excelling) for MC and less than 50% (46.4%) for CF. **Conclusions:** It appears that girls' participation in sports can contribute to some extent, to reinforcing their CF. However, its contribution to their MC development is questionable. It seems that sports in Greece implement a sport-specific training that fails to allow for the girls to acquire a wider motor repertoire.

Relevance

The findings of this study highlight the need to prioritize holistic sport programs in childhood with the aim of promoting important factors for lifelong PA and thus laying the foundation of a physically literate society.

44 - Can creative dance promote prosocial behavior in 1st graders?

Angeliki Giatra, Maria Koutsouba, Fotini Venetsanou, Nektarios Stavrou, National and Kapodistrian University of Athens

Background: Prosocial behavior (PB) is an element of children's social-emotional competence that refers to the willingness to care for, share with, and comfort others. These skills help children be accepted by their peers and build reciprocal relationships, facilitating their socialization. Since school is a fundamental socialization context, PB should be taught in this environment. Creative dance (CD) is thought to be suitable for children as it is based on natural movements, requires no previous experience, and serves as a means of self-expression and non-verbal communication, whereas, it encourages divergent and creative thinking, collaboration, and respect for others. Available literature supports the impact of CD on children's social-emotional competence; however, limited research has been conducted in children at the transitional age of the first grade. This study aimed at examining the impact of a CD program on the PB of first graders. **Methods and Results:** Four first-grade classes from two elementary schools in Athens, participated in the study. Two classes were randomly classified into the intervention group (EG; n=36) and the other two in the control group (CG; n=35). For nine weeks (29 lessons), the CG continued the physical education (PE) lessons following the national curriculum, whereas the EG participated in a CD program. Children's PB was assessed, before and after the intervention, using the PB subscale of the Strengths & Difficulties Questionnaire-Greek version. The analysis of covariance (gender*group) applied to children's post-measures scores (covariate: baseline scores) showed practically important differences between the groups ($\eta 2 > .56$), with EC outperforming CG. No important differences due to gender or gender*group were detected. **Conclusion:** Creative dance improved participants' (both girls' and boys') willingness to help, comfort, and respect others' emotions, so it could be an integral part of PE for improving the PB of children at this age.

Relevance

This study examines the impact of the creative dance on the prosocial behaviour of 1st graders, in an effort to provide physical education teachers with a promising and useful educational tool for the enhancement of a main element of the young students' social-emotional-competence.

45 - eHealth for mental health in DCD: can we use Facebook to deliver a parent-mediated physical activity intervention for better mental health?

Jacqueline Williams, Alexandra Parker, Michaela Pascoe, Victoria University; Peter Baldwin, Black Dog Institute; John Cairney, University of Queensland; Kate Wilmut, Oxford Brookes University; Matthew McQueen, Victoria University; Vincent Mancini, Telethon Kids Institute

Background: Individuals with Developmental Coordination Disorder (DCD) are at increased risk of poor mental health. Physical activity (PA) can reduce both risk and symptoms of poor mental health, but families of children with DCD often struggle to engage children in PA due to issues with coordination and fatigue. This pilot study explored the feasibility and efficacy of a 12-week Facebook-delivered, parent-mediated intervention to improve PA levels of children with DCD. **Methods and Results:** Families of 31 children (5-10 years old) with DCD were gifted activity tracking watches and parents joined a private Facebook group for 12 weeks. Parents were provided with weekly resources, including videos, related to PA, mental health and DCD. Daily steps were extracted from the child and parent Garmin watches to determine efficacy, and feasibility was assessed using objective Facebook engagement measures, parent report, and wear time of Garmin trackers. Facebook engagement was high, with an average of 78% of all posts being viewed by families. Parent reports indicated that 80% of families somewhat or strongly agreed that the intervention was useful for their family. Child activity tracker data was valid for 95.61% of intervention weeks. Step data indicated an average increase of approximately 10%, or 1000 steps, across the 12 weeks. More than two thirds of children had step increases of more than 10% during the intervention phase, compared to the baseline values. **Conclusion:** Data from this pilot study supports both the feasibility and efficacy of this intervention to increase PA in children with DCD. eHealth interventions are cost-effective and can reach a wide audience, increasing their appeal, but larger studies are required to validate these findings.

Relevance

Poor mental health is a serious issue for children with DCD and but is often neglected in intervention research. This intervention is relevant not only to the audience interested in research into DCD, but as it involves a physical activity intervention, is also very relevant for the broader audience interested in motor development as eHealth interventions will have relevance to other groups.

47 - Childhood motor difficulties and physical activity and fitness in midlife: a 40-year cohort study

Ilkka Järvinen, University of Helsinki; Jyrki Launes, University of Helsinki, Working Group - The Perinatal Adverse Events and Special Trends in Cognitive Trajectory (PLASTICITY); Laura Hokkanen, University of Helsinki

Background: Childhood motor difficulties (MD), the key symptom of developmental coordination disorder, has been linked to reduced physical activity (PA) and physical fitness (PF) in adulthood (Cantell et al. 2008, Tan et al.,2022). Despite evidence for these associations, longitudinal studies of their persistence beyond early adulthood are limited. Our prospective study explores these links up to midlife. **Methods and Results:** At age 9 years, 348 participants from a cohort exposed to mild birth risks were classified into 3 groups based on the Test of Motor Impairment: 26 with childhood MD (cMD), 54 with borderline cMD (bcMD), and 268 with no cMD. At 40, they reported PA frequency, how many flights of stairs they could climb without breathlessness, and how long they could walk or run without rest. Analyses of variance revealed significant associations between childhood MD and PA frequency ($F(2, 345) = 6.37$, $p = .002$) and running distance ($F(2, 345) = 3.73$, $p = .025$). In pairwise comparisons, cMD and bcMD groups reported less PA than the no-cMD group. The cMD group estimated a shorter running distance than the no-cMD group. These associations persisted after adjusting for childhood socioeconomic status, sex, and body mass index at age 9. Moreover, after adjustments, the running distance was significantly shorter for the bcMD group than for the no cMD group. No other associations were significant. **Conclusions:** This prospective cohort study indicates that objectively assessed childhood MD and borderline childhood MD are linked to reduced self-reported PA frequency and PF in midlife.

Relevance

Physical activity and fitness are crucial for both physical and mental health. Hence, our results emphasise the importance of interventions to increase physical activity and fitness in children with motor difficulties and adults with a history of childhood motor difficulties.

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48 - Visuomotor adaptation in adults with Developmental Coordination Disorder

Marie Martel, Judith Gentle, University of Surrey

Background: Developmental Coordination Disorder (DCD/Dyspraxia) is a neurodevelopmental condition marked by impaired motor skills in the absence of neurological injury. A core ability of humans is to learn and refine a multitude of motor skills throughout the lifespan. Research on DCD agrees on an impairment in some of these processes, although the aetiology is not clear. **Methods and Results:** This study aimed to investigate motor learning abilities in 137 individuals with and without DCD (DCD=27; Control=110) using a classic paradigm of visuomotor rotation that consists of transforming visual feedback of a movement to introduce a new mapping between arm movement and the received visual feedback. Participants were asked to use the trackpad of a laptop to slice through targets displayed on the screen, aiming to bring the cursor (indicating their hand position) to the target. In some trials, the cursor indicated an altered hand position: to successfully reach the target, they had to adapt the direction of the movement. Accuracy was measured as the difference between the hand position and the target in different phases of the game. Both groups successfully learned the task, suggesting that individuals with DCD can adapt their movement to the visual information they receive and update the models of action in the brain accordingly. There was no evident difference in accuracy to reach the targets, however, the DCD group was more variable in their performance. **Conclusions:** This study shows that explicit motor adaptation is preserved in adults with DCD, improving our fundamental understanding of DCD in adults. Increased variability might suggest that they needed more exploration to successfully reach the target which has been observed numerously in this population. Future studies including larger sample sizes will allow taking into consideration co-occurring conditions and the building of more efficient and individualized remediation strategies.

Relevance

This work disentangles the preserved/affected motor abilities in DCD. Adults with DCD could adapt their movement when they were explicitly asked to do it, suggesting explicit cognitive strategies could counteract some of the difficulties in DCD. If every action could be broken into smaller steps, each being explicit enough to be anticipated, adults with DCD might perform similarly to their peers.

49 - The association between the ages & stages questionnaire and fundamental motor skills in preschool-aged children

Jerraco Johnson, University of North Texas; Kacie Gray, University of Texas at Arlington; Mitch Kay, University of North Texas; Crystal Alvarez, University of Texas at Arlington; Katie Breault, University of North Texas; Priscila Tamplain, University of Texas at Arlington

Background: Early identification of developmental delay (DD) is essential for providing early intervention and mitigating negative long-term effects and relies on accurate child screenings. The ages and stages questionnaire (ASQ) is a common parent-completed screening tool to identify development across several domains without a formal assessment. Early motor skills are foundational for later physical health in children. This study examined the relationship between the ASQ and the Movement Assessment Battery for Children (MABC-2) in preschool aged children. **Methods and Results:** 43 children were recruited for this study. Motor skills were assessed using the MABC-2, which measures three components of movement: manual dexterity, aiming & catching, and balance. Their caregivers completed the ASQ. Bivariate Pearson correlations were used to analyze the data. Caregivers' ratings on the fine motor skill ($r = .30$, $p = .048$) and personal-social ($r = .39$, $p = .011$) domains of the ASQ were significantly correlated with the child's MABC total test scores. No other correlations were significant including the gross motor skill domain and total ASQ score. While most of the current sample were not at-risk for DD, six children scored below the 16th percentile. We explored this relationship in this sub-sample. **Conclusions:** While the ASQ is largely used as a measure to identify problems in early development, it was not associated with results of actual motor skills using the MABC-2. Of the six children at-risk for DD in this study, only two guardians rated their children accordingly on the ASQ. The other four caregivers rated their children higher than their actual ability which highlights a potential disconnect between the questionnaire and the child's actual motor skills. The findings indicate that a more thorough, direct assessment of motor skills may be needed to detect early motor problems. The study should be replicated using a larger sample size and with more children with DD.

Relevance

Parents play a key role in early identification. If the ASQ is not as sensitive of a screening tool for motor skill development, many young children with or at-risk for motor DD may not be receiving the earliest intervention that can make a difference in their trajectories. There should be considerations on adding measures that can give a better overview of motor development in early childhood.

52 - Developing a virtual reality screening tool for DCD

Gavin Buckingham, University of Exeter

Background: Developmental coordination disorder (DCD) is diagnosed inconsistently across the UK, in part due to a lack of individuals trained to administer the gold-standard diagnostic test (the Movement ABC). Survey methods, such as the DCD-Q, are easily administered but may lack the diagnostic sensitivity of an objective behavioural assessment. Modern virtual reality (VR) technologies, which track the movement of the head and hands to allow the user to interact with a computer-generated environment, might bridge the gap between questionnaire-based screening and formal diagnosis. **Methods and Results:** We developed four gamified tasks in Unity Game Engine for a Valve Index Headset in a laboratory setting. These tasks were designed to broadly mimic some salient features of the MABC-2. Initial prototypes of this VR screening were then iteratively adapted based on feedback from neurotypical children (n=4), dyspraxic children (n=3), and dyspraxic adults (n=2). After 6 months of co-development, we have the alpha build of our screening tool, and aim to recruit 30 children aged 11-16 with probable DCD and 30 children of the same age without DCD. Data collection is currently ongoing (n=29, 11 with DCD), and due to be completed by April. When data collection is complete, we will examine the diagnostic sensitivity of the VR screening tool and examine correlations between distinct outcome variables collected during the VR task in relation to MABC-2 sub-scales. **Conclusion:** The outcomes from this study will demonstrate the viability of using VR to screen children for DCD and motivate the development of the next stage of this project, optimised for a standalone headset (Meta Quest 3) for pilot rollout in a school-based setting.

Relevance

This work, funded by the Waterloo Foundation, represents the first step toward using immersive technologies to create an engaging and objective test battery which can be easily administered in a school setting with minimal training and support.

53 - Children with Developmental Coordination Disorder and Autism Spectrum Disorder show similar profiles in the Sensory Organization Test

Crystal Alvarez, The University of Texas at Arlington

Background: Children with Developmental Coordination Disorder (DCD) and Autism Spectrum Disorder (ASD) have shown impairments in postural control (PC) when compared to children with typical neuromotor development (TD). A recent study showed differences in characteristics of dynamic PC in these clinical groups of children. The aim of the present study was to identify profiles of postural control as measured by the Sensory Organization Test (SOT). **Methods and Results:** Three groups of children participated in the study: TD (n=10), DCD (n=15), ASD (n=21). Ages ranged between 5 and 16 years (M=8.3, SD=2.8), with 12 females and 34 males. Children's motor ability was tested using the Movement Assessment Battery for Children, 2nd Edition (MABC-2); and parents filled out the Developmental Coordination Disorder Questionnaire (DCD-Q). Results for each group are as follows: TD (MABC-M=52.4%, SD=25.4%; DCDQ-M=68.7, SD=6.4), DCD (MABC-M=5.4%, SD=4.7%; DCDQ-M=41.6, SD=15.7), and ASD (MABC-M=13%, SD=24%; DCDQ - M=35.2, SD=12.6). All children were tested in 6 conditions of the SOT– eyes open quiet stance, eyes closed quiet stance, eyes open surround wall movement, eyes open force-plate perturbations, eyes closed force-plate perturbations, eyes open force-plate perturbations and surround wall movement. There was a significant difference for groups in all conditions except eyes open quiet stance (all $p < .05$). In all significant conditions, post-hoc comparisons indicated that the TD group scored significantly higher than both the DCD and ASD groups, and there was no difference between the DCD and ASD groups. **Conclusions:** Our results show similarities in postural control in these clinical groups using the SOT. We conclude that sensory organization is similar in both clinical groups but is lower than those of typically developing children. Here, the SOT involves static PC tests with different sensory inputs. More specific differences between DCD and ASD are likely found in more complex, dynamic tasks like the one used by Miller et al. (2019). These findings add to the body of literature comparing motor profiles of children with DCD and ASD and can help in the understanding of similarities and differences in the motor system of the two conditions.

Relevance

Postural Control is a fundamental motor skill. Difficulties in maintaining postural control can affect the emergence of other motor skills and is essential to being active and healthy. Early detection in postural control impairments for these children will help promote assessment opportunities and specific intervention strategies that can support postural control for each group.

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54 - Atypical procedural learning of adults with developmental coordination disorder: evidence from modulation of neural oscillation

Yulan Yao, Binn Zhang, Zuyang Fan, Shanghai University of Sport

Background: The purpose of this study was to explore the implicit procedural learning patterns and the EEG oscillatory activity in adults with DCD. **Methods and Results:** A total of 22 adults with DCD (14 females) and 22 age-matched control participants (11 females) aged 18 to 21 years were included. The task was adapted from the classic serial reaction time task. A significant main effect of the group was found on reaction time $F(1, 42) = 6.554$, $p = .01$, $\eta P2 = .019$. The reaction time of the DCD group (379.131 ± 4.472ms) was significantly longer than the control group (362.938 ± 4.472ms). On the Global Performance Index (GPI), a marginally significant group main effect was found $F(1, 336) = 3.653$, $p = .057$, $\eta P2 = .011$ with the DCD group (1.269 ± .013) exhibiting higher scores than the control group (1.236 ± .013). As to EEG oscillatory, we found marginally significant interactions between groups and blocks of frontal theta (4-7Hz) power $F(1, 42) = 3.880$, $p = .055$, $\eta p2 = .085$. For the DCD group, the average power of Block7(0.782 ± 0.113μV) was higher than Block6(0.621 ± 0.076μV), while there was no significant difference between Block6 and 7 for the control group. The main effect of the group is significant $F(1, 42) = 8.406$, $p = .006$, $\eta p2 = .167$, with the power of the DCD group (0.701 ± 0.089μV) being higher than the control group (0.338 ± 0.089μV). There was a significant interaction between group and EEG time window in the frontal theta power $F(1.575, 66.170) = 4.505$, $p = .022$, $\eta p2 = .097$. From the 6th time window (500-600ms), the DCD group exhibited significantly higher power than the control group (pmax=.030), with the maximum occurring at the 7th time window (DCD group: 0.797 ± 0.174μV; control group: 0.228 ± 0.174μV), suggesting a delayed appearance of activation peaks in the theta bands in the frontal region for the DCD group. **Conclusion:** This study reveals atypical sequence learning patterns in adults with DCD, providing support for the presence of procedural learning defects in individuals with DCD.

Relevance

This study calls for broader social attention to adults with DCD and expands the research perspective from the field of action to cognition. Our study provides evidence to clarify the mechanism of procedural learning impairment in adults with DCD and provide empirical evidence for the development of intervention plans for procedural learning in adults with DCD.

55 - Procedural learning via motor imagery reveals the deficit in the internal model in adults with DCD

Binn Zhang, Yulan Yao, Shanghai University of Sport

Background: As an important aspect of motor coordination, motor sequence learning ability in adults with Developmental Coordination Disorder (DCD) is still unclear. The internal modeling deficit (IMD) hypothesis supports the idea that impairments in forward model generation in DCD disrupt the comparison between prediction and actual sensory feedback, thereby hindering the learning and execution of movements, which may explain the potential procedural learning defects in DCD. This study aims to examine implicit procedural learning patterns in adults with DCD and investigates the mechanism of implicit procedural learning defects in them. **Methods and Results:** Procedural learning via motor imagery was utilized to evaluate the predictive control in the context of the IMD hypothesis. Altogether 18 (12 girls) participants for the control group and 19 (10 girls) participants for the DCD group aged 18-21 were included. Implicit procedural learning was examined using the Serial Reaction Time task under two conditions: motor execution and motor imagery. In the motor execution condition, participants were instructed to press the keys as directed using the corresponding fingers. In the motor imagery condition, participants were required to mentally simulate key pressing from an internal perspective guided by the position of the asterisk. Results show that the reaction time of the DCD group is longer than that of the control group ($F(1, 35) = 6.323$, $p = .017$*, partial $\eta^2 = .153$). The interaction between group and reaction mode is significant $F(1, 35) = 8.142$, $p = .007$**, partial $\eta^2 = .132$. In the DCD group, the reaction time under motor imagery was found to be faster than under motor execution ($F(1,18) = 9.848$, $p = .006$**, partial $\eta^2 = .354$). At the same time, no significant difference was observed between motor imagery and motor execution in the control group $F(1,17) = 0.247$, $p = .626$). **Conclusion:** This study provides evidence to support the hypothesis of IMD through implicit procedural learning via motor imagery in adults with DCD.

Relevance

This study provides evidence in the field of procedural learning for the hypothesis of the internal modeling deficit (IMD). This study provides research evidence to clarify the mechanism of procedural learning impairment in adults with DCD from the internal model. The results of this study may provide a theoretical basis for early intervention in DCD.

56 - Evidence of somatosensory deficits in children with Developmental Coordination Disorder

Marion Naffrechoux, Alessandro Farnè, Denis Pélisson, Alice Catherine Roy, Lyon Neuroscience Research Center (CRNL), IMPACT Team

Background: Developmental Coordination Disorder (DCD) consists in slowness, clumsiness and inaccuracy of motor performance. Despite its high prevalence, the etiology of this disorder is still unknown. While internal models subtending movement generation have been suggested to be affected in DCD, the hypothesis of perceptual deficits explaining motor disturbance has been much less investigated. Previous studies have revealed that DCD children have impaired visuo-spatial capabilities, but their tactile and proprioceptive abilities –though critical for motor control– are still largely unknown: tactile abilities have been rarely examined in children with DCD, and studies of proprioceptive abilities have brought inconsistent results. Critically, somatosensory abilities -typically assessed through manual pointing responses- could not be distinguished from the motor deficits affecting the responding limb. Here we aimed to evaluate proprioceptive and tactile spatial abilities in DCD children independently of their motor deficits. **Methods and Results:** DCD and Typically Developing (TD) children (n=17 in each group, mean age= 10.72 ±1.09 and 10.78±1.27) had to localize, by manual or ocular pointing, unseen proprioceptive and tactile targets, i.e. (i) the tip of their index finger, (ii) tactile stimuli applied to the thumb or index finger. Comparison between the manual and ocular responses allowed us to isolate the perceptual component (preserved ocular response) from the motor component (impaired manual pointing) involved in DCD. DCD children showed larger errors in localizing proprioceptive and tactile targets than TD children, for both manual and ocular responses. Also, proprioceptive errors correlated negatively with manual dexterity across all children (DCD+TD). **Conclusions:** Proprioceptive and tactile localization performance seem reduced in children with DCD even when responding with their preserved ocular effector, reflecting altered perceptual abilities. These findings speak for a shift in the conceptualization of DCD.

Relevance

This work aims to better understand the etiology of DCD. Long described as a motor disorder, DCD also displays perceptual disorders: in addition to previously reported visuo-spatial impairments, here we disclose consistent somatosensory deficits. Better understanding DCD could improve rehabilitation by proposing interventions focused on specific deficits, and thus the patients' quality of life.

57 - The development of a movement demonstration video library to support motor learning in children with Developmental Coordination Disorder

David Wright, Manchester Metropolitan University; Sally Payne, Royal College of Occupational Therapists, The Dyspraxia Foundation; Paul Holmes, Greg Wood, Manchester Metropolitan University

Background: Action observation involves watching movement demonstrations. Our research has shown that this technique, either done independently or combined with synchronous motor imagery, can facilitate motor learning in children with Developmental Coordination Disorder (DCD) and can be delivered effectively in home settings under parental supervision. Despite the documented benefits of these techniques in research contexts, no resource existed to allow children with DCD, and their families, access to appropriate, research-informed, action observation content. To address this gap, we have developed a co-produced, free-to-access video library of movement demonstration videos for various activities of daily living. **Methods and Results:** We used an online survey of practitioners and individuals with lived experience of DCD to identify activities of daily living that children with DCD often struggle to learn. Movement demonstration videos were then created for 25 of the activities of daily living that were reported most commonly as being difficult to learn, including shoelace tying, using cutlery, and opening packets. All the video demonstrations were performed by typically developing child models and recorded using head-mounted cameras to provide first-person viewpoint demonstrations, with both right- and left-handed versions created. The movement demonstration videos have been developed into an online video library that can be accessed freely by children with DCD, or those who support children with DCD, to assist their learning of fundamental activities of daily living. **Conclusions:** The video skills library is free-to-access and has the potential to aid motor learning in children with DCD. In our presentation, we will summarise our previous research showing benefits of action observation in children with DCD and showcase the video library to delegates.

Relevance

We have developed a library of movement demonstration videos for activities of daily living to support motor learning in children with DCD. This provides children with DCD, and those support them, with a free resource to aid motor learning. Members of the society can use this resource freely in their research and applied practice to support children’s motor development and learning.

58 - Motor learning in trouble! Research in adults with Developmental Coordination Disorder

Arthur De Raeve, Frederik Deconinck, Ghent University; Mireille Augustijn, Ghent University, Research Foundation-Flanders (FWO)

Background: Developmental Coordination Disorder (DCD) significantly affects skilled movement coordination, influencing an individual's daily activities. This study is part of a broader project examining the evolution of motor behaviour and brain structure and function during motor task learning in individuals with DCD. Specifically, this section investigates the differences in motor learning over a short and longer period in adults with DCD compared to typically developing (TD) peers, considering both group and individual perspectives. **Methods and Results:** Thirteen participants with DCD and thirteen TD individuals (18-35y) engaged in a 6-week, 18-sessions balance training program on a rolla bolla. Performance was assessed at four time points by measuring the amount of time participants could maintain their balance on the loose or fixed role (maximum 120 seconds), with the latter condition requiring control of less degrees of freedom. RMANOVA's were used to explore time by group interaction effects. For the loose role, no significant differences in motor learning were observed between groups ($p=0.744$, $np2=0.012$). However, individual data showed slower and more heterogenic learning in adults with DCD. On the fixed role, the DCD group displayed a significantly slower learning pattern compared to TD peers ($p< 0.001$, $np2= 0.324$), both after 3 and 6 weeks of training. **Conclusions:** Adults with DCD can learn a challenging balance task that requires the control of multiple degrees of freedom, albeit at a slower pace than TD participants. For the fixed role, adults with DCD displayed limited improvement over time. So when the demands are increased and require rapid detection of and reaction to disruptions, learning is severely hampered. The interindividual differences in the learning curves confirm the importance of a adopting tailored approach to DCD.

Relevance

Relevance for society: By taking a detailed look at motor learning in different tasks and conditions, this study aims to increase our understanding of the specific factors that hinder motor learning in DCD. Moreover, the data on neuroplasticity (not reported here) will also shed light on the underlying brain mechanisms of motor learning in this population.

59 - Influence of sociodemographic factors on muscular fitness of primary school children in South Africa

Xonné Muller, North-West University, University of Fort Hare; Anita E Pienaar, Barry Gerber, North-West University; Colin Moran, Naomi E Brooks, University of Stirling

Background: Global physical fitness levels have declined over the past 50 years due to rising overweight and obesity rates, sedentarism and negative economic shifts. Discrepancies in muscular strength (MS) are noticeable in South African children. Health-related fitness including MS and endurance levels play a significant role in achieving desired physical activity levels, reducing non-communicable diseases, improving growth and development. The study aimed to identify risk factors that might influence muscular fitness in primary school children to guide timely interventions.
Methods and Results: A total 349 children (boys=165; girls=184) formed part of this study. Children from various SES were tested at three time points 2010, 2013, 2016, spanning seven school years with mean ages of 6.8, 9.9 and 12.9. Norm-based, standerdised tests were used to measure MS and endurance (sit-ups, standing long jump, push-ups, wall sit and V-ups) over time. Mixed linear regression models were used to analyse the data. P-values were adjusted according to the Tukey method. Significant two-way interactions were found between age and SES for standing long jump, push-ups, wall-sit, and sit-ups. Children from low SES backgrounds performed better at younger ages (6.8 years) in the V-up and push-up subtests, although non-significantly. However, as they grew older (9.9 -12.9 years), children from high SES groups excelled with significantly better scores for push-ups. Boys outperformed girls in overall MS at 9.9 and 12.9 years old. No change was found in the regression model after controlling for covariates (body mass, stature, BMI, and body fat percentage).
Conclusion: The findings signify the consideration of age, SES and gender discrepancies as important factors when addressing and promoting MS and endurance among children. Further research and targeted interventions are warranted to bridge the disparities and improve overall MS as part of fitness levels in children from diverse backgrounds.

Relevance

This study identifies factors in low-middle-income countries influencing health-related fitness, through identifying timely interventions. These findings can tailor interventions based on SES, gender and age, assisiting policymakers and health practitioners. Implementing insights from this study may improve overall health, reduce disease risks, and enhance overall child growth and development.

60 - Self-concept, diagnosis and wellbeing in adults with DCD

Kate Wilmut, Clare Rathbone, Oxford Brookes University

Background: Previous research has highlighted poorer outcomes for adults with DCD in terms of anxiety, confidence and resilience. Furthermore, children with DCD have a significantly more negative self-concept in terms of physical abilities, sporting ability and physical health. However, self-concept is under-researched in adults with DCD, as is the role of diagnosis. Across two studies we aimed to determine how adults with DCD define themselves, in general and in relation to their DCD and how this relates to their wellbeing, their memories and the presence of a diagnosis. **Methods and Results:** Both diagnosed (dDCD) and self-identified (sDCD) adults with DCD and without DCD were recruited (study 1: dDCD N=97, sDCD N=48, no DCD N=49, study 2: dDCD N=104, sDCD N=32). An online questionnaire asked participants to identify enduring aspects of their self and (in study 2) associated memories both in general and in relation to their DCD, for each of these they also rated the valence, importance and age of emergence. Participants also completed scales of wellbeing and for study 2 the Adult Developmental Coordination Disorders Checklist (ADC). General valence of self-concept statements was more positive in the group without DCD compared to those with DCD, but those statements were rated as equally important for all groups. In line with this, measures of wellbeing were poorer in the DCD groups compared to the no DCD group. For participants with DCD related self-concepts and memories are more negative and less important compared to those not related to DCD. Across multiple measures we consistently saw non-significant differences across the dDCD and sDCD groups and across those with an early versus a later diagnosis. **Conclusions:** Our findings illustrate poorer psycho-social outcomes in adults with DCD while also alluding to a poorer self-concept, both generally and in relation to their DCD, which might drive those lower levels of wellbeing. Furthermore, these data suggest that an early diagnosis of DCD may not be a protective factor.

Relevance

This project focused on aspects of the sense of self, associate autobiographical memories the importance of diagnosis in terms of wellbeing in adults with Developmental Coordination Disorder. There is a lack of research and data within this field and our understanding of mental health in adults with DCD is lacking, therefore, it is highly relevant for the ISRA-DCD.

62 - Over-time change in physical and mental health in Taiwanese children with developmental coordination disorder

Yao-Chuen Li, China Medical University; Sheng Wu, National Taiwan University of Sport

Background: Children with developmental coordination disorder (DCD) experience many health challenges, such as physical inactivity, physical unfitness, or internalizing problems. However, there is a lack of longitudinal research investigating their physical and mental health, specifically in Taiwan. Therefore, this study aimed to track the changes in physical, psychosocial, and mental health in Taiwanese preschool children with DCD. **Methods and Results:** 123 children aged between 4 and 6 years participated in this three-year prospective study, including 99 typically developing children and 23 children with DCD. Data were repeatedly collected on subjectively- and objectively-measured physical activity, physical fitness (i.e., body mass index (BMI), cardiorespiratory fitness, muscle strength, and flexibility), stress, physical self-concept, perceived social support, internalizing and externalizing problems, and executive functions (i.e., inhibitory control, cognitive flexibility, and working memory). Mixed effect modelling was used to assess over-time changes in health outcomes between children with and without DCD. The first model examined the main effects of time and group, whereas the interaction of time*group was added into Model 2. Sex was the covariate in both models. Children with DCD significantly had poorer executive functions, poorer physical fitness, more sedentary behaviours, and less vigorous physical activity over time. Specifically, there were significant time*group interactions on cardiorespiratory fitness, BMI, and flexibility, indicating that the gaps in BMI and flexibility increased over time, whereas the gap in cardiorespiratory fitness decreased over time. **Conclusions:** When children with DCD transition from early childhood to middle childhood, they may experience more challenges regarding physical health and cognitive performance. Interventions may prioritize these health outcomes and prevent the long-term, adverse impacts on holistic well-being.

Relevance

This study emphasizes the necessity of early intervention to mitigate the enduring negative impact of DCD on physical and mental health, specifically executive functions and physical activity and fitness in the early years.

63 - Sensory Modulation Disorder (SMD) of university students with and without probable DCD.

Miri Tal-Saban, Aviva Yochman, Naomi Weintraub, Hagit Magen, Hebrew University of Jerusalem

Background: Developmental Coordination Disorder (DCD) is associated with co-occurring neuro-developmental disorders, which may diminish functioning and behavioral manifestations of DCD. One of these impairments, noted in childhood is Sensory Modulation Disorder (SMD). However, limited studies have explored the co-occurrence of SMD among adults with DCD and particularly when controlling for attention. This study aims to address this knowledge gap by comparing the sensory profiles of non-referred adults with and without symptoms of DCD. **Methods and Results:** A random sample of 225 university students was divided into two study groups based on the cut off scores of the Adolescents & Adults Coordination Questionnaire (AAC-Q). Sixty-three students were identified with probable DCD (pDCD), and 162 were typically developing students. As part of the study, all participants completed the Adolescent/Adult Sensory Profile (AASP), assessing Sensory Modulation Disorder (SMD), as well as the Wender-Utah Rating Scale, which screens for attention. A MANOVA revealed an overall significant group effect on the AASP, with significant group effects on the low registration and sensory sensitivity quadrants. These effects persisted even when controlling for attention. The percentage of adults with pDCD classified with low registration was 52.4%, as opposed to only 10.5% in the control group, and 49.2% of the adults in the pDCD group were classified with sensory sensitivity compared to 23.5% in the control group. **Conclusions:** The current findings contribute to our understanding of co-occurring neurodevelopmental disorders in general, and in particular among young adults with pDCD. This study demonstrates that the co-occurrence of pDCD and SMD persists into adulthood and therefore should be considered during assessment and intervention in this population.

Relevance

Limited studies investigated the co-occurance of Sensory modulation disorder (SMD) and DCD in adults. This study reveals that the co-occurrence of probable (pDCD) and SMD persists into adulthood, adults with pDCD exhibit passive sensory self-regulation strategies. Addressing this co-occurrence is crucial for effective assessment and intervention which addresses the diverse needs of this population.

64 - Effectiveness of catch-ball training using virtual reality technology

Masatoshi Katagiri, Hokkaido University of Education; Kana HIgashitani, Hokkaido Hoshioki school for students with special needs

Introduction: The execution of ball-throwing and catching activities poses challenges for numerous individuals with deficient gross motor skills. Specifically, individuals with poorer moto skills, such as those diagnosed with Developmental Coordination Disorder (DCD), often exhibit an aversion to engaging in activities involving a ball due to perceived sensations of "dread" or "painful." In the context of this investigation, we examined the efficacy of virtual reality technology (VR)-based catching training as an interventional exercise for individuals grappling with difficulties in ball-catching. **Methods and Results:** Seventeen participants, comprising one male and sixteen females aged 18-22 years, were randomly divided into two groups exhibiting analogous catching proficiency. The intervention group engaged in catching exercises utilizing VR technology (40 iterations), while the control group participated in ball-catching sessions with an actual ball (60 iterations). Within the intervention group, the mean pre-intervention catching score was 23.63, whereas the control group exhibited a mean pre-intervention catching score of 25. Following four intervention sessions, the mean catching score soared to 33.25 in the intervention group, reflecting a notable increment of 9.62 points relative to the pre-intervention assessment. Analysis of the catching scores indicated a main effect of intervention ($F(1,15)=20.15$, $p<.001$). No discernible interaction was observed between pre- and post-intervention phases and group ($F(1,15)=1.17$, $p=.30$). **Conclusions:** The results suggest equivalence in effectiveness between catching training in VR and real-world practice involving a tangible ball. Moreover, VR-based training may afford a more attainable subjective sense of motor proficiency and is particularly advantageous for individuals grappling with physical ineptitude, as it mitigates their apprehension towards the ball.

Relevance

This study suggests that the use of VR technology is well suited for motor exercise for children with poorer motor skills in school. Children with poorer motor skills may not actively engage in physical exercise due to fear. However, the use of VR technology may reduce their fear and make it easier for them to engage in training while having fun. As a result, their children will have more possibilities for social participation through motor exercise.

66 - A scoping review of differences between DCD, ADHD, and co-occurring DCD and ADHD

Emily J. Meachon, Agnes M. Detert, University of Basel; Nadja Schott, University of Stuttgart; Kate Wilmut, Oxford Brookes University; Alexander Grob, University of Basel

Developmental Coordination Disorder (DCD) and Attention-Deficit/Hyperactivity Disorder (ADHD) frequently co-occur and share primary and secondary symptoms. It is unclear if inherent similarities between DCD and ADHD explain this or if symptomatic overlaps can be attributed to co-occurrence. This has led to ongoing challenges in research and practice to disentangle DCD and ADHD in differential diagnosis. It is imperative to precisely categorize each condition's unique versus overlapping features. Therefore, we conducted a scoping review to summarize literature describing DCD and/or ADHD in medical and psychological sciences across the lifespan. Our review was preregistered on the Open Science Framework (OSF) and complied with PRISMA guidelines. Systematic searches yielded N = 56 relevant articles published up to 2022. These described neuroimaging (n = 10), genetic and twin studies (n = 3), methylphenidate efficacy (n = 5), cognition (n = 8), motor skills (n = 14), sensorimotor processing and perception (n = 4), psychosocial factors (n = 5), physical activity and physical therapy (n = 3), and symptom classification (n = 4) among those with DCD and/or ADHD. A majority of studies included child and adolescent samples with few studies replicated. Substantial evidence converged to support that DCD and ADHD overlap in neural and functional domains but can often be distinguished by sensorimotor difficulties particular to DCD. Furthermore, compared to just one condition (i.e., DCD or ADHD), co-occurring DCD and ADHD was consistently indicative of more difficulties and impairment shown in neural structure and function, motor skills, sensorimotor processing, physical activity, psychosocial wellbeing, and symptom management. Future research should examine DCD and/or ADHD in adult samples and fill existing gaps in genetics and physical activity. Furthermore, it is evident extensive replication is needed to determine precursors, stability, and changeability of the conditions.

Relevance

We provide an overview of existing studies which aimed to better understand DCD, ADHD, and co-occurring DCD+ADHD relevant to researchers, practitioners, and people with these conditions. This work lays out foundational evidence within and across 56 papers summarizing the patterns observed to be unique to DCD and/or ADHD as well as highlighting where both DCD and ADHD overlap.

68 - Parental estimations of children’s behaviors in different risk scenarios

Rita Cordovil, João Barreiros, Universidade de Lisboa; Carolina Burnay, The Education University of Hong Kong, Universidade de Lisboa; Chris Button, University of Otago; David Anderson, San Francisco State University

Throughout development, parents arrange the environments in which their children move to encourage active yet safe exploration. The success of this depends on the parents’ accurate assessment of their child’s behavior and abilities. In a group of studies, we investigated parents’ perception of children’s behavior and action limits in four tasks with different levels of perceived risk: reaching a toy on a shelf (n=33, 1- to 4-year-old children), reaching a toy in a swimming pool and avoiding falling in it (n=68, 1- to 4-year-old children), avoiding falling over a water and a real cliff (n=101, 8- to 19-month-old children, for both tasks). In the reaching tasks, parents were asked to estimate their child’s maximum reachability to determine their error tendency (i.e., over / underestimation when prediction was greater / lower than actual reachability). In the swimming pool and cliffs tasks, parents were asked to estimate their child’s behavior (avoid or not-avoid getting into the water and going over the real and the water cliff). Our findings showed that parents tend to overestimate their child’s behavior in the vertical reachability task (63.6% overestimations), but underestimate it in the swimming pool (52.9% underestimations). Regarding the accuracy of predicted avoidance behavior, 77.9% of parents accurately predicted their child’s behavior in the swimming pool task, but there were only 47.3% and 48.9% accurate predictions in the water cliff and real cliff tasks, respectively. Most incorrect predictions involved children who avoided the cliff but were predicted by their parents to fall (39.3% in the water cliff and 42.2% in the real cliff). In the swimming pool and cliffs tasks, about 10% of children predicted to avoid the situation did not, posing a potential safety issue. In conclusion, parents tend to believe that their children will not avoid risk situations, and usually underestimate the extent of their exploratory behavior in tasks they perceive as riskier.

Relevance

In terms of child safety, it is crucial to determine whether parents can accurately predict their children's behavior in different risk situations promoting an active yet safe exploration of the environment.

69 - How does screen access and screen time rules relate to objectively-measured child physical activity and parent-reported screen time?

Kara Palmer, Imani Drame, University of Michigan; E. Kip Webster, University of Tennessee; Leah Robinson, University of Michigan

Background: In a generation dominated by technology and sedentary lifestyles, understanding more about children's screen usage and how it relates to other health behaviors such as physical activity (PA) is imperative. The purpose of this pilot study was to determine how screen access and screen time rules relate to objectively measured PA and parent-reported screen time. **Methods and Results:** Participants were from the baseline measure of Cohort 1 on the Promoting Activities and Trajectories of Health study. Parents completed a questionnaire on their child's screen time usage in minutes on weekdays and weekends, access to screens in their bedroom, and presence or absence of screen time rules at home. Children's moderate-to-vigorous PA (MVPA) was assessed using wrist-worn accelerometers. Minutes of MVPA were calculated for weekday and weekends. We compared children's minutes of weekday and weekend MVPA and screen time usage between: (1) children with and without access to screens in their bedrooms, and (2) children with and without screen time rules. In total, 48 families completed the parent questionnaire (41.8% response rate; majority [94%] completed by biological mothers). All 100% of parents reported on if their children's access to screens in their bedroom (67% reported children had access to screens); 95% of parents reported on if there were screen time rules in their home (78% reported having screen time rules). Results indicated that children who had access to screens in their bedrooms had significantly more weekday screen time compared to children without access to screens in their bedrooms (135.7 vs 89.1 min; respectively; $p<0.05$). Further, children who had screen time rules at home engaged in more MVPA on weekdays compared to children without screen time rules (66.1 vs 52.2 min; respectively; $p<0.05$). **Conclusions:** These preliminary data support that home physical and social environments around screens influence both screen time usage and PA in children.

Relevance

Physical activity is directly linked with motor development in children. Screen time is emerging as an important associated factor with both physical activity and motor development. There is a need to understand how the home environment and parental practices around screens might influence screen time usage and physical activity behaviors in children.

70 - Comparing three measures of children's run speed

Kara Palmer, Aaron Wood, John Adams, Martin J. Clynes, Morgan Horvath, Leah Robinson, University of Michigan; Karin Pfeiffer, Michigan State University; Leesi George-Komi, University of Michigan

Background: Running speed is a commonly used measure of motor performance and can be assessed in the field (e.g., stopwatch) or through video analyses (e.g., Dartfish®) of recorded run performances. Previous work has used Dartfish® to assess children's run speed across two stride lengths; however, it is not known how video analyses of speed across two strides compares to run speed collected in the field or run speed collected from video analyses across a distance. **Methods and Results:** Data were from the baseline measure of Cohort 1 in the Children's Health Activity Motor Program- After School Program Study. Children (6-9yrs) ran across 11m for three trials. Running speed (m/s) was measured across the center 7m of the total distance in three ways: (1) during run performances using a stopwatch ["Live"], (2) via Dartfish® to assess speed across the full 7m ["Dartfish® Full"], and (3) via Dartfish® to assess speed of the two fastest consecutive strides ["Dartfish® Strides"]. The Dartfish® Full was considered the reference standard. Differences between (1) Dartfish® Full vs. Live and (2) Dartfish® Full vs. Dartfish® Strides were assessed using percent differences, Lin's Correlation Coefficients (LCCs), and Bland-Altman Plots. A total of 71 children (7.1±0.8 yrs, 29 boys) had at least one measure of run performance. As compared to Dartfish® Full, children's run performances were slower when measured Live (M= 7.89% ± 9.33%) and faster when measured Dartfish® Strides (M= -6.40% ± 8.69%). LCCs were weak between Dartfish® Full vs. Live (LCC range= 0.51-0.47) and moderate between Dartfish® Full vs. Dartfish® Strides (LCC range= 0.78-0.74). Bland-Altman plots showed general agreement between Live vs. Dartfish® Full but systematic differences between Dartfish® Full vs. Dartfish® Strides. **Conclusions:** These data support running performance is different across different measures. Researchers should be cognizant of these differences when selecting and reporting running speed.

Relevance

As we continue to develop and report on motor performance using a variety of assessments, we need a better understanding of differences in outcomes based on measures. These data provide novel information into differences in running speed as assessed using three different measures.

71 - Understanding participation and Quality of Life of College Students with pDCD using Structural Equation Modeling

Miri Tal-Saban, Naomi Weintraub, Hagit Magen, Hebrew University of Jerusalem, Israel

Background: Developmental coordination disorder (DCD) is a chronic neurodevelopmental disorder affecting motor coordination, impairments in daily activities and a reduction in quality of life (QoL). A unique population of individuals with DCD are college students. As a result of the academic requirements and the complex daily activities needed in college life, these individuals face numerous challenges in their everyday life. Nevertheless, the literature regarding participation and QoL in this population is limited. Purpose: To describe participation and QoL of college students with pDCD compared to their typically developing (TD) peers, and to describe a structural equation model (SEM) to explore QoL in this population. **Methods**: A total of 297 college students participated in this study. Three groups were identified based on the cut off scores of the Adolescents & Adults Coordination Questionnaire: 40 students with pDCD, 45 students with borderline DCD and 212 TD students. Methods: The participants were administered three questionnaires assessing participation, QoL and executive function (EF), and two screening questionnaires for DCD and attention deficits. **Results**: Participants with pDCD and borderline DCD showed reduced participation, lower QoL EF and attention compared to TD participants. The results of the SEM showed that pDCD had a direct significant effect on all the variables in the model. Importantly, DCD had a weak direct effect on QoL, and strong indirect effect on QoL mediated by participation. Additionally, attention and behavioral regulation had a direct effect on QoL, whereas behavioral regulation had an indirect effect on QoL mediated by participation. **Conclusions**: This study contributes to the growing knowledge of DCD among adults, particularly college students. This study shows that DCD in adulthood is associated with reduced participation, which has a negative impact on quality of life, and emphasizes the importance of participation in explaining QoL.

Relevance

The results strengthen the understanding of the functional implications of pDCD in young adults, particularly college students that go beyond problems in coordination. The results emphasize the important role of participation in determining QoL in this population, and suggest novel avenues for the development of intervention programs.

72 - Children with high actual and perceived motor skill competence are more physically active

Lisa Barnett, Simone J.J.M. Verswijveren, Nicola Ridgers, Deakin University; Maike Tietjens, University of Münster; Natalie Lander, Gavin Abbott, Deakin University

Background: The aim was to understand how motor skills (actual and perceived) contribute to moderate- to vigorous-intensity physical activity (MVPA) in children. Previous studies i) tended to use broad measures of perceived sport competence, ii) did not align actual and perceived motor competence measures and/or iii) did not use device-based physical activity measures. **Methods**: Cross-sectional data were pooled from four Australian studies with a total of 481 children (54.5% boys) aged 3.5 to 11.7 years included. Motor skill competence (total, object control and locomotor) was collected using the Test of Gross Motor Skill Development (TGMD) and motor skill perception was assessed with the pictorial scale of Perceived Movement Skill Competence (PMSC). ActiGraph data were reprocessed with Evenson cut-points to identify time spent in MVPA (i.e., ≥ 2296 counts per minute -cpm). Latent profile analyses were used to identify actual and perceived skill profiles and then associations with MVPA were assessed (adjusting for sex and age). **Results**: For total skill profiles, a two-class solution best fit the data [high-high: 82% of sample and low-low:18%) with children in the high-aligned profile 8 minutes p/day more active. For the two subdomains, there was a generally a three-class solution (low-aligned, high-aligned, & generally low-aligned), with the high-aligned group 17.5 MVPA minutes p/day more active than the generally low-aligned group. **Conclusions**: Perceptions (locomotor and object control) and actual object control skills appeared to drive profile differences. Considering the World Health Organization 2020 recommendations for children are at least an average of 60 minutes MVPA per day across the week, the difference in physical activity between profiles equates to between 12% to 29% of recommended daily activity. These results provide a holistic perspective to the I-MDRC society on building children's motor skills as a strategy for children's physical activity.

Relevance

The sample size is large for objectively measured physical activity and measures are well validated. Findings can be used to inform intervention development and point to object control actual skills and both types of skill perception being important to foster in children as important mechanisms for children achieving physical activity guidelines.

73 - Longitudinal relationship between organised and non-organised physical activities and motor competence in children aged 3–11 years

Nanne-Mari Luukkainen, Arto Laukkanen, Donna Niemistö, Arja Sääkslahti, University of Jyväskylä

Background: Age positively correlates with children's motor competence (MC) and affects the type and amount of sports participation. This study aimed to find out how outdoor time and participation in sports in early childhood (T1) predict MC later in school age (T2). **Methods**: The participants (n = 627, 51.0% girls) were Finnish, 3-8 years old at T1 (mean 5.5 years), and 6-11 years old at T2 (mean 8.7 years). The rate of participation in sports and outdoor time on weekdays and weekends was queried via a parental questionnaire at T1. At T2, children's MC was assessed using a shortened version of the Test of Gross Motor Development – 3rd edition (TGMD-3), including locomotor skills of hopping and skipping, and object control skills of one-hand stationary dribbling and overhand throwing, and a total score of these skills. Additionally, the jumping sideways test of the Körperkoordinationstest Für Kinder (KTK) instrument was used. Data was analyzed using linear regression models with the enter method. **Results**: Children's participation in more than two (multisport) organised activities at T1 predicted better motor competence at T2 in locomotor skills, object control skills, total fundamental movements skills, and jumping sideways. Outdoor time on weekdays at T1 predicted better object control skills and total fundamental movement skills in all participants and girls. **Conclusion**: Participation in more than two sports and spending more time outdoors during the weekdays predicts process- and product-oriented MC. These results underline the necessity of coach and teacher training and, on the other hand, the family's role as a provider of participation in organised sports and the possibility of being physically active outdoors.

Relevance

Motor competence is the foundation of movement, which enables the performance of basic everyday activities. The more complex the movements are, the more advanced motor skills they require. Therefore, it is crucial to understand the factors that predict the development of motor skills.

75 - Exergames: A potentially effective tool to improve physical activity behaviour in adolescents with DCD

Taha Yassine Temlali, Bert Steenbergen, Jessica Lust, Sandra der Wal, Radboud University

Background: A large proportion of adolescents with developmental coordination disorder (DCD) are physically inactive. Physical literacy has been described as an important determinant in promoting health behaviors. The potential of exergames to improve both physical literacy and activity has been recognized in typically developing children. We aimed to map the available evidence of this potential for adolescents with DCD by a scoping review. **Methods**: A scoping review was performed via a literature search in PubMed, Web of Science, Embase, ERIC, and CINHAIL. The population of interest were adolescents with DCD (10 -17 years old). We included studies examining the effects of exergaming on physical activity behaviour and physical literacy. The primary outcome measure of interest was reported and/or objectively assessed physical activity behaviour. Secondary outcome measures included physical literacy domains. **Results**: From 2860 records, two studies in DCD assessed physical activity, 12 studies discussed exergame features and 14 studies assessed physical literacy domains. In DCD, one study showed positive effects of exergaming on physical activity and the other failed to show such significant effects. Positive effects of exergames on the different physical literacy domains (motor competence, self-concept and affect, motivation, and social/ experiential) were shown. Exergame features including multiplayer modes, realism, game rewards, challenges and enjoyment were shown to have a significant effect on motivating and encouraging adolescents to exert more effort while playing. **Conclusion**: Currently there is no conclusive evidence regarding the (in)efficiency of exergames to improve physical activity in adolescents with DCD. Based on the positive effects of exergaming on physical activity in other populations, more in-depth research in adolescents with DCD is warranted. Physical literacy should be regarded as an important determinant in this regard.

Relevance

Adolescents with DCD are more likely to be physically inactive and sedentary compared to their healthy counterparts. This puts them at a heightened risk of various serious health problems. In recent years, exergames have received growing attention as a promising solution to the problem of physical inactivity. The current study highlights its potential also for adolescents with DCD.

76 - How Visual Trace Modification with Digital Tools Enhances the Rehabilitation of Dysgraphia in Children with DCD?

Jean-François Connan, Marianne Jover, Alexandrine Saint-Cast, Université Aix-Marseille; Jeremy Danna, Université de Toulouse

Background: Handwriting learning relies on the effective integration of sensory feedback, with a transition from trace-based control in novice writers to movement control in expert writers. This transition can be difficult for children with dysgraphia and the use of additional visual feedback (FB) could facilitate it and help to improve writing difficulties (Danna & Velay, 2015). Writing on digital tools allows for modifications that are not possible on paper, such as reducing or enriching the writer's visual information (Danna & Velay, 2015; Connan et al., 2023). The present research examines the effect, on a group of children with dysgraphia, of a1 rehabilitation protocol comprising handwriting tasks presented on a digital tablet. The protocol comprised sessions with and without experimental manipulation of the visual FB aimed to favor changes in the children’s handwriting motor control. The principle of our modification of visual FB was to mix a decrease of shape information during movement

and an increase of speed or fluidity information during or after movement. **Methods and Results**: A longitudinal protocol comprising graphomotor and writing tasks was applied to 20 children with dysgraphia and developmental coordination disorder (DCD). No visual BF modification was applied in half of the sessions (condition A), in the other half our visual BF modification was applied (condition B), the orders counterbalanced across participants. When applied, the visual FB modification was alternated between trials and consisted in either reducing the display of the pen trace during the trial leading to a 'snake' effect following the pen, or the addition of dots indicating on the resulting trace the location of dysfluent movements after the action. The results showed a specific short-term effect of modifying the visual FB, the children's increased pen velocity and the trace length. The results also showed an improvement in the legibility score and the inscription frequency following the protocol. **Conclusion**: The rehabilitation protocol including the visual modification of the written trace improved dysgraphia in children's handwriting.

Relevance

This project is a scientific validation of an experimental new rehabilitation protocol for dysgraphic children with DCD. This project will have an applied benefit for dysgraphic children with DCD and will provide new fundamental knowledge for a better understanding of the control mechanisms of the writing movement in DCD.

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77 - Construct validity of the Athlete Introductory Movement Screen in children aged 11-13 years

Michael Duncan, Matteo Crotti, Ricardo Martins, Lucas Guimaraes-Ferreira, Jason Tallis, William Pattison, Coventry University

Background: Movement skill assessment is common in physical education and youth sport. Recently, the Athlete Introductory Movement Screen (AIMS) was developed as a representative, screen to determine child readiness to engage in more formalized training (Rogers et al., 2019). Reliability of the AIMS has been established in a small sample of 15 year olds, but it's validity has not. The present study therefore examined construct validity of the AIMS in children aged 11-13 years. **Methods**: Following ethics approval, 87 children (37 girls) 11-13 years of age participated. Children performed the AIMS and TGMD-3 in a counterbalanced order (Rogers et al., 2019; Ulrich, 2019). Administration of both tests followed recommended guidelines. Assessments were videotaped and scored by 2 experienced raters. AIMS skills were scored (overhead squat, push-up, lunge, and front brace), and a composite score (0-48) was calculated. AIMS tertiles classed children as 'high', 'medium' or 'low' movement skill. For the TGMD-3, run, jump, hop, catch, overhand and underhand throw were assessed (0-48). **Results**: Data were analysed using a 2 (Sex) X 3 (AIMS tertile) way ANCOVA, controlling for age at peak height velocity (APHV) with TGMD-3 scores as the dependant variable. Results indicated a significant Sex X AIMS tertile interaction for TGMD-3 scores ($p = .039$, $P\eta2 = .08$). TGMD-3 scores were significantly higher for girls classed as medium movement skill compared to the low, and those classed as high movement skill compared to both medium and low movement skill groups (all, $p = .001$). For boys, those classed as high movement skill had significantly greater TGMD-3 scores than boys classed as low or medium movement skill (both $p = .001$). APHV was not significant as a covariate. **Conclusion**: The present study suggests that the AIMS has construct validity as a measure of movement skill in 11-13 year old children.

Relevance

Understanding validity is important in establishing tools to assess movement skills accurately. Such investigation explicitly aligns to the aims of the I-MDRC and given the array of movement skills available it is important that tools developed to assess these skills have independent scrutiny for their psychometric properties. The present study addresses this issue.

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78 - Clinical measures of postural control for children with Developmental Coordination Disorder and their psychometric and clinical properties

Benjamin Liversidge, Leanne Johnston, Bronwyn Thompson, University of Queensland, Australia

Background: Developmental Coordination Disorder (DCD) is characterised by poorly controlled posture and movement, however the most valid and reliable postural control assessments for this population are unknown. This study aimed to identify clinical measures of postural control reported for children with DCD and examine their psychometric properties. **Methods**: Four databases were searched for papers that: included children with DCD aged 0-18 years; assessed using a clinical test/subscale of postural control; with original psychometric data. Measure content was coded to the Systems Theory of postural control. Quality of evidence was rated using COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) checklists for validity, reliability and responsiveness. **Results**: Searches yielded 443 papers (103 included). From these, seven postural control measures/subscales were identified: Movement Assessment Battery for Children First (MABC) and Second (MABC-2) editions, Bruininks-Oseretsky Test of Motor Proficiency First (BOTMP) and Second editions (BOT-2), Peabody Developmental Motor Scales Second Edition (PDMS-2), the Lower-Quarter Y-Balance Test (YBT) and the Functional Gait Assessment (FGA). Psychometric evidence was strongest for the BOT-2 (validity), PDMS-2 and MABC-2 (reliability) and MABC-2 (responsiveness). The PDMS2 and MABC-2 had the most positive evidence. The BOTMP had limited, negative evidence while the FGA had no evidence available. At most, two of seven Systems Theory domains of postural control were assessed by a single measure. **Conclusion**: Four currently available measures have psychometric evidence for postural control assessment for children with DCD (MABC-2, BOT-2, PDMS-2, YBT). Together, these measures address only three of seven Systems Theory domains. More comprehensive assessments should be examined for children with DCD, such as the multi-system Kids Balance Evaluation Systems Test.

Relevance

This study is the first systematic review of postural control assessment for children with DCD. Four available tools exist with psychometric evidence to support use by clinicians. However, no measure covers all Systems Theory domains of postural control. Researchers could consider investigating the psychometric properties of the Kids Balance Evaluation Systems Test, which assesses all domains.

79 - A retrospective video analysis of movement quality in infants later diagnosed with Developmental Coordination Disorder

Amy De Roubaix, Lynn Bar-On, Katleen Onderbeke, Dominique Van de Velde, Herbert Roeyers, Ghent University; Anjo Janssen, Radboud UMC; Jill G. Zwicker, University of British Columbia, BC Children's Hospital Research Institute; Hilde Van Waelvelde, Ghent University

Background: Developmental Coordination Disorder (DCD) is a neurodevelopmental condition affecting coordinated motor skill acquisition. Nuanced parent and clinician observations encompass movement quality aspects, focusing on the 'how' of movements rather than mere age-adequacy. These include descriptors such as 'funny' or clumsy movements, which are characterized by varying levels of muscle tension, speed, or strength. Clinicians note a lack of pre-movement organization, limited adaptive flexibility, slowness in movement, and/or joint fixations in infants with DCD. Using the 'Observable Movement Quality' scale (OMQ), we aimed to capture these qualitative descriptions of motor behaviour in infants with DCD, with and without autism spectrum disorder (ASD) compared to typically developing (TD) children. **Methods**: Using retrospective video analysis, a trained clinician observed 5-minute compilations of home videos of infants (6-24 months) from Belgium and Canada who were later diagnosed with DCD or DCD+ASD, compared to TD children. The 15-item OMQ was used to score video compilations at 6-12m (TD n = 16, DCD n = 22, DCD+ASD n = 15), 12-18m (TD n = 20, DCD n = 23, DCD + ASD n = 11), and 18-24m (TD n = 16, DCD n = 20, DCD+ASD n = 13). A three-point-Likert scale for clinical judgement (will/might/will not develop DCD) was also applied. Groups were compared using ANOVA whilst Cramer's V assessed the association between clinical judgement and OMQ. **Results**: Reduced movement quality was only found in the age category 18-24 months in children with DCD ($p = 0.012$) and DCD+ASD ($p = 0.004$) in comparison to TD children. The clinician's judgment regarding the likelihood of DCD development was moderately associated with the OMQ scores (Cramer's $V = 0.471$, $p < 0.001$) in the age-category 18-24 months. **Conclusions**: Differences in movement quality between TD and DCD/DCD+ASD were confirmed in infants as young as 18-24 months. Based on careful observation, a clinician demonstrated the ability to identify an important number of potential cases of DCD, reinforcing the value of assessing movement quality in the early identification of DCD.

Relevance

These results emphasize the importance of considering movement quality in the early detection of DCD.

80 - Self-perception and participation in physical activity in children with and without DCD: A longitudinal study

Vicky McQuillan, University of Salford; Ruth Swanwick, David Sugden, University of Leeds

Background: Physical activity (PA) is important for health and wellbeing, but most children do not participate enough in PA, a potential public health disaster. Children with developmental coordination disorder (DCD) participate in less PA than typically developing children (TDC), yet few longitudinal DCD studies have examined characteristics associated children's participation in PA. Links between motor competence (MC), self-perceived competence (SPC) and PA have been proposed. Aim: To investigate the characteristics and SPC over time of children with and without DCD who participate in PA. **Method and Results**: 34 schoolchildren, 7-14 years, screened for IQ, neurodevelopmental conditions and categorised by MC with Movement Assessment Battery for Children 2 (MABC2) and DCD DSM5 criteria applied. Parents were questioned. Children's SPC was investigated with scores of CSAPPA (Hay, 1992) over 2 years along with MABC-2 scores. Nested cases of children with stable and changing profiles were interviewed. 44% of children participated in PA. Stable and changing motor profiles emerged over the 2 years (McQuillan et al., 2021). Most CSAPPA scores deteriorated. Enjoyment of PA was associated with both TDC and DCD participation in PA. Other factors included positive parental attitude to PA and their regular participation. **Conclusion**: There were environmental and attitudinal barriers to participation in PA but SPC was not important for DCD or TDC. Child enjoyment of PA coupled with positive support from a parent was crucial for both TDC and DCD participation.

Relevance

Intervention is required to increase participation in all children's PA to develop better lifelong habits and improve health and wellbeing outcomes. This should encourage child enjoyment of any PA and assist parents to enable active participation for children at every level of MC, rather than improving child SPC. Some children with DCD enjoy and participate in PA despite poor MC.

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81 - Understanding the role of family socioeconomic status, size, and structure in early DCD mechanisms: A pathway analysis

Xiaotian Dai, Wenchong Du, Gareth Williams, Keeley Brookes, Nottingham Trent University; Jing Hua, Shanghai First Maternity and Infant Hospital, Tongji University

Background: Growing evidence emphasizes that DCD is significantly influenced by family dynamics, yet the specific role of family characteristics in its early mechanisms remains understudied. This research aims to elucidate the impact of family socioeconomic status (SES), size, and structure on the development of DCD. **Methods and Results**: A national cohort study was conducted in China, involving 150,948 children aged 3-5 years. DCD was assessed using the Little Developmental Coordination Disorder Questionnaire (LDCDQ). Family SES was considered a latent variable, incorporating annual household income, parental educational achievement, and occupational status. Family structures were categorized into nuclear family (living with both parents), linear family (parents and grandparents), joint family (parents, grandparents, and other relatives), and single-parent family. The study employed hypothesis tests, multilevel regression, and structural equation modelling to examine the interconnections among these variables. The direct effect of having a sibling ($\beta = -0.064$, 95% CI: -0.067, -0.061, $p < 0.001$) and high family SES ($\beta = -0.294$, 95% CI: -0.305, -0.283, $p < 0.001$) was protective against DCD. The mediating effect of family SES was observed in the pathway, resulting an indirect risk effect of having a sibling ($\beta = 0.096$, 95% CI: 0.079, 0.113, $p < 0.001$). Family structure moderated the sibling effect on family SES ($\beta = 0.082$, 95% CI: 0.080, 0.084, $p < 0.001$). The overall negative impact of having a sibling was diminished but remained significant ($\beta = 0.032$, 95% CI: 0.018, 0.046, $p < 0.001$). **Conclusions**: Our findings establish a clear pathway linking family SES, size, and structure with DCD. The study highlights the nuanced roles of family dynamics, particularly the protective effect of siblings, mediated by SES and moderated by family structure. These insights are crucial for understanding DCD's early mechanism and guiding intervention strategies.

Relevance

This research holds significant societal relevance by shedding light on the intricate relationship between family and DCD in children. Unravelling these connections informs targeted interventions, promoting early detection, and fostering supportive environments, emphasizing the need for external support in mitigating risks associated with limited resources.

82 - The impact of DCD on parent and sibling depression: A bidirectional two-sample mendelian randomization analysis

Xiaotian Dai, Wenchong Du, Gareth Williams, Keeley Brookes, Nottingham Trent University; Jing Hua, Shanghai First Maternity and Infant Hospital, Tongji University

Background: Developmental Coordination Disorder (DCD) impacts not only the individual but also the mental health of family members. Despite research on DCD's influence on parental mental well-being, direct evidence of its impact on siblings is limited, and the causal relationships between DCD and family members' depression remain unexplored. This study fills the gap by analysing the genetic dynamics underlying the association between DCD and depression in both parents and siblings. **Methods and Results**: Bidirectional two-sample Mendelian randomization (MR) analyses were conducted using genome-wide association study data from two independent cohorts. Severe depression data for mothers (N = 423,217), fathers (N = 399,499), and siblings (N = 362,315) were sourced from the UK Biobank, while DCD data (N = 377,277) were contributed by the FinnGen. To ensure the validity and robustness of our findings, we employed inverse variance weighted analysis. Additionally, a battery of sensitivity tests was conducted, including the Benjamini–Hochberg Method (BH), F-statistics, MR-Egger intercept, MR-PRESSO, and leave-one-out analysis. Our investigation revealed a unidirectional pathway, indicating a significant association from individual DCD to severe depression in sibling (OR = 1.002, 95% CI 1.001-1.003, p = 2.778×10-3, BH adjusted p<0.05), but not in mother or father. Heterogeneity and sensitivity analyses supported this result, affirming its robustness and causal effect. No significant causal relationship was detected between other combinations. **Conclusions**: Our study is the first to establish a causal relationship between DCD and depression in parents and siblings, providing genetically-informed evidence of DCD's impact on sibling mental health but not parents. These findings highlight the importance for comprehensive mental health support for siblings in families affected by DCD, stressing the importance of including them in intervention and support strategies.

Relevance

This research reveals a novel causal link between DCD and sibling depression, emphasizing the need for societal awareness and targeted support for families affected by DCD. By providing genetically-informed evidence, the findings contribute to a clearer understanding of DCD's impact on family, highlighting the importance of comprehensive mental health strategies that include all family members.

83 - Fundamental movements and physical affordances children use for physically active play in different seasons

Susanna Iivonen, Donna Niemistö, Arja Sääkslahti, University of Jyväskylä

Background: Motor development is influenced by individual, environmental, and task constraints that impact motor competence (MC) in object manipulation, locomotion, and balance throughout life (Goodway et al., 2019). This study examines this phenomenon in the context of preschool children's free outdoor play in different seasons. The aim was to explore how children with varying levels of physical activity (PA) transition from sedentary behaviour to active play across different seasons, while exploring the fundamental movements (Goodway et al., 2019) and physical environmental affordances involved. **Methods and Results**: Children's (N = 12) free outdoor play was videotaped for 60 minutes during autumn, winter, spring, and summer in Finland. The data (12 x 60 min. x 4) was systematically observed using duration recording to determine the most physically active and the most sedentary child of the group during each season. These data (8 × 60 min.) were qualitatively observed to record how often fundamental movements and environmental affordances were used when switching from physically sedentary to active play. Results showed that the most active/sedentary children, as a seasonal average, used non-locomotor axial, balancing, or manipulative movements 80/67 times, brisk locomotor, or manipulative movements 34/11 times, walking or running 5/11 times, and swinging 1/0 times. They made use of 62/24 times man-made objects, 43/23 times free spaces in the yard, and 21/12 times natural materials as affordances. **Conclusions**: In general, children used mostly non-locomotor balancing, axial, and manipulative movements, and man-made objects for active play across the four seasons. Results support the earlier findings that a wider repertoire of environmental affordances is linked to higher PA levels (Sando & Sandseter, 2020). However, there was a wide variation in which affordances stimulated which skills at the individual child and season levels, underlining individual differences.

Relevance

Outdoor play is a powerful tool to promote children's physical activity and motor, which are mutually linked to cognitive and socioemotional outcomes later in life. The availability of affordance-rich and spacious outdoor play areas throughout the year increases the probability of discovering opportunities for active play that promotes motor competence.

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84 - Effectiveness of the group-based CO-OP intervention: multiple baseline single-case experimental study protocol across subjects

Emmanuel Madieu, University of Trois-Rivières

Background: The international DCD guidelines recommend using a group format in intervention (Blank et al., 2019). Indeed, research shows that using groups in intervention sessions contributes to an improvement in psychosocial factors, such as self-esteem and sense of belonging. In addition, this format reduces healthcare costs. However, literature syntheses of studies exploring the effectiveness of the CO-OP approach delivered in groups highlights the paucity of research and poor study designs. Objectives: To determine the effectiveness of the CO-OP approach when used in a group format with children with DCD. **Methods**: A series of multiple baseline single case experimental studies across subjects is underway. Three groups of four DCD children (N = 12), between 8 and 12 years of age, have begun the protocol. Children's performance on the three activities practiced over the course of 10 sessions will determine the effectiveness of the approach, assessed using the Canadian measure of occupational performance, as well as blindly scored Performance Quality Rating Scale. Data will be analyzed visually at the individual level (VAOIR Protocol), then statistically at the individual and group level. **Results**: CO-OP groups have been used successfully in our tertiary care center for years. This study's results will add rigorous evidence supporting such clinical decision. **Conclusion**: Health care professionals ought to use research-informed practice. Nevertheless, the existing research does not always offer the needed evidence. Creating the knowledge that supports our clinical decisions is one way of making a difference for children with DCD. The recommended group modality for interventions in children with DCD is supported with the CO-OP approach for this study as a modality for evidence-based practice with DCD patients.

Relevance

It is admitted that group-based design improves psychosocial dimensions, such as self-esteem and sense of belonging, and also reduces healthcare costs. The effectiveness study would help to enhance the value of CO-OP intervention groups for greater patient benefit, creating a new healthcare offering. Further research is needed to support the effectiveness of this approach and generalize its used.

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86 - Improving motor skills in DCD: a case study applying Neuromotor Task Training (NTT) on buttoning activity with an 8-year-Old child

Celine Foucras, Eugénie Condomines, Université Paul Sabatier

Background: This case study aims to highlight the structure of the NTT, approach (Schoemaker & Smits-Engelsman, 2005). This method enables professionals to focus their intervention on daily problematic activities for the patient, through targeted progressive training on various failure points identified in these tasks, assessed in diverse contexts. **Methods and Results**: This poster elucidates the use of NTT through the learning of buttoning with Maël, an 8-year-old boy with DCD, by following the necessary 5 steps. First, an assessment of the child's needs (structured interview, psychomotor assessment) and the selection of tasks (buttoning, transformed into "SMART" goal) are proposed. Next, to identify limiting factors for Maël, an analysis of the task and his performance (Fitts and Posner stages) is conducted. The training phase is then introduced, consisting 7 sessions with exercises of increasing complexity, targeting identified failure points, while adhering to the principles of motor learning theories (type of practice, instructions and feedback). Finally, a reevaluation is suggested for buttoning and Manual Dexterity (M-ABC2). Improvements in the quality and speed of buttoning execution, as well as progress in digital dexterity and bimanual coordination, are observed. **Conclusions**: The NTT approach, due to its structure and reliance on motor learning theories, enables a relatively rapid improvement in performance on targeted activities. By focusing on problematic daily activities, it seeks the engagement of the subject and their surroundings. It enhances the patient's performance and participation in specific activities while reducing the deficit in certain mobilized functions. It can be used to improve both fine and gross motor skills (Offor et al., 2016). Requiring minimal cognitive skills, it is accessible to a broad profile of patients.

Relevance

NTT is one of the activity-oriented approaches recommended (Blank et al., 2019). However, it remains a relatively understudied method and is not widely known among professionals. This poster aims to illustrate its utilization. To scientifically validate its effectiveness, a Single Case Experimental Design (SCED) would be necessary, along with experiments involving a larger sample of children.

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87 - The relationship between motor competence and cognitive and psychosocial development: Evidence from an intervention study

Catherine M. Capio, Hong Kong Metropolitan University; Norman B. Mendoza, The Education University of Hong Kong; Rachel A. Jones, University of Wollongong; Kerry Lee, The Education University of Hong Kong; Rich S.W. Masters, University of Waikato

Background: Children who are skilful at moving tend to have better academic and social outcomes compared to those who are less competent at moving. With limited evidence from intervention studies, causal relationships between motor skill proficiency and cognitive and social development have yet to be clearly established. We aimed to examine whether a training program to improve gross motor skills (i.e., object control, locomotor) in young children would also lead to improvements in cognitive (i.e., executive function) and psychosocial (i.e., social competence and behaviours) domains. **Methods**: Using a two-arm (intervention vs. active control) group-randomised intervention design, 185 children aged 36 to 60 months (mean 47.51, SD 8.11 months) were allocated to an intervention or active control group. The intervention was implemented over one school year and targeted gross motor skills. We monitored the following across five time points: locomotor and object control proficiency using the Test of Gross Motor Development-3, executive function using the Head-Toes-Shoulders-Knees test, and social competence and behaviour using the Social Competence and Behavioural Evaluation scale. We performed longitudinal analysis using hierarchical linear mixed-effects models (HLMMs) and latent growth curve models (LGCMs). **Results**: The HLMMs showed that participants in the intervention group displayed faster rates of improvement in object control skills ($p < 0.001$) and executive function ($p < 0.001$) than those in the active control group. The LGCMs revealed a dose–response relationship in which children who displayed greater improvements in object control ($p < 0.001$) and locomotor skills ($p < 0.02$) over time also displayed greater improvements in executive function. No significant effects of the intervention on social competence or behaviours were found. **Conclusions**: The current study provides evidence that (1) gross motor skills training improved proficiency in locomotor and object control skills, (2) participation in the motor skills training programme was beneficial for cognitive development but not psychosocial development, and (3) greater improvements in motor proficiency were associated with greater gains in cognitive development.

Relevance

The findings of this study contribute to our understanding of child development, providing evidence of a causal relationship where motor proficiency appears to be an antecedent to cognitive development in early childhood. We did not find similar evidence for motor and psychosocial domains. The apparent cognitive benefits underscore the importance of motor skills programs in early childhood settings.

88 - Instructions and feedback in telehealth physiotherapy sessions for children with neurodevelopmental disorders: a pilot study

Kathlynne F. Eguia, Shamay S.M. Ng, Thomson W.L. Wong, Hong Kong Polytechnic University

Background: Telehealth has become a viable mode for delivering physiotherapy, including for children with neurodevelopmental disorders (NDDs). While movement-related instructions and feedback comprise a critical component of physiotherapy practice, there is limited research to inform how paediatric physiotherapists' could use them in telehealth. This pilot study is part of a research project that aims to examine physiotherapists' use of instructions and feedback during telehealth to facilitate movement skill acquisition among children with NDDs. **Methods**: Using an observational non-participation design, telehealth physiotherapy sessions of eight children with NDDs (i.e., Down Syndrome, Autism Spectrum Disorder, ADHD, Cerebral Palsy) were recorded. Physiotherapists' statements were transcribed verbatim and analysed following a structured matrix of the following parameters: type, modality, and attentional focus, and recipient. Descriptive statistics were performed to identify trends. **Results**: A mean of 141 (SD 62) statements were transcribed within sessions that averaged 43 (SD 5) minutes. Majority of the statements were directed towards the child (81% SD 10) while the remaining were directed towards the caregiver. Coaching statements consisted of 47% (SD 12) instructions and 53% (SD 14) feedback. Majority of the statements focused on strategy (e.g., turn and squat) comprising 46% (SD 9), and reinforcements (e.g., good job) comprising 36% (SD 11). The statements that utilised attentional focus made up 18% (SD 4) of the statements, and trended towards a preference for external focus (e.g., jump to the red stone) relative to internal focus (e.g., move your left leg). Internally focused statements tended to be used more frequently for children with minimal to no intellectual disability. **Conclusion**: In telehealth practice, instructions and feedback may be categorised according to the recipient - i.e., child or caregiver. Providing motivational reinforcements is also an important aspect for children. Such parameters have not been considered in previous observational studies of in-person physiotherapy of adult patients. There is a trend for a relationship between the use of attentional focus and the cognitive capacity of the child

Relevance

This pilot study revealed parameters (i.e., recipient, reinforcement) that should be considered when examining instructions and feedback by paediatric physiotherapists in the telehealth context. The findings inform a further study that will explore attentional focus in delivering instructions and feedback to enhance physiotherapy service delivery for children with NDDs.

89 - Benefits of an intensive individual CO-OP intervention in a group setting for children with DCD: a replication study

Jessica Lust, Radboud University; Hilde Krajenbrink, Kenniscentrum Sport & Bewegen; Jordi Van Heeswijk, Anke Verhaegh, Sint Maartenskliniek; Bert Steenbergen, Radboud University

Background: Children with developmental coordination disorder (DCD) experience motor difficulties that negatively impact their participation in everyday life and require intervention. Vlog4succes is an intervention program of short duration using Cognitive Orientation to daily Occupational Performance (CO-OP) as a basis. It combines individual sessions and group activities, the involvement of parents, and the use of video logs. It's benefits for children with DCD have been reported by Krajenbrink et al. (2022) based on the data from one (2020) cohort. The aim of the present study was to replicate the findings of this study using the data from three subsequent runs of the intervention program. **Methods and Results**: Data was collected during three yearly editions of the intervention program (2021, 2022, 2023). Thirty-three children with DCD (aged 8-17 years) participated and each worked on their self-chosen intervention-goals. Assessment took place at four moments in time: two pre-test measures, a post-test measure and a follow-up measure. Outcome measures consisted of changes in performance and satisfaction of intervention- and transfer-goals based on self-perceived performance and satisfaction as measured by the Canadian Occupational Performance Measure (COPM) and of changes in the Performance Quality Rating Scale Generic (PQRS-G) as assessed by an independent rater. Secondary outcome measures were changes in children's attitude, motivation, and confidence in relation to motor skill activities as surveyed by a parental questionnaire. Data are currently being processed and results will be presented at the conference. **Conclusions**: Will be presented at the conference.

Relevance

The development of evidence based interventions for children with DCD is of utmost importance. With this replication study, covering three runs of a yearly intervention program that has been found beneficial based on one former study, we aim to contribute to the further development of empirically tested DCD interventions.

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91 - Association of developmental coordination disorder with early-life exposure to fine particulate matter in Chinese preschoolers

Vivienne Du, Wenchong Du, Nottingham Trent University; Jing Hua, Shanghai First Maternity and Infant Hospital, Tongji University; Jing Cai, Fudan University; Anna Barnett, Oxford Brookes University

Background: While prenatal, postnatal, and neonatal factors are recognized as influencing DCD, the role of environmental exposures, particularly to neurotoxicants such as fine particulate matter (PM2.5) in the air, remains largely unexplored. This study aims to investigate the potential association between early-life PM2.5 exposure and increased risk of DCD and to identify the vulnerable subgroups to PM2.5 exposure. **Methods and Results**: The cohort study encompassed 109,731 children aged 3–5 from 551 county-level cities in China. Residential PM2.5 levels were estimated using a satellite-based model. The Little DCD Questionnaire (LDCDQ) assessed children's motor performance. Using linear and generalized linear mixed models, we found that high prenatal and postnatal PM2.5 exposure significantly reduced LDCDQ scores, especially in control during movement and general coordination, less so in fine motor skills. An interquartile range increase in early-life PM2.5 exposure was associated with a 0.19 decrement in total LDCDQ score (95% confidence interval [CI]: 0.05, 0.33). Higher PM2.5 exposure increased DCD risk, with adjusted odds ratios of 1.06 (95% CI: 1.01, 1.10) and 1.06 (95% CI: 1.01, 1.13) for each interquartile range increase during the first trimester and first three years, respectively. Children from rural areas, with neonatal intensive care unit admissions, or less than six months of exclusive breastfeeding were more susceptible. **Conclusions**: The study provides robust evidence linking early-life PM2.5 exposure to increased DCD risk in preschoolers. It highlights the greater vulnerability of certain groups, including rural children, those with neonatal intensive care histories, and those with shorter breastfeeding durations.

Relevance

Understanding the association between PM2.5 exposure and DCD underscores the importance of environmental health in early childhood development. To address environmental factors is vital for public health policies and interventions aimed at reducing exposure to neurotoxicants, particularly among vulnerable groups, to mitigate the risk of DCD.

92 - Virtual reality as a tool for the evaluation of Developmental Coordination Disorder

Huajing Li, Nottingham Trent University

Background: Traditional assessment methods for DCD suffer from subjectivity and limited ecological validity. This study explores the potential of virtual reality (VR) to provide a more objective and comprehensive assessment of DCD in children. **Methods and Results**: We developed a Virtual Reality (VR) assessment and compared the performance in a VR game between Typically Developed (TD) children and children with DCD. We then compared the performance in a VR game with the sub-grades of the Movement Assessment Battery for Children (MABC). Workshops with healthcare professionals specialized in DCD helped in identifying key motor components for a VR evaluation program. The program's effectiveness was then tested in a control group experiment involving children with and without DCD, comparing it with the Movement Assessment Battery for Children-2 (MABC-2). Results indicated that VR could continuously gather comprehensive movement data (foot, hand, head movements) at high refresh rates. The VR assessments correlated significantly with MABC-2 results but provided more detailed insights into motor developmental issues. **Conclusions:** VR technology, with its immersive and interactive capabilities, shows promising potential as an objective tool for evaluating DCD. It overcomes some limitations of traditional methods, such as spatial requirements and subjectivity. The combination of VR with movement capture devices offers a new frontier in assessing and understanding DCD, promising to enhance clinical diagnosis and treatment strategies.

Relevance

Embracing VR technology for DCD assessment has profound implications for pediatric healthcare. It promises a shift towards more objective, comprehensive evaluations, aiding in early diagnosis and intervention. This advancement can transform the management of DCD, ultimately improving the quality of life for affected children and their families.

93 - The relationship between actual motor competence, perceived motor competence, and emotional intelligence in young adults

Katrien De Neve, Matthieu Lenoir, Eline Coppens, Ghent University

Background: The relationship between Actual Motor Competence (AMC) and Perceived Motor Competence (PMC) has received considerable attention in literature. However, the underlying mechanisms have not been fully unravelled. Emotional Intelligence (EI) has been put forward as a potential factor in this relationship (Mohammadi et al., 2022). EI involves the ability to monitor one's own and others' emotions, to discriminate among them and to use this information to guide one's own thinking and actions, and is considered as a modifiable construct. The purpose of this study was to explore the relationship between AMC, PMC, and EI in healthy adolescents. **Methods**: The Körperkoordinationstest für Kinder (KTK3 version), an AMC-PMC aligned questionnaire, and Shutte Self-Report Emotional Intelligence Scale (Schutte et al., 1998) was applied to cross-sectionally assess AMC, PMC, and EI, respectively in 215 university students in Physical Education and Movement Sciences (60 females; mean age 18.38 +/- 0.55 yrs). Given the assumption that EI is not a stable characteristic in this age group yet, the Relative Age Effect (RAE) was analysed first. In this exploratory study, correlation analysis was used as the main statistical procedure with the statistical significance level set at $p < .05$. **Results**: Age was positively associated with higher levels of EI in males and females ($p > 0.05$), a finding that did not occur for AMC ($p > 0.05$) nor PMC ($p < 0.05$). Female participants scored higher on the EI subscale 'social skills' than their male counterparts ($p < 0.5$). A positive relationship between AMC and PMC was observed in males only ($R^2 = 0.102$, $p < 0.001$). A positive relationship between the EI subscale 'social skills' and AMC was observed only in male participants ($p < 0.05$). **Conclusion**: This study suggests that EI has not reached a stable status in 18-yr old healthy subjects yet, in contrast to AMC and PMC. Some indication of an association between EI and AMC has been observed in this study, although differences were smaller than expected based upon literature.

Relevance

This study might be a gateway to expand existing models of development of AMC and PMC with psychological concepts like EI. This might in turn lead to useful information with respect to developing intervention programs.

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94 - Kinetics and Kinematics of Shape Tracing in Children with Developmental Coordination Disorder (DCD)

Michal Hochhauser, Michael Wagner, Rachel Bartov, Ariel University, Orot college

Background: Children with Developmental Coordination Disorder (DCD) often demonstrate visual-motor deficits which impact handwriting performance. Shape tracing, a prerequisite for handwriting, serves as a valuable and multifaceted activity that promotes children's motor and cognitive development. Research has shown that children with DCD face handwriting challenges, but shape tracing has yet to be objectively studied. Aims: To investigate the kinetics (pressure applied to the writing surface) and kinematics (spatial and temporal aspects) associated with shape tracing in children with DCD and compare with typically developing (TD) peers utilizing a digitized tablet. **Methods**: Twenty-seven children with DCD aged 7 to 12 years and 27 TD children matched by age and gender, traced 5 unique shapes resembling cursive letters onto a digitized tablet. During the tracing task, the extractor module computed participants' performance by measuring the tracing offset, i.e., the Euclidean distance between the Traced shape and the Reference shape averaged across 8 trials. **Results**: Findings revealed distinct patterns of motor control during the shape tracing task among children with DCD, compared to TD, suggesting challenges in both the spatial precision ($p = .001$) and pressure application ($p = .001$) as well as in the temporal performance ($p = .001$) where an interaction effect was seen with the types of shapes ($p = .036$). **Conclusions**: This research provides a real-time analysis of the kinetics and kinematics of shape tracing, underlying the mechanisms of shape tracing difficulties in children with DCD.

Relevance

The digitized tablet can serve as an early development objective tool for the assessment of graphomotor skills in children with DCD. Insights on early shape tracing processes beyond investigating the shape tracing product is novel and may contribute to therapeutic and educational interventions.

96 - Improvement in motivation and anxiety among preschoolers with mild developmental disabilities, following sensory-motor intervention

Orit Bart, Bosmat Soref, Tel Aviv University

Background: Preschoolers with mild developmental disabilities are recommended for occupational therapy (OT) due to their restricted participation in everyday occupations of life. Research indicates that these children commonly exhibit challenges in sensory-motor and cognitive aspects, along with emotional and behavioral difficulties. Nevertheless, there is a lack of studies investigating the emotional outcomes of OT sensory-motor interventions, particularly during the preschool years. The aim of the study was to assess the impact of an occupational therapy intervention primarily targeting motor and process performance skills, along with sensory-motor personal factors, on mastery motivation and anxiety. **Methods**: Thirty-eight children aged 4.6-6 years and their parents participated in a prospective cohort study with Interrupted Time-Series design, including assessments at three time points: a) baseline – when referred to occupational therapy assessment; b) pre-test before first treatment session; c) post-test after the last treatment session. Parents completed the Revised Dimensions of Mastery Motivation Questionnaire (DMQ18) and the Preschool Anxiety Scale three times. OT intervention lasted between 9-12 weeks, once a week. OT's completed the Documentation of Occupational Therapy Session Intervention (D.O.T.S.I.) every intervention session. **Results**: After the intervention period, anxiety level decreased ($F=4.402$ $p<.05$) and Mastery Motivation improved in the subscales of General Competence ($F = 5.294$ $p < .01$) and Cognitive Persistence ($F = 4.625$ $p < .05$). Such changes were not detected during the waiting period, between referral to OT and the beginning of the intervention. **Conclusions**: OT intervention designed to enhance sensory-motor abilities and process skills has proven effective in improving emotional-behavioral outcomes. This intervention provided to preschoolers with mild disabilities improves child's mastery motivation and reduces anxiety.

Relevance

The findings contribute to the field of occupational therapy and provide evidence for the effectiveness of sensory-motor intervention in improving emotional-behavioral outcomes in preschool-aged children. This information can guide healthcare professionals, educators, and parents in designing appropriate interventions and support systems for children with mild developmental disabilities.

98 – The Movement ABC-3 Test: Rationale for the new edition

Sheila Henderson, University College London; Anna Barnett, Oxford Brookes University

Background: The Movement ABC Test and Checklist have long been popular in the field of DCD. The second edition was published in 2007, with norms gathered in the UK. The objectives for the production of Movement ABC-3 were to (1) provide updated norms (2) extend the age range to 25 years (3) bring the Test & Checklist into alignment and (4) update the content, task presentation and materials. The aim of this paper is to describe the changes that have been made to the Test content and task presentation. **Method**: An expert panel reviewed the Test and suggested revisions to improve its utility and construct coverage. The content of each domain (Manual Dexterity, MD, Aiming & Catching, AC, Balance & Locomotion, BL) was reviewed separately in light of a review of recent literature, the extended age range and need to rationalise content. New tasks and improvements to materials were tried out then incorporated into the standardisation studies. Requests for help with task administration for inexperienced users led to the introduction of verbatim instructions which were piloted then incorporated into the existing guidance. For the standardisation, norms were gathered across the UK, Australia and New Zealand. **Results**: The new age bands (ABs) cover 3-6, 7-11 and 12-25 years with the number of tasks in each increasing from 8 to 10. New and adapted tasks give better alignment and a clearer progression both within and across ABs e.g., in MD (now 4 tasks) there is a new drawing task and the same bimanual task across ABs; in AC (now 3 tasks) a clearer separation of aiming and catching elements is made along with a task which combines the two at each AB; in BL (3 tasks), minor task improvements have been facilitated by lighter, more practical floor mats. **Conclusions**: The Movement ABC-3 Test now offers a more comprehensive measure of competence in 3 domains across a much wider age range. Improvements to content and task presentation accompanied by updated norms improves utility.

Relevance

The Movement ABC Test is commonly used to assess individuals suspected of having significant movement difficulties, including those with DCD. Norm-referenced scores play a crucial role in the diagnostic process and an important part in decision making about service provision. Along with the new Checklist, the Movement ABC 3 Test should continue to serve these purposes well.

100 - Cross-cultural exploration of motor skills and executive function among children with autism spectrum disorder in Taiwan and the United States

Ming-Chih Sung, University of South Carolina Upstate; Megan MacDonald, Oregon State University

Background: Motor skill and executive function (EF) delays are prevalent in children with autism spectrum disorder (ASD). These developmental domains are also known to be influenced by geographical and cultural factors. The purpose of this study was to examine cross-cultural differences in motor skills and EF between young children with ASD from Taiwan and the US. **Methods and Results**: This study was a cross-sectional study, where 172 parents of children (4 to 6 years and 11 months old) with ASD were recruited from two countries, Taiwan (n = 100) and the United States (n = 72). The parents completed a questionnaire that included general demographic information, child motor skills using the Children Activity Scale – Parents, and child EF using the Childhood Executive Functioning Inventory. One-way multivariate analysis of covariance was conducted to examine the measures between children with ASD from two countries. Results indicated a significant difference in parent ratings of motor skills ($p < .05$), with children with ASD in the US rated as having better gross and fine motor skills compared to their peers in Taiwan. However, parent ratings of EF were not significantly different between the two countries ($p = .58$). **Conclusions**: The present study suggested that American children with ASD were rated as having better gross and fine motor skills compared to their Taiwanese peers, while EF was similarly rated by parents. Understanding the similarity and difference between motor skills and EF among young children with ASD from different countries might be an important first step for future interventions and programs to improve early motor skills and EF for young children with ASD.

Relevance

This study is relevant to society as it directly links the child development constructs of motor skill and EF between young children with ASD across two countries. Its results has implications for educators and practitioners in Taiwan in respect to early childhood for young children with ASD across the two countries.

101 - Associations of SGA and LGA with children's suspected Developmental Coordination Disorder: a national cohort study in 551 Chinese cities

Haizhen You, Tongji University School of Medicine; Tongji University School of Medicine, Shanghai 200120, China; Wenchong Du, Nottingham Trent University

Background: While previous research has explored DCD in relation to preterm and postterm births, the association between birth weights for gestational age (small for gestational age [SGA] and large for gestational age [LGA]) and DCD remains unexplored. **Methods and Results:** In this population-based cohort study, we analyzed data from 129,278 children aged 3-5 years across 2,403 kindergartens in 551 Chinese cities (mean [SD] age, 3.9 [0.8] years), including 67,780 boys (52.4%) and 61,498 girls (47.6%). Motor performance in early childhood was evaluated using the Little Developmental Coordination Disorder Questionnaire (LDCDQ). Multi-level logistic regression was conducted to examine the relationship between SGA/LGA and suspected DCD, adjusted for demographic and health characteristics. Our findings indicated an increased risk of suspected DCD in children with SGA (OR=1.171; 95%CI, 1.107-1.239) and LGA (OR=1.057; 95%CI, 1.015-1.101) compared to appropriate for gestational age (AGA) peers. Notably, SGA was associated with suspected DCD in both males and females, while LGA's association was significant only in females. Furthermore, the risk associated with SGA was more pronounced in children born at full term and postterm but was not significant in early and preterm births. Most associations of LGA with suspected DCD across different gestational weeks were not statistically significant. **Conclusions:** Both SGA and LGA at birth are associated with a higher risk of suspected DCD, with these associations more pronounced in girls and late-onset SGA infants. Further research is needed to understand the causal relationships between SGA/LGA and DCD.

Relevance

Presenting novel evidence, this study is the first to elucidate the association between SGA/LGA births and suspected DCD in children, highlighting the need for gender-specific assessments. These findings advocate for enhanced, long-term monitoring, particularly for SGA/LGA infants born at full term and postterm, paving the way for improved clinical management and intervention strategies for DCD.

102 - An evidence summary developed by a community of practice Mind the Gap! A knowledge translation technique

Carolyn Dunford, Brunel University London; Hortensia Gimeno, Barts Health NHS Trust; Anne Corbett, Brunel University London

Background: International Clinical Guidelines for developmental coordination disorder (DCD) recommend evidence-based interventions including Cognitive Orientation to Occupational Performance (CO-OP) but many approaches used in standard care are not evidence-based (Blank et al., 2019; Novak & Honan, 2019). Mind the Gap is a community of practice established in 2019 to facilitate knowledge acquisition, translation and generation of evidence in occupational therapy practice for children/youth and families. **Methods and Results:** The community comprises of 87 child/youth clinical and academic occupational therapists from UK, Ireland, Australia, Holland, Belgium, Singapore and Ghana. The group meets every 3-4 months. Interventions with strong supporting evidence are identified, critically discussed, summarised and synthesised into evidence summaries through consensus. They are all reviewed by the UK Royal College of Occupational Therapists (RCOT), peers and service users and published on RCOT website. Five written summaries, with infographics, have been produced including "Cognitive Orientation to Occupational Performance (CO-OP) DCD" synthesises the evidence for therapists and service users. **Conclusions:** There is evidence to support the use of CO-OP with children with DCD and it is strongly recommended in the International Guidelines (Blank et al; 2019). The child must be at least four years old and be motivated to work on three goals. They also need to have adequate communication ability to discuss with the therapist different aspects of the CO-OP process. A total of 12 individual sessions of up to an hour is recommended including an initial goal setting session and final review session. Follow up homework between sessions is recommended. Mind the Gap members value the community for keeping them up to date, informing service design/provision, providing opportunities for open critical debate/discussion of the evidence and networking. Developing evidence summaries facilitates a critical approach to evidence. Disseminating accessible evidence summaries have the potential to promote effective practice and inform service users.

Relevance

The evidence summary and infographic has the potential to disseminate/promote evidence-based practice for children with DCD. Providing the information in an accessible format enables service users to make informed decisions about CO-OP. There is the potential to produce evidence summaries and infographics for other evidence-based interventions to facilitate understanding of the options available.

103 - Youngsters' engagement in physical activity and sports: exploring the role of perceived motor competence, competence satisfaction, and motivation

An De Meester, University of South Carolina; Cristina Menescardi, Isaac Estevan, University of Valencia

Background: Regular physical activity (PA) is associated with many health benefits, but PA levels are declining worldwide, even among children. Children's actual motor competence (AMC) is generally accepted as one of the most crucial determinants of PA participation, and their perceived motor competence (PMC) is thought to mediate the relationship between AMC and PA. However, evidence for this hypothesized mediating effect remains equivocal. Furthermore, Self-Determination Theory research in adult populations shows that competence satisfaction and autonomous motivation also play a crucial role in PA participation, but evidence in younger populations remains sparse. Some studies support the mediational role of children's autonomous motivation in the PMC-PA pathway, but little is known about the exact role of competence satisfaction. Therefore, the aim of this study is to examine the potential mediating and/or moderating roles of PMC, competence satisfaction, and autonomous motivation in the relationship between 3rd- 6th graders' AMC and organized sports participation (OSP).
Methods and Results: 567 children (52.7% boys, 7.9 - 10.3 yrs) from 38 classes completed the Körperkoordinationstest für Kinder to measure their AMC. PMC was measured with the athletic competence subscale of the Self-Perception Profile for Children, competence satisfaction with the Psychological Need Satisfaction in Exercise Scale, autonomous sports motivation with the Behavioral Regulations in Exercise Questionnaire, and weekly OSP with the Physical Activity Questionnaire. Structural Equation Modeling in Mplus 8.10 showed that PMC and competence satisfaction mediate the relationship between AMC and OSP, while autonomous motivation moderates the relationship.
Conclusions: The mediating effects of PMC and competence satisfaction suggest that children who feel confident in their MC and are satisfied with their need for competence are more likely to engage in OSP, even if they have similar AMC levels to their peers who engage less in OSP. In addition, children with higher levels of autonomous motivation are more likely than their less motivated peers to realize and translate their AMC-driven potential into a sustained physically active lifestyle.

Relevance

Youth sports coaches and PE teachers should create inclusive environments that focus on developing AMC, enhancing PMC (e.g., by building confidence and positive self-perceptions) and competence satisfaction (e.g., through challenging yet achievable goals), and fostering autonomous motivation (e.g., via autonomy-support and constructive feedback) to promote sustained PA engagement.

104 - A systematic review of language, speech, and oral motor performance in children with developmental coordination disorder

Anna Fäldt, Uppsala University; Amy De Roubaix, Evelien D'haeseleer, Ghent University

Background: Developmental Coordination Disorder is a neurodevelopmental disorder characterized by motor difficulties which significantly and persistently impact activities of daily living and participation. Qualitative research and parental reports have suggested that children with (probable) Developmental Coordination Disorder (pDCD) experience challenges in the domain of language, speech, and oral motor development (Gurevitz, 2019; Rinat et al., 2022; Pless et al., 2001). This systematic review provides an overview of recent studies assessing challenges in language, speech, and oral motor development in children with pDCD. **Methods and Results:** A systematic search was performed in Pubmed, Web Of Science, EMBASE, and CINAHL and included all peer-reviewed articles published since January 2002 and up to November 2023 reporting on language, speech, or oral motor performance in children with pDCD assessed by standardised instruments. Main contribution. A total of fourteen papers were included. **Conclusions:** The evidence suggests a higher prevalence of speech, language, and oral motor difficulties in children with pDCD.

Relevance

It is essential for society to be aware of the possible co-occurrence of DCD and language, speech and oral motor difficulties to identify and ensure timely interventions. Speech-language disorders are considered potentially hidden disorders with major negative impacts on the child's development, learning and quality of life. These negative impacts may be even larger when co-occurring with DCD.

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105 - Improving motor competence of children: The “super quinas” intervention program.

Luis Paulo Rodrigues, Instituto Politécnico de Viana do Castelo & Sport Physical activity and health Research & INnovation cenTer (SPRINT); Rita Cordovil, Universidade de Lisboa; Julio Costa, Portuguese Football Federation; Susana Vale, Instituto Politécnico do Porto; André Seabra, Portuguese Football Federation

Background: The need for movement interventions to enhance motor competence amongst school-aged children has gained vital importance in the last years, given the negative secular trends that indicate a concerning decline in motor skills among pediatric populations with evident implications on the future health outcomes and sports participation. Responsive to this reality, the Portuguese Football Federation organized and proposed an intervention program on motor competence to be implemented on the extracurricular time of the Portuguese primary schools: the Super Quinas Time (SQT). **Methods and Results:** Thirty-nine schools from all counties of Portugal were assigned either to intervention (27) or to control condition (25), on a total of 949 children that completed all the program and the testing (70.7%). The Super Quinas intervention program comprised an extra weekly hour of extracurricular physical education and lasted for 12 weeks. Motor competence was assessed using the Motor Competence Assessment (MCA) before the beginning of the program (January 2023) and at the end (April 2023). The normative results of the MCA for age and sex, were used to compare changes in MC between the two moments in the experimental and control group. Results showed a general effect of time ($p \leq .001$) for all subscales and total MCA, with results improving at the final evaluation. More importantly, the experimental group showed significant and positive differences, when compared with the control group, in the Stability ($p = .007$), Manipulative ($p = .015$), and total MCA results ($p = .018$). **Conclusions:** The SQT intervention program proved to promote motor competence amongst 6- to 10-years-old children. This finding suggests that adding one hour of PE to the regular primary school schedule can help children to develop their motor competence levels, with the subsequent positive implications for their future life.

Relevance

Motor program interventions emerge as a strategy to counteract the secular decline in motor competence. These interventions offer a structured and systematic approach to motor skill development. Integrating these programs into school time we address the specific challenges posed by the contemporary environment, offering a counterbalance to the erosion of motor competence in pediatric populations.

106 - Mediating effect of internal factors on the relationship between developmental coordination disorder and physical activity in school-aged children

Huynh-Truc Tran, China Medical University, Taiwan

Background: Little is known regarding the relationships among developmental coordination disorder (DCD), internal factors, and physical activity (PA) in school-aged children. The purpose of this study was to investigate whether internal factors, including body mass index (BMI), muscle strength, flexibility, internalizing problems, and physical self-concept, would mediate the relationship between DCD and PA in school-aged children. **Methods and Results:** 67 children aged 6–8 years (13 DCD, 19.4%) who provided valid data were enrolled. Children with DCD were confirmed to meet diagnostic criteria of the DSM-V. PA was measured using accelerometers. BMI, muscle strength, and flexibility were assessed by trained research assistants, whereas the Child Behavior Checklist (CBCL) and the Self Description Questionnaire for Preschoolers (SDQP) were used to assess children's internalizing problems and physical self-concept, respectively. Mediation analysis was conducted using the PROCESS macro for R. DCD was found to have a significant indirect effect on moderate-to-vigorous PA (MVPA) through muscle strength (effect = −3.62, bootstrap SE = 2.41, 95% bootstrap CI = −9.21, −0.02). Additionally, there was a significant mediating effect of muscle strength on the relationship between DCD and vigorous PA (VPA) (effect = −2.08, bootstrap SE = 1.30, 95% bootstrap CI = −5.09, −0.13). However, while there was a direct effect of DCD on MVPA, there was no statistically significant mediating effect of internalizing problems on this relationship. **Conclusions:** Our findings highlight the importance of muscle strength on the relationship between DCD and the participation in higher intensity PA.

Relevance

The results of this study provide practical implications for future interventions targeting the participation in MVPA and VPA in school-aged children with DCD, which should focus on the improvement in muscle strength of lower extremities alongside motor skills training.

109 - The PERFormance and FITness Test Battery: An alternative test to measure motor skills and fitness for school-aged children in low-resourced areas.

Bouwien Smits-Engelsman, North West University & University of Cape Town; Dané Coetzee, North West University, Marisja Denysschen, North West University; Gillian Ferguson, University of Cape Town; Oluwakemi Adebukola Ituen, University of Cape Town; Dorothee Jelsma, University of Groningen; Tatiane Targino Gomes Draghi, Nossa Senhora do Patrocínio University Center; Rosemary Doe-Asinyo, Brunel University: Faiçal Farhat, University of Sfax; Palacky University Olomouc; Paula Rodrigues, Piaget Research Center for Ecological Human Development; Evi Verbecque, Hasselt University

Background: Despite the efforts made to cross-culturally adapt motor tests to improve their psychometric properties, e.g. norms for specific countries or regions, these adaptations do not suffice for use in the African context and many other developing countries. Developing a new motor performance test is a large endeavor, with the first step being the definition of content−determining the kind of items to include. Given that poor motor coordination can lead to restricted participation in leisure activities and organized sports, we chose to include aspects of musculoskeletal fitness. Therefore, the test encompasses both skills (Locomotor, Ball skills, Balance) and the strength (Lower and Upper extremity) and anaerobic capacity aspects (15-sec endurance and explosive power) necessary to perform the skills in daily life. **Methods and Results:** Since its introduction in 2018, a large team of students and volunteers have collected evidence on the psychometric properties of the PERF-FIT and have compiled information about all important intrinsic components of the test. A summary will be presented of ten published papers and four sets of new data, offering insights into the test's feasibility, adequacy, and usefulness across different African (e.g., Ethiopia, Nigeria) and European countries (Netherlands, Portugal). The validity of the PERF-FIT has been rigorously tested through comparisons with the MABC-2, BOT-2, KTK, DCD-Q and Alphafit, spanning diverse populations in Brazil, Ghana, and South Africa. Two balance items ("Hug knee" and "Pick up Can") have been studied in laboratory settings (Brazil and Czech Republic). Reliability has been established on a South African and Dutch sample while sensitivity to measure change has been demonstrated in two intervention studies in Brazil and Tunisia. Importantly, norming is based on a large sample, a fundamental psychometric property of a test.
Conclusions: The PERF-FIT is a newly validated, reliable, and responsive tool specially developed for use in low-resourced areas to measure motor performance, power and agility, at baseline and to monitor treatment efficacy. A short version of the PERF-FIT with one item per aspect for screening purposes, needs to be developed.

Relevance

Relevance: Lack of culturally appropriate norms has been a problem for clinicians and researchers in low- and middle-income countries. Thanks to the collective effort of students and their supervisors, the manual for PERFormance and FITness Test Battery is now available. It includes norms per age group (6-12 years) and gender, based on 2500 children from and for low- and middle-income countries.

110 - Assessment of motor competence in schoolchildren: reliability of the Alfamov app.

Aida Carballo-Fazanes, University of Santiago de Compostela; Eva Santos-Miranda, University of Santiago de Compostela; Ezequiel Rey, Universidade de Vigo; Cristina Varela-Casal, Universidade de Vigo; Cristian Abelairas-Gómez, University of Santiago de Compostela

Background: Assessing motor competence (MC) in childhood is crucial due to its impact on immediate and future health. However, there is no consensus on the best tool to use in a specific context, with barriers including the lack of digital technology to facilitate the assessment and the lack of knowledge and time to perform it. In this context, Alfamov app has been developed to comprehensively assess and monitor the development of fundamental movement skills (FMS). This study aims to investigate the intra- and inter-rater reliability of Alfamov. **Methods and Results:** The reliability of Alfamov was assessed by two raters (one expert and one novice in MC scoring), who independently evaluated the MC of 90 healthy schoolchildren aged 6-12 years using pre-recorded videos. The intra-rater reliability analysis was conducted by the expert rater, and the inter-rater reliability analysis was performed between the expert and novice raters. The intraclass correlation coefficient (ICC) was used to assess reliability. Results showed excellent intra-rater reliability for overall score, with an ICC of 0.971 (95% confidence intervals [CI]: 0.957–0.981). The locomotor, object control, and stability subscales also showed excellent reliability, with ICC values of 0.954 (95%CI: 0.931–0.969), 0.970 (95%CI: 0.955–0.980), and 0.935 (95%CI: 0.903–0.957), respectively. Inter-rater reliability showed good-to-excellent ICC values for the overall score ICC (95% CI) 0.861 (0.797–0.907), and the object control subscale ICC (95% CI) 0.874 (0. 814–0.915), and moderate-to-good ICC values for the locomotor ICC (95% CI) 0.727 (0.613–0.812) and stability subscales ICC (95% CI) 0.811 (0.726–0.871). **Conclusions:** These results strongly support Alfamov as a reliable and accurate tool for assessing FMS in schoolchildren, recommending its integration into schools and pediatric settings to provide a systematic approach to assessing MC.

Relevance

This robust tool not only equips physical education teachers with essential information for reliable MC assessment, but also has the potential to improve communication among key stakeholders in children's MC development: physical education teachers, pediatric health care professionals, and families, ultimately streamlining interventions for improved outcomes.

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111 - Estimating dyspraxia and associated factors among children in Hong Kong

Catherine M. Capio, Hong Kong Metropolitan University; Kathlynne F. Eguia, The Hong Kong Polytechnic University; Sum Kwing Cheung, The Education University of Hong Kong; Kevin K.H. Chung, The Education University of Hong Kong

Background: It is estimated that developmental coordination disorder (DCD) affects 5%-6% of children globally, with prevalence varying across regions. In Hong Kong, we currently do not know the extent to which DCD affects children, and programs for children with special educational needs have limited focus on DCD or dyspraxia. We aimed to estimate the incidence of probable DCD among children in Hong Kong and explored the relationship of motor coordination with health and functional outcomes. **Methods and Results:** We conducted a scoping review of the literature following standard framework [1] and protocol [2], followed by a cross-sectional survey of a population-representative sample of parents of children aged 5-12 years from across Hong Kong (n=632). The survey consisted of the Developmental Coordination Disorder Questionnaire-Chinese version (DCDQ-C) and components of the Patient Reported Outcome Measurement Information System (PROMIS) Parent Proxy Scale - Global Health, Physical Activity, Positive Affect, and Cognitive Function. The review showed that approximately 9.4% of tested participants had DCD and 19.7% were at risk. The survey revealed that the DCDQ-C scores categorised 19.1% of children as “suspect DCD” (sDCD). Children who had sDCD had lower global health ($p<0.001$), positive affect ($p<0.001$), and cognitive function ($p<0.001$) scores than did those who were “probably not DCD” (nDCD). For nDCD children, the DCDQ-C score was correlated with global health ($r=0.45$, $p<0.001$), positive affect ($r=0.27$, $p<0.001$) and cognitive function ($r=0.31$, $p<0.001$). For sDCD children, the DCDQ-C score was correlated with physical activity ($r=0.17$, $p=0.05$) and positive affect ($r=0.19$, $p=0.03$). **Conclusions:** The findings revealed a high prevalence of children at risk of DCD in Hong Kong. The relationship between motor difficulties and health and functional outcomes differed between sDCD and nDCD children. However, positive affect was consistently related to motor coordination among all the children.

Relevance

We conducted the survey during the latter part of the COVID-19 pandemic and social restrictions potentially exacerbated parents’ concerns. Nevertheless, the findings suggest that promoting motor coordination may be a crucial contributor to children's well-being. The apparent high DCD prevalence, based on previous studies and the survey, also warrants attention from policy-makers and practitioners.

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112 - Paediatric motor difficulties and internalising problems: An integrative review on the environmental stress hypothesis

Noah Erskine, University of Queensland; John Cairney, University of Queensland; Jaime Barratt, University of Queensland and Brock University

Background: The current study aims to provide an in-depth analysis and extension of the Environmental Stress Hypothesis (ESH) framework, focusing on the complex interplay between poor motor skills and internalising problems like anxiety and depression. **Methods and Results:** Using an integrative research review methodology, this study synthesizes findings from 38 articles, both empirical and theoretical, building upon the foundational work of Mancini et al. (2019). The hypothesis posits that poor motor skills serve as a primary stressor, leading to internalising problems through various secondary stressors. A rigorous comparison of data was conducted, considering study design, findings, and methodologies - while giving special attention to variables such as age, sex, and comorbidities. The study also enhances the ESH framework by introducing resource buffers, including optimism and familial support, as additional influencing factors. **Conclusions:** This multi-level approach yields a more nuanced and comprehensive ESH framework, highlighting the need for future studies to consider intersectional variables and how they may vary across various life stages.

Relevance

Expanding on the ESH, this study delves into the correlation between poor motor skills and internalising problems, emphasizing the intricate role of secondary stressors and stress buffers. It enriches our understanding of this complex link, helps inform targeted interventions, strengthens support systems, and directs future research to improve psychological outcomes.

114 - Rhythmic processing in children with dysgraphia associated with DCD and/or DD

Margaux Lê, Marianne Jover, Aix Marseille University; Jeremy Danna, University of Toulouse Jean-Jaurès; Celine Benois, Hospital of Marseille; Chloe Di Meglio, Hospital of Marseille; Aline Frey, Aix Marseille University

Background: Handwriting is a rhythmic activity and difficulties to process rhythmic and temporal information may contribute to handwriting alteration. Indeed, numerous studies have reported that rhythm perception and production are impaired in both developmental coordination disorders (DCD) and dyslexia (Lense et al., 2021), two disorders that are frequently associated with dysgraphia (Jolly et al., 2023; Jover et al., 2013). However, rhythmic processing may be different in these two disorders, suggesting that the relation between handwriting and rhythm alterations depends on the associated disorder. This study aims to better characterize handwriting and rhythmic skills in DCD and/or dyslexia.
Methods and Results: We assessed these skills in children with dysgraphia associated with DCD and/or dyslexia, and in age-matched typically developing children. All the participants performed (1) graphomotor tasks (loop tracing, sentence and text copying) on a digital tablet to measure their writing frequency and (2) rhythm perception (i.e. listen to an isochronous rhythm) and production tasks (i.e. tap every two beats). During the rhythm tasks, cerebral activity was recorded with EEG to disentangle neural sensory and motor contributions to behavioral beat synchronization. Currently, data are still under collection. We expect the children to present distinct profiles depending on the presence of DCD or dyslexia, and that the handwriting difficulties will coincide with the rhythm ones. The results will bring new elements on the rhythm-handwriting link depending on the associated disorders, and would provide guidelines for music-based rehabilitation of handwriting difficulties.

Relevance

Rhythmic skills are altered in DCD and other neuro-developmental disorders (NDD) and these could contribute to difficulties, such as handwriting. Importantly, music-based intervention seems to be efficient for DCD and dyslexia. A better characterization of children's rhythmic skills depending on associated NDD would permit to provide guideline for these remediations tools.

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116 - Movement coordination, anxiety and mental effort in adults with and without DCD

Judith Gentle,University of Surrey; Mara Deluca, Aliah Shaheen, Brunel University

Background: Developmental Coordination Disorder (DCD/Dyspraxia) is characterised by difficulties planning and coordinating movements. In addition to the everyday living and psychosocial implications, uncoordinated movement is less efficient and may create an increased cognitive load. DCD is also complex and heterogeneous, and not all individuals present with the same behaviours. The aim of this study, therefore, is to explore the relationship between mental effort, anxiety and the biomechanical variables of movement coordination in adults with and without DCD. **Methods and Results:** 10 adults with DCD (18-60 years) and 10 age/gender/height-matched controls took part in this study. 3D motion capture (Qualisys, Göteborg) and sensors attached on the head, torso, arms, hands, legs and feet tracked the movement of the participants whilst performing everyday activities such as walking and ascending/descending stairs. Before completing the tasks, participants completed the Movement Assessment for Children (2nd edition), the State-Trait Anxiety Inventory (STAI) and the Adult Developmental Coordination Disorder Checklist. After completing each of the tasks participants completed the Rating Scale of Mental Effort and measures of state anxiety from the STAI. Movement data (joint and segment kinematics and coordination) obtained from the two groups was used to ascertain the level of coordination in the movements, and the accompanying mental effort and state anxiety. Initial analysis suggests that there are differences in movement characteristics and mental effort between groups. **Conclusions:** Mental effort is likely to play a role in uncoordinated movement. Thus, the mental effort needed to perform many everyday activities could mediate the relationship between movement coordination and heightened anxiety in this group.

Relevance

Findings from this work will inform theoretical advances, expanding our understanding of the mechanisms involved in coordinated movement. It will also inform the development of targeted interventions aimed at improving movement coordination and reducing physical effort for those with coordination difficulties.

118 - Characterizing goal-directed whole-body movements in autistic children and children with Developmental Coordination Disorder

Nicholas Fears, Louisiana State University; Stacey Hirsch, University of Michigan; Priscila Tamplain, University of Texas at Arlington; Tylan Templin, Southwest Research Institute; Gabriela Sherrod, Children's Hospital of Philadelphia; Nicoleta Bugnariu, University of the Pacific; Rita Patterson, University of North Texas Health Science Center; Haylie Miller, University of Michigan

Background: Many neurodevelopmental conditions exhibit clinically significant motor difficulties. Postural control difficulties have been demonstrated in both autistic children and children with Developmental Coordination Disorder (DCD). However, there has been relatively little research examining postural control in autism and DCD within the same study. To better understand how postural control differences compare across these neurodevelopmental conditions, we examined dynamic postural control differences in autistic children and children with developmental coordination disorder in the same study. **Methods and Results:** We used an integrated motion capture and immersive virtual reality system to study dynamic postural control in autistic children (n=16; Male=14, Female=2), children with DCD (n=10; Male=9, Female=1), and neurotypical children (n=12; Male=7, Female=5). Children enrolled in the study were between 86-178 months of age (M=125.68 months) with a non-verbal IQ above 70. Children moved their bodies to direct a user-controlled ball to a static target using a motion capture marker on the C7 vertebrae. There were no group differences in task success ($p>.05$), but there were significant differences in their trial duration ($p=.003$), path efficiency (i.e., ratio of target distance to path traveled; $p=.029$), and log dimensionless jerk ($p=.033$). Autistic children used longer, less efficient, and jerkier movements than neurotypical children, and children with DCD used numerically (though not statistically-significantly) longer, less efficient, and jerkier movements than neurotypical but slightly better movements than autistic children. **Conclusions:** These results of this study support for our hypotheses that autistic children have difficulty with goal-directed whole-body movements and provide mixed support for our hypothesis that children with DCD differ in their goal-directed body movements compared to autistic and neurotypical children. Further research must elucidate the similarities and differences in motor difficulties across neurodevelopmental conditions to inform specifically targeted motor interventions for these populations.

Relevance

Autism and DCD are neurodevelopmental conditions with clinically significant motor difficulties. We examined how autistic children and children with DCD complete a postural control task to understand difficulties in their movements. By examining differences in motor difficulties across neurodevelopmental conditions, we can better inform targeted motor interventions for these populations.

121 - Which Motor Skills Do School-Aged Children with and without Motor Problems Perceive as Important to Them?

Marisja Denysschen, North-West University; Dané Coetzee, North-West University; Rosemary Doe-Asinyo, Brunel University; Emmanuel Bonney, University of Minnesota; Bouwien Smits-Engelsman, University of Cape Town

Background: Incorporating children's preferences and values about motor skills into intervention planning is critical for improving learning outcomes. However, there is little information about the sort of motor skills children with and with movement difficulties perceive as important. Given the cultural and traditional values placed on skills needed in active play and daily chores, the perceived importance might vary between cultures. **Methods and Results:** An instrument originally meant for children in the Netherlands, was culturally adapted for use in Africa using rigorous adaptation procedures. Semi-structured interviews were conducted with relevant stakeholders (i.e. parents, teachers, and children with DCD) to collect contextually relevant information about everyday motor activities that they perceive as problematic. After qualitative and quantitative analysis of the data, the child and parent version of Motor Coordination Questionnaire (MoCQ) was constructed. The MoCQ consists of 2 parts, one part inquiring how good the children perceive themselves on the depicted skills (part perceived competence: MoCQ-PC) and one part asking about the importance (MoCQ-I). The MoCQ-I was deployed to ~1400 children (6-12y) with and without motor problems in South Africa (SA) and Ghana. In the SA sample, we compared the frequency of the scores between 2 groups based on the MABC-2 (16th percentile). For the Ghanaian sample, the same analysis was done but groups were made based on the DCD-Q. Overall SA children perceived catching, throwing, handwriting, selfcare, household shores, taking part in team sports, indigenous games to be (very) important. The frequency of the answers was only different for catching ($p<0.03$) and biking ($p<0.001$) between the p-DCD and typically developing group (TD). In the Ghanian children, additional items were perceived as very important: kicking, running, hopping, dancing. Ghanian parents filled out the proxy version of questionnaire and rated handwriting, running, household chores and self-care most frequently as very important.

Relevance

Understanding children's perceived importance of daily motor activities is vital for therapists to tailor meaningful motor skill interventions. It is essential to study if the downgrading of the importance for certain activities is impacting the motivation to learn or if it is merely a coping strategy; if skills are made less important the impact on well-being of the child might be less.

122 - Application of learning strategies by children with DCD and their parents at home

Emma van Rooijen, Fysiotherapie Oosterwolde; Fokke Fennema, Rehabilitation Center 'Revalidatie Friesland'; Heleen Reinders-Messelink, Rehabilitation Center 'Revalidatie Friesland' & University of Groningen; Marina Schoemaker, University of Groningen, The Netherlands

Background: Developmental coordination disorder (DCD) occurs in five to six per cent of school-aged children. Rehabilitation-Friesland aims to improve their care for children with DCD. During intervention learning strategies are learned that help the children to improve their motor performance. The intention is that the learned strategies can also help the children to improve their performance outside the intervention context. However, it is unclear if and how these strategies are applied at home. This study focuses on how children with DCD and their parents make use of the learning strategies in the home situation. **Methods and Results:** A qualitative study with semi-structured interviews was used to explore if and how learning strategies were applied by parents and children at home. Participants were approached by e-mail and recruited from the rehabilitation's database. A different interview guide was composed for parents and children. After the interviews were held, they were analyzed through inductive coding. A group of eight parents and eight children were included. According to the interviews, not all children consciously used a learning strategy. The children who most often used the strategies applied them at school, during gym or outdoor play. They reported greater self-confidence as a result. The parents who were more involved in the intervention did indicate that they used the learning strategy a lot in the home situation. Not every parent appeared to be familiar with the learning strategies. **Conclusions:** This study concludes that some children with Developmental Coordination Disorder (DCD) applied the learning strategies at home after the intervention at the rehabilitation center. Parental involvement during the intervention affected if and how they applied them at home.

Relevance

The results of the study can be used to further improve the care for children with DCD, for instance by involving parents even more in the rehabilitation process.

124 - Understanding the use of motor competence assessments in Australian primary physical education: A qualitative study

Samantha Snow, Lisa Barnett, Trent Brown, Jo Salmon, Natalie Lander, Deakin University

Background: Motor Competence (MC) is critical for child health and development. Despite the benefits, MC is low. Primary school Health and Physical Education (HPE) theoretically provides an ideal setting for children to develop MC. Developing MC is a main aim of the primary HPE curricula in Australia and includes explicit assessment of MC. Despite explicit curriculum recommendations, and the importance of assessment to develop MC, the use of valid reliable and feasible MC assessment by teachers in HPE is currently unknown. Therefore, the aims of this study are to (i) Understand the current use, barriers, and facilitators of valid reliable and feasible MC assessments by Australian primary HPE teachers, ii) Provide recommendations to overcome the barriers. **Methods and Results:** 16 participants including 8 teachers and 8 stakeholders (e.g., assessment authorities, researchers, teacher educators, professional development providers) took part in a semi-structured individual online interviews. The Capability, Opportunity & Motivation model of Behavioural change (COM-B) was used to frame interview questions and analysis of the data. Findings showed teachers rarely used valid, reliable, and feasible assessment tools in their HPE practices. Further, most were unaware of any evidence-based MC assessment tools and rather created their own assessment methods. Further teachers rarely used the results to inform their teaching. Barriers to MC assessment included time, cost, education, access, and support. Continuing professional development (PD) remained of interest to participants as well as increased access to evidence-based MC assessments online. **Conclusions:** Current teaching of MC by Australian HPE teachers appears to omit the use of valid reliable and feasible assessment tools. Increasing teacher access and education via an online MC assessment platform may enhance the quality of teaching and ultimately improve student MC.

Relevance

This study addresses assessment of MC by teachers in HPE as such aligns with the themes of IMDRC. By better understanding teacher's current implementation of MC assessment and exploring the barriers and facilitators to implementation of evidence-based MC assessment in real world settings, we can identify potential solutions and provide recommendations to bridge the research to practice divide.

126 - Enhancing early diagnosis of autism spectrum disorder with machine learning algorithms using postural control features

Ting Liu, Texas A&M University-San Antonio; Ila Wallace, Texas A&M University-Corpus Christi; Hayden Cressman, University of Texas of the Permian Basin; Rachel Koldenhoven, Texas State University, USA; Yumeng Li, Texas State University; Damian Valles,Texas State University

Background: Autism Spectrum Disorder (ASD) encompasses a spectrum of neurological and developmental disorders impacting diverse aspects of an individual's functioning, including social interactions, communication, emotional regulation, learning, and motor skills. The presentation of ASD is highly individualized, with some individuals facing challenges in social interactions while excelling in learning and motor skills, and others struggling with emotional regulation and learning but demonstrating proficient communication with peers. Recognizing the diverse manifestations of ASD is imperative, necessitating tools capable of accommodating this variability. Previous research has underscored significant differences in postural stability between children with ASD and their neurotypical counterparts. This study delves into the assessment of postural stability using Center of Pressure (COP) measurements during 20-second periods of quiet standing. The purpose of the study was to investigate whether machine learning algorithms, once trained, can assist healthcare providers in the diagnostic process. **Methods and Results:** A total of 38 participants aged between 5 and 16 were analyzed, with children with ASD constituting the ASD group and children with typical neurodevelopment serving as the control (TD) group. Participants' COP measurements were collected using a force plate on a flat surface of a rubber mat. A machine learning algorithm was trained on 80% of the data and tested on the remaining 20%, utilizing Logistic Regression Accuracy to evaluate classification outcomes. Based on COP outcome measures, the results demonstrated high accuracy rates as the model correctly predicted all test ASD trials as ASD except one. **Conclusions:** The overall accuracy suggests the potential utility of machine learning algorithms in identifying ASD in children, particularly during the initial stages of the diagnostic evaluation. This innovative approach holds promise for enhancing the efficiency and accuracy of ASD diagnosis.

Relevance

Overall, the findings of this study have significant implications for society by offering a promising avenue for enhancing ASD diagnosis, ultimately leading to improved outcomes and quality of life for individuals with ASD and their families.

127 - Repeated sprinting, fatigue, power, and agility in children with different levels of motor competence

Dané Coetzee, North-West University; Marisja Denysschen, North-West University; Bouwien Smits-Englsman, University of Cape Town

Background: Children with motor delays often face challenges in health-related fitness, but the impact on running skills remains unclear. Previous research has highlighted the impact of DCD on physical activity, revealing lower cardiorespiratory fitness, muscular strength, muscular endurance, and higher body composition compared to their peers. While cardiovascular outcomes have been explored, few studies explored anaerobic capacity, muscle power, endurance, running, and fatigue in children with DCD. This study aim to compare repetitive running, running induced fatigue, power and agility in typically developing (TD) children and those with varying degrees of motor coordination problems. **Methods and Results:** The MABC-2 was used to define groups as having DCD (p-DCD≤5th percentile n=141), at risk for DCD (r-DCD 6th–16th percentile n=160), and TD (TD>16th percentile n=191). The CRISP test was used to assess anaerobic fitness and fatigue. Power and Agility subscale items of the PERF-FIT were used as field-based measure of lower and upper body muscular strength (long jump and overhead throw), running (ladder run and ladder step) and agility (side jump) in the three motor level groups. Because we wanted to know if lower performance is already present in young children, age group (6-9 and 10-12 yr) was added as between-subject factor in the analysis. The p-DCD group was significantly slower and fatigued more than the r-DCD and TD children ($p<0.01$). This was also the case in the 6–9-year-olds. Despite poorer sprinting proficiency, there was no significant difference in the fatigue index if power (Watts, taking mass into account) was used instead of time (s) between age groups and the three motor level groups. Moreover, the DCD groups had significantly ($p<0.001$) worse performance on all power and agility items and indicating lower scores for anaerobic fitness. **Conclusions:** The moderate differences in coordination proficiency between TD and r-DCD are not large enough to affect the slowdown of sprinting over trials, while the p-DCD group and TD group were different. Higher body weight, lower agility and less strength are likely to slow children with p-DCD down during the repetitive running test.

Relevance

Understanding factors influencing fitness performance in children with different levels of motor competence is essential. Assessing running times, fatigue, and power and diminishing the deficits through tailored intervention programs has broad implications for the immediate and future PA engagement. Analyzing age differences longitudinally aids in understanding activity level relations.

129 - Pretesting and piloting a motor creativity tool in Finnish children

Elina Meklin; Donna Niemistö; Nanne-Mari Luukkainen; Arja Sääkslahti; Arto Laukkanen, University of Jyväskylä

Background: This study pretested the feasibility and internal consistency of a motor creativity. We used the Dominguez et al.(2015) study, which combined three tasks from Torrance´s (1981) Thinking Creatively in Action (TCAM) test and one task from Bertsch´s Test of Motor Creativity (Bertsch, 1983). Thus, motor creativity comprises sub-areas of fluency, flexibility, originality, and imagination. **Methods and Results:** A pretest of the translated tool was conducted by two researchers for five children (age range 10–11 -years). After adjustments, the tool was piloted in 22 children (age range 9–13-years, 50% girls). Tasks were performed and videotaped one child at a time in a peaceful space, in separation from other participants. Fluency, flexibility, and originality was tested using locomotion, manipulation and symbolism tasks, and imagination using an imagination task. Fluency was scored as the number of distinct responses, flexibility as the number of different categories of responses produced, originality as uniqueness of the responses to the tasks. Imagination was scored as the success of playing asked roles of the imagination task. Cronbach's alphas suggested acceptable internal consistency for fluency (.750), moderate internal consistency for flexibility (.525), and originality (.662). The internal consistency of all three motor creativity sub-areas was acceptable (.722). Piloted tasks were found understandable and feasible for children. The highest scores were scored in the locomotion task, especially for fluency, flexibility, and originality. **Conclusions:** The tested motor creativity tool shows promise in measuring children´s motor creativity at primary school age in Finland. Further validation of the tool is warranted.

Relevance

The tool presented is promising to measure children's motor creativity in Finland. Research on motor creativity is relevant to society as it has the potential to positively impact education, health, child development, and overall well-being. The findings can inform practices and interventions that contribute to a more holistic and creative approach to childhood development. Research will continue.

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130 - Motor function, linguistic ability, and related neurodevelopmental disorders in children with familial high-risk of schizophrenia or bipolar disorder

Marta Schiavon, Copenhagen University Hospital; Hanne Birgitte Klee Burton; Nicoline Hemager, Copenhagen University Hospital, The Lundbeck Foundation Initiative for Integrative Psychiatric Research, and University of Copenhagen; Aja Nedergaard Greve, The Lundbeck Foundation Initiative for Integrative Psychiatric Research, Aarhus University Hospital & Aarhus University; Katrine Spang, The Lundbeck Foundation Initiative for Integrative Psychiatric Research; Ditte Ellersgaard, The Lundbeck Foundation Initiative for Integrative Psychiatric Research, Hospital University Lausanne and Lausanne University; Kerstin Jessica Plessen; Jens Richardt Jepsen, Copenhagen University Hospital, The Lundbeck Foundation Initiative for Integrative Psychiatric Research, Center for Neuropsychiatric Schizophrenia Research and Center for Clinical Intervention and Neuropsychiatric Schizophrenia Research; Anne Amalie Elgaard Thorup, The Lundbeck Foundation Initiative for Integrative Psychiatric Research and University of Copenhagen; Merete Nordentoft, Copenhagen University Hospital, The Lundbeck Foundation Initiative for Integrative Psychiatric Research and University of Copenhagen; Ron Nudel, Copenhagen University Hospital and The Lundbeck Foundation Initiative for Integrative Psychiatric Research.

Background: Developmental motor and language disorders such as developmental coordination disorder (DCD) and specific language impairment (SLI) often co-occur. It has also been found that schizophrenia (SZ) and bipolar disorder (BP) may be preceded by early neurodevelopmental deficits. In fact, children of parents with SZ, thus at familial high-risk (FHR) of SZ, present impaired motor function and linguistic ability compared with population-based controls (PBC), and children with definite motor problems are more likely to perceive psychotic-like experiences. **Methods and Results:** We investigated the co-occurrence of SLI and DCD in the Danish High Risk and Resilience Study (the VIA 7 study), a cohort of 522 7-year-old children born to parents with SZ (FHR-SZ, N=202) or BP (FHR-BP, N=120), or neither of these disorders (PBC, N=200). We used the Movement Assessment Battery for Children-2 (MABC-2) to test motor function, while linguistic ability was assessed using the Test for Reception of Grammar-2 (TROG-2) and the Reynolds Intellectual Screening Test (RIST) – Guess What (verbal subset). DCD and SLI were defined based on the children's MABC-2 and TROG-2 scores. We found significant correlations between most measures of linguistic ability and motor function, and an association between DCD and SLI (OR=8.22, P=2.28×10-7). We performed linear regressions of the quantitative linguistic or motor scores on respectively DCD or SLI status while adjusting for familial high-risk status and sex and found that familial high-risk of SZ had a significant negative effect on all linguistic and motor outcomes, apart from the "aiming and catching" subdomain of the MABC-2. Most DCD and SLI cases were found in the FHR-SZ group. The prevalence of concomitant DCD and SLI was 6.9% in the FHR-SZ group, 2.5% in the FHR-BP group, and 1.7% among PBC. **Conclusions:** Our results confirm an overlap between DCD and SLI. The higher prevalence of both DCD and SLI among children in the FHR-SZ group and their overall poorer performance in linguistic and motor tests may indicate the presence of group-specific factors affecting neurodevelopmental processes. Further research should focus on identifying modifiable risk factors on which to intervene.

Relevance

Our results confirmed an overlap between DCD and SLI. We also found a higher prevalence of both DCD and SLI among children of parents with schizophrenia-spectrum disorders. We would like to bring these findings to our colleagues' attention, and encourage a holistic, inter-disciplinary approach to DCD and SLI, with particular focus on children at familial high risk of severe mental illness.

131 - Assessing the perceptions of children with Developmental Coordination Disorder for virtual reality sports games: A patient and public involvement

Mohammed Alharbi, David Harris, Greg Wood, Helen Dodd, Gavin Buckingham, University of Exeter

Background: Children with Developmental Coordination Disorder (DCD) report difficulties with exercise and sports participation, which often results in lower levels of engagement in sports compared to their typically developing peers, potentially due to lower perceived self-efficacy regarding their physical abilities. Immersive Virtual Reality (VR), offering a safe, engaging, and controlled environment, has emerged as a promising tool that may help address these challenges by enabling children to practice and develop new skills. While the use of VR has shown potential in rehabilitation and skill acquisition across various populations, its specific application in enhancing sports participation and enjoyment among children with DCD remains underexplored. The success of any VR interventions can be enhanced through Patient and Public Involvement (PPI), which ensures that technologies align with patient needs, preferences, and experiences. We therefore sought to gather children's insights about VR-based interventions to understand their unique needs and preferences. This PPI activity aims to understand the attitudes, perceptions, and preferences of children with DCD regarding sports participation and physical activity games using immersive VR technology. **Methods and Results:** Participants were five children and adolescents aged 8-16 years, diagnosed with DCD. We gathered participants' viewpoints across two activities. First, focus groups aimed to explore their experiences, challenges, and preferences in sports participation. Next, participants engaged with VR sports experiences in a controlled environment. Subsequent semi-structured interviews with each participant provided insights and feedback on using VR for sports participation. Preliminary findings suggest that most of our sample were excited about the possibility of using VR in sporting contexts.

Relevance

Engaging with children with DCD to develop interventions tailored to their needs can potentially improve their enjoyment, motivation, and self-efficacy around sporting activities. If effective, this work could increase sports participation and generate associated health benefits in this population. Overall, this work exemplifies accessible, child-focused innovation in rehabilitation technology.

132 - Motor competence and compliance with physical activity recommendations in chilean schoolchildren

Jaime Carcamo-Oyarzun, Universidad de La Frontera

Background: The development of motor competence is thought to be a crucial precursor for raising the trajectory of PA throughout a person's life. The objectives of this study are to determine motor competence and the daily time of moderate and vigorous physical activity of students in 5th and 6th grade of elementary school in Chile and to establish whether there are differences in motor competence according to sex and compliance with physical activity recommendations. **Methods and Results:** 368 schoolchildren (M=11.10 years; 54.3% girls) participated. To assess motor competence, the MOBAK 5-6 test was used. Physical activity was measured using ActiGraph wGT3X-BT® accelerometers. Boys (M = 3.65, SD = 2.14) showed a better performance than girls (M=2.39, SD=1.80) in Object Control ($p \leq 0.001$, PS=0.67). For Self-Movement, the girls (M=2.72 SD=2.14) performed better than the boys (M=2.40 SD=1.86); however, there were no significant differences between the two sexes (p=0.257). Boys (M=48.4 SD=22.8) presented more daily minutes of moderate and vigorous physical activity than girls (M=35.9 SD=16.9), with statistically significant differences ($p \leq 0.001$, PS=0.67). Comparison of MC in those who do and those who do not comply with the physical activity recommendations indicated that only for Object Control, there is a statistically significant difference ($p \leq 0.001$; PS=0.29; compliers: M=4.28 SD=2.12; non-compliers: M=2.67 SD=1.29). By contrast, an analysis of Self-Movement found no significant difference (compliers: M=2.73 SD=1.97; non-compliers: M=2.54 SD=2.04; p=0.408) between the two groups. **Conclusions:** It is necessary to generate instances that develop motor competence in all its dimensions to promote higher levels of moderate to vigorous physical activity.

Relevance

This research provides useful information for physical activity programmes, highlighting the need to consider balance and locomotion activities for the promotion of self-movement. Furthermore, this study contributes to the scientific dissemination relating to motor competence in Latin America, a region underrepresented in global research.

133 - Motor profiles and prevalence of co-occurring developmental coordination disorder in children with autism spectrum disorder

Tine Van Damme, KU Leuven

Background: Research indicates a high prevalence of motor problems in children with autism. Furthermore, a considerable co-occurrence between autism and Developmental Coordination Disorder (DCD) has been suggested. Despite the overwhelming evidence of motor problems in individuals with autism, current research has failed to establish the prevalence rate of DCD in this population. To this end, large scale studies are needed, but the available ones focus on the identification of children 'at risk for DCD' via parent-reported questionnaires, rather than thoroughly assessing all diagnostic criteria. The purpose of this study is to investigate the prevalence rate of DCD in a large sample of children with autism. The motor profiles will be examined using valid and reliable standardized motor assessment instruments. **Methods and Results**: A large retrospective database was used, including the data of children who were referred to the Expertise Center for Autism (UPC KU Leuven, Belgium) between October 2015 and August 2023. Children are referred to this center for a multidisciplinary diagnostic assessment protocol, allowing a rigorous examination of each developmental domain. The standard protocol includes a motor assessment battery to examine the motor skills and confirm or rule out the presence of DCD. All children, between 5-17 years old, diagnosed with autism spectrum disorder were included in this study. In total, 311 patient records (78.8% males, mean age = 9.05y) were analyzed. 19.6% (n = 61) of the children with autism received a co-occurring DCD diagnosis. In 62.2% of the cases, the parents reported a clinical score on the DCD Questionnaire. On the Movement Assessment Battery for Children-2, 44.7% scored in the red zone, 15.5% in the orange zone and 39.8% in the green zone. Moreover, 47.4% showed difficulties with visual motor integration (scored very low to below average on the Beery VMI). Lastly, 52% showed significant problems in handwriting quality and 44% in handwriting speed, measured with the SOS-2. **Conclusion**: About one in five children with autism has co-occurring DCD. Motor problems were apparent in a larger portion of the sample and showed heterogeneity.

Relevance

Presence of motor problems impacts daily functioning and increases mental and physical health risks. Motor problems and DCD often remain undiagnosed and consequently untreated. Motor assessment is often not part of routine clinical care for children with autism. Given the high prevalence rate, we argue that screening for motor problems in children with autism is indispensable.

135 - The influence of parenting style on the action possibilities of two-years-old children

Stefania Zoia, Aurora Platè, Erica Dragonetti, Sara Mattanza, Camilla Pege, Irene Leo, University of Padua

Background: Balance and locomotion, object manipulation and visual-motor integration skills all depend on the child's internal state and on the basis of engagement with the environment (Newell 1986). The main aim of this study is to explore the way that parent-child interactions during movement experiences can influence motor development. **Methods**: Forty-two typically developing children between 24 and 38 months and one of their parents were involved in this study. Data were collected in nursery schools. The children's medical history was negative and no parent reported problems on the SCL-90-Revised questionnaire. Each child was individually assessed on the Peabody Developmental Scales-2; each parent filled out the socio-demographic and Parenting Stress Index-Short Form (PSI-SF) questionnaires. The quality of parenting interaction was judged by the experimenter using the Parent Interaction with children checklist of Observation Linked to Outcomes (PICCOLO). **Results**: The parental education correlates positively with the child's manipulation skills (rho=0.37 (p=0.02) and parents with high socio-economic status had children who scored better on Locomotion (t=2.493, $p < 0.01$) and had a higher Gross Motor Quotient (GMQ; t=2.094, $p = 0.04$). The parental subgroup (16 of the 42 parents), with PSI-SF scores higher than 1-standard deviation above the mean, showed that Parent-Child Dysfunctional Interaction predicts lower GMQ (ß -0,449; $p < 0.003$) and Locomotion (ßeta -0.365; $p < 0.02$). Furthermore, a high Parenting Affection seems to have a negative effect to locomotion (ß -0.412; $p< 0.05$) and to visual-motor integration skills (ß -0.425; $p< 0.02$) while high Parenting Affection plus high Parental Distress seems to predict lower scores in stationary ability (ß -0.401; p=0.009). **Conclusions**: Typical parent-child dyads were studied to see how the environmental context, in which the child develops, can facilitate or hinder their motor development during the second year of life. The findings support the causal relationship between parental attitudes and child motor skills, particularly in parents with lower education and social-economical status, and when they felt an increase of parental distress or showed high emotional involvement.

Relevance

This is one of the few studies that highlights the effect of parental distress and of parenting interaction quality on the development of some motor areas, such locomotion and visual-motor integration skills. Recognizing when the parental stress or emotional level represents a negative environmental constraint for the child's motor learning can have important clinical implications.

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136 - Longitudinal trajectories of motor competence of autistic children over a 12-month intervention: effects of symptom severity

E. Andrew Pitchford, Oregon State University; Samantha Miller, Franziska Loetzner, Leah Ketcheson, Wayne State University

Background: Autistic children can experience significant motor delays, but targeted interventions can be effective in promoting motor competence. The Physical Literacy and Nutrition Education (PLANE) program, which was first implemented as a virtual intervention, is a community-based program that encourages autistic children and their parent(s) to engage in physical activity and promote positive health trajectories. Activities for children focus on the development of fundamental motor skill (FMS) competency. While the PLANE program has led to positive changes in FMS, we have observed high variance in response across participants. The purpose of this analysis was to examine the effect of autism symptom severity on trajectories of FMS competence over the 12-month PLANE intervention. **Methods and Results**: Twenty-nine autistic children (78% male, M=8.3±3.6y) participated in weekly PLANE sessions for 1 year. FMS was measured quarterly with the Test of Gross Motor Development (TGMD-3). Autism symptom severity was measured with the Childhood Autism Rating Scale (CARS-2) and children were divided based on T-score into high (T≥49) and low (T<49) severity groups. Children demonstrated significant improvements over time in TGMD-3 total score ($p<.001$), locomotor skills ($p<.001$), and ball skills ($p=.018$). Different response patterns were observed between severity groups. Children with low autism severity had significant improvements in total score and locomotor skills ($p<.001$) at the 4-month measurement and then plateaued at 8 and 12 months. Children with high autism severity did not demonstrate significant changes until 8 months in total score ($p=.005$) and locomotor skills ($p=.001$), and until 12 months for ball skills ($p=.006$). FMS competence was higher among the low severity group compared to the high severity group at all timepoints ($p<.001$). **Conclusions**: Findings support PLANE for improving FMS competency in autistic children through longitudinal programming, but also suggest that more individualized approaches may be needed for some participants. Further research is needed to better understand how to scale up and out the program to create more accessible opportunities for sustained physical activity participation.

Relevance

This project is relevant to this audience as it examines a health promotion program for a population with motor delays and health disparities. The analysis of autism symptom severity is noteworthy as it provides additional context about individual responses to the intervention. Addressing the heterogeneity of samples of autistic children is relevant to both researchers and practitioners.

137 - Gender invariance of the TGMD-3 in Greek children

Maria Karageorgopoulou, Antonis Kambas, Democritus University of Thrace; Fotini Venetsanou, National and Kapodistrian University of Athens; Nadia Cristina Valentini, Universidade Federal do Rio Grande do Sul; Martha Spanou, Ellinogermaniki Agogi, National and Kapodistrian University of Athens; Kostas Soutos, Ellinogermaniki Agogi; Sofoklis Sotiriou, Ellinogermaniki Agogi

Fundamental Movement Skills (FMS) proficiency is positively associated with lifelong engagement in physical activity; thus, its early assessment is proving highly important. Various tools are widely used for assessing FMS worldwide, with the Test of Gross Motor Development (TGMD) being among the most common ones. Its latest version, the TGMD-3, has been validated in many countries, but there is currently no data available for Greece. This study aims to investigate potential performance trend differences in TGMD-3 between boys and girls of different age groups in Greece. Through this procedure, valuable insights regarding the necessity of different norms for boys and girls will occur. Furthermore, emerged data will aid Greek professionals in effectively intervening FMS proficiency equally for all children, irrespectively their gender. For that purpose, 280 children (143 girls, 137 boys) aged 3-10 years old (M=92.82±26.43 months) were randomly selected from kindergartens and primary schools of urban and rural regions of Greece. Measurement invariance of each age group for both genders was investigated through independent samples t-test. Significant differences emerged across specific skills and age groups: (a) 6-year-old boys performed significantly higher at “one-hand forehand strike of self-bounced ball” [$t(41)=4.49$, $p<.005$, $d=1.37$]; (b) 10-year-old boys outperformed girls in “one-hand stationary dribble” [$t(57)=2.26$, $p<.005$, $d=.59$] and “kick a stationary ball” [$t(57)=3.41$, $p<.005$, $d=.89$]; (c) 10-year-old girls’ “run” score was higher than boys [$t(57)=2.3$, $p<.005$, $d=.60$]. No statistically significant differences were found between the two genders in any other comparison. In agreement with prior research, our findings indicate that preschool boys’ and girls’ FMS proficiency is similar rather than different, and that boys in middle childhood tend to score higher in ball skills compared to girls. Current results, however, should be reconsidered after the data collection and normalization process has been completed.

Relevance

This study will provide valuable feedback for Greek professionals, promoting FMS through gender-neutral physical activities. Identifying gender differences in FMS proficiency of children will highlight the need to eliminate sports stereotypes by creating a pleasant and inclusive environment, ensuring equality for both genders.

138 - Qualitative evaluation of paper-cutting performance between children with Developmental Coordination Disorder and typically developing children

Leila Faber, University of Groningen, University Medical Centre Groningen; Suzanne Houwen, University of Groningen; Esther Hartman, Marina Schoemaker, University of Groningen, University Medical Centre Groningen

Background: Fine motor skills are often assessed with quantitative tests, which provide little information on how a task is performed. Through qualitative assessment of a fine motor task, various components such as grip type and non-dominant hand use can be observed. Within each component, different observable actions are possible ranging from less to more proficient. However, such qualitative descriptions of task performance for fine motor skills are limited, while they could provide important insights for personalized care. Therefore, this study aims to investigate the differences in qualitative performance of a paper-cutting task between 5- to 10-year-old children with Developmental Coordination Disorder (DCD) and typically developing (TD) children. **Methods and Results**: Performance of 178 Dutch TD children (85 boys; M= 8.06, SD± 1.58 years) and six children with DCD (diagnosed according to the DSM-5; two 6-year-olds, three 9-year-olds, one 10-year-old) was observed with a newly developed observation tool during the paper-cutting task of the DCDDaily. Preliminary descriptive results revealed differences between children with DCD and TD children. Children with DCD showed either the least proficient movement pattern present in the youngest TD group (delayed motor performance, e.g., supporting the paper passively) or a movement pattern not present in the TD group (deviant motor performance; e.g., extending all fingers while holding the scissors). Additionally, when combining multiple actions, older TD children often showed a combination of small cutting movements without closing the scissors. In contrast, the children with DCD combined the small cutting movements with closing the scissors, leading to less fluent movements. **Conclusion**: Data collection is ongoing, but preliminary differences were revealed in the qualitative performance of a paper-cutting task between DCD and TD children.

Relevance

Fine motor skill performance was observed with a novel observation tool which enables the assessment of qualitative aspects of multiple fine motor skills which provides valuable insight into potential delays or deviances in development between disorders. Understanding qualitative aspects of performance is crucial for personalized support by educators, healthcare professionals, and caregivers.

139 - Pilot of a teacher training intervention focused on physical education pedagogies to foster motor competence and motivation in primary school children

Matteo Crotti, Coventry University; Lorayne Angela Woodfield, Newman University; Michael Duncan, Coventry University

Background: Motor competence (MC) development is a core physical education (PE) curriculum aim within primary school. However, primary school teachers in England receive little training about PE pedagogy and often lack the confidence and knowledge to teach PE, which can result in the use of controlling teaching practices and an emphasis on pupil performance. These practices are linked with negative experiences and low motivation in PE that could negatively affect pupil's MC development. Therefore, this study aims to assess whether a professional online training intervention could help primary school teachers promote MC development and motivation in PE.
Methods: We recruited 65 children from two schools within the West Midlands (England). One school (38 children, year 5-6 classes) was allocated to the intervention group while the other school (27 children, year 5-6 classes) was allocated to the control group. The teachers receiving the intervention will be invited to complete an online training programme focused on the use of student-centred pedagogical approaches in PE lessons to help promote motivation and MC development and they will be expected to deliver PE over a period of 10 weeks based on the intervention materials. The control group teachers will be invited to deliver PE as usual. MC (through the Test of Gross Motor Development 3) and motivation towards PE (through questionnaires and semi structured interviews) in children will be assessed before and after the intervention duration both in the intervention and control groups. Teacher pedagogical practices will be assessed before and during the intervention period in both groups. Once data collection is complete, all teachers will take part in semi-structured interviews aimed at investigating their perception about intervention feasibility, acceptability, and about the pedagogies they used in PE. Analysis of covariance will be used to assess intervention effects for quantitative data (i.e., TGMD3 and questionnaires). The interviews will be recorded, transcribed, and analysed using qualitative methods including thematic analysis. All the data will be collected and analysed for dissemination by May 2024.

Relevance

Primary school teachers recognise the need of training to deliver PE. However, schools may not allow teachers to take part in face-to-face trainings due to time and financial limitations. If well received and effective in promoting MC and motivation in PE, the online teacher training that we designed could be delivered on a large scale and could have a huge impact on PE quality and children's MC.

143 - The impact of swimming on fundamental movement skill development in children (3–11 years): a systematic literature review

Clare Roscoe, Lauren Sinclair, University of Derby, UK

Background: Swimming is the only sport providing lifesaving skills and research shows swimming can aid fundamental movement skill (FMS) development. Therefore, this review investigated: (1) how swimming impacts FMS development in children aged 3–11 years, (2) successful tools assessing swimming and FMS, and (3) recommendations appropriate to the UK curriculum. **Methods and Results**: A systematic literature review using Google Scholar, PubMed, and SPORTDiscuss was conducted to investigate the effects of swimming on FMS development. Methods included database searching, finalising articles appropriate to the inclusion (literature published January 2008 to December 2022, peer-reviewed English language articles analysing the effect of swimming on FMS in 3–11-year-old children, experimental, primary data-based studies) and exclusion (review articles) criteria and identifying relevant articles using the Preferred Reporting Items for Systematic Reviews and MetaAnalyses. The Mixed Methods Appraisal Tool assessed data quality and bias risk, whilst thematic analysis synthesised data alongside descriptive results. Ten papers met the inclusion criteria, only two originated in the UK, the remaining eight were from: Portugal (3), Serbia (2), Romania (1), Poland (1), and Turkey (1). It was found that swimming does have a significant positive impact on FMS, including significant pre–post testing ($p<0.01$) and improvements in balance ($p=0.0004$), running ($p=0.014$) and hopping ($p=0.009$) pre- to post-testing. The main themes included: swimming significantly improves FMS development; increased frequency, intensity, time, and type of swimming is needed generally and to improve FMS; a longer intervention duration would be beneficial; the need for a swimming-specific assessment battery; negative comments surrounding intervention assessment tools and intervention duration; and positives surrounding the significant effect of swimming interventions on FMS. **Conclusions**: This research supports that swimming does significantly improve FMS development. Future research addressing swimming and FMS is essential to improving the curriculum and research is required to establish standardised assessment tools for both swimming and FMS independently.

Relevance

This research focuses on the benefits of swimming for improvements in fundamental movement skills (FMS), yet at the same time highlights the requirement for further research to establish standardised assessment tools for both swimming and FMS independently and to address swimming and FMS to improve the UK National Curriculum for primary aged children.

144 - How do children use playgrounds: do fundamental movement skills play a part?

Amy Stringer, Matteo Crotti, Michael Duncan, Coventry University

Background: Low proficiency in fundamental movement skills (FMS) and low engagement in physical activity (PA) are reported in children (Pawlowski et al., 2023). Playgrounds are crucial for PA and FMS opportunities, but research on how FMS affects PA in playgrounds is limited. This study explores the impact of FMS competency on PA in a playground. **Methods**: We recruited (N = 22) children aged 5–10. FMS was assessed using TGMD3, and PA was observed using the Observational System for Recording Physical Activity for 30 minutes. Children were categorized into competent and less competent groups based on TGMD3 average. ANCOVA with PA as the dependent variable, FMS group as independent, and age as a covariate was conducted. **Results**: Most activities performed were stationary (34.3%), light (38.3%), and moderate intensity (22.5%). Common PA types were standing (21.2%), walking (17.2%), swinging (14.3%), sitting (12.6%), and climbing (10.1%). Less competent males and more competent females spent significantly ($p = .035$) more time performing pushing and pulling activities (Mean (M): 161.9s ± 58.2; M: 139.5s ± 41.7) than the reverse (M: 77.8s ± 43.1; M: 17.4s ± 41.1). A significant difference ($p = .034$) was found for high-intensity activities between more competent and less competent males (M: 80.0s ± 68.7; M: 3.7s ± 4.0). No other significant differences in PA behaviours were found between groups ($p > .05$). **Conclusion**: Results suggest playground behaviours in respect to FMS and PA are non-linear and influenced by context. The interaction of other children within the same play space can influence behaviours in a manner that current methods do not fully capture. FMS proficiency may influence some activities within a play space but attributing proficiency to PA in a play space with other children remains challenging.

Relevance

Playgrounds play an important role for children to be physically active and practice their FMS. Understanding how children interact with playgrounds in relation to PA and FMS is important to inform playground design that can support childrens needs. Creating spaces that encourage PA and FMS performance may be able to deter rising obesity levels amongst children.

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145 - The impact of DCD: a report on current state of DCD in Sweden, health-related quality of life of children and parents, resource use and costs

Kine Johansen, Johanna Hardselius, Uppsala University; Yuying Feng, Karolinska Institutet; Karin Fängström, Uppsala University; Michael Wells, Karolinska Institutet; Filipa Sampaio, Uppsala University

Background: Developmental Coordination Disorder (DCD) is an underdiagnosed neurodevelopmental condition impacting motor performance, leading to increased caregiver (i.e., parental) burden. This study aimed to explore the current state of DCD in Sweden, as well as investigate health related quality of life (HRQOL) of children and parents, resource use and costs related to DCD. **Methods**: As a part of the international "Impact for DCD"-initiative, a nationwide survey targeting parents of 6-12-year-old children in Sweden between June and December 2023 was conducted. Participants were recruited via the national network for physiotherapists working with people with DCD in Sweden and social media platforms to complete a 30-40-minute online survey.

Data included sociodemographic details, healthcare experiences, and standardized questionnaires assessing children' motor abilities, HRQOL of children and their parents, resource use and costs. **Results**: Of 111 respondents (mothers: 96.4%), 94.6% of the children (average age 9 years, ±SD 1.9 years, girls = 33.3%) exhibited motor difficulties indicative of DCD according to the Developmental Coordination Disorder Questionnaire (DCDQ). More than half of the parents (55.9%) had sought help for their child's motor difficulties, typically by the age of 2 (interquartile range [IQR]: 1-3 years), however, only one-third of reported that their child had received adequate support from healthcare services for their motor difficulties. Only 15.5% had received a formal DCD-diagnosis (Median: 6 years old, IQR: 5.1-9.8 years). Co-occurring developmental disorders were common (68.5%), with attention deficit hyperactivity disorder (ADHD) (35.5%), autism spectrum disorder (43.1%), and developmental language disorder (22.5%) being the most prevalent. Data regarding children and parents' HRQOL, as well as a resource use and costs, will be assessed and presented. **Conclusion**: Our study revealed a significant gap between the prevalence of motor difficulties and formal diagnoses of DCD among children in Sweden. Furthermore, our findings indicate insufficient support and access to healthcare services for affected families. Improved recognition and support systems for children with DCD are urgently needed.

Relevance

The study underscores the necessity of addressing DCD within the Swedish health system by increasing awareness and understanding of the challenges faced by children with DCD and their families. This study can contribute with insights that can inform policy and intervention or better care and support.

146 - Relationship between grassroots footballers' physical, technical and tactical skills, perceived competence and decision-making and execution in small-sides games

William Pattison, Eileen Africa, Lucas Guimaraes Ferreira, Michael Duncan, Coventry University

Background: There is a relationship between physical, technical and tactical skills and perceived competence in grassroots football (Duncan et al., 2022a; Duncan et al., 2022b). However, no study has examined if these factors influence players' decision-making and execution in small-sided games (SSGs). The present study seeks to address this gap in the existing literature. **Methods:** Fifty-one U13s and U14s grassroots footballers participated in two four-minute SSGs (25m x 36m). Players' decision-making and execution on the ball and off the ball actions were analysed using Game Performance Evaluation Tool (GPET), generating 1374 actions. TGMD-3 assessed motor skills, while the Loughborough Soccer Passing Test (LSPT) and the Ghent University Dribbling Test measured technical skills. Procedural Tactical Knowledge Test (KORA) produced two scores of IDG (identifying gaps on the ball) and OTB (off the ball movement) to give a measure of tactical understanding. Perceived physical competence (PC) and social acceptance (SA) were measured using Harter's 3 Self Perception Profile for Adolescents (Harter, 2012). **Results:** Multiple linear regressions demonstrated that locomotor and ball skills, LSPT, the Ghent University Dribbling Test, IDG, OTB, PC and SA have a significant influence, directly and/or indirectly, upon grassroots footballers' on the ball and off the ball decision-making and execution within SSGs. **Conclusions:** Results demonstrated that a combination of physical, technical, tactical, and perceived capabilities contribute towards SSG performance in youth grassroots soccer. Therefore, this suggests the need for grassroots football coaches to consider a holistic approach player development in the future.

Relevance

Despite the popularity and social/economic value of grassroots football (see Football Association (FA) strategy 2020). There remains a predisposition within research to focus on elite and academy groups. Evidencing the relationship between these variables and performance within SSGs can help encourage coaches to develop young grassroots footballers more effectively, accounting for each aspect of the FA's 4 corner Model.

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147 - Low perceived motor competence profiles in childhood and their associated factors in late childhood: a longitudinal study

Donna Niemistö,Asko Tolvanen, Arja Sääkslahti, Arto Laukkanen, University of Jyväskylä

Background: Children with low perceived motor competence (PMC) in early childhood are at risk of low PMC and lower motor competence (MC) in middle childhood (Niemistö et al., 2023). Tracking starts at 5-7 years as over 92% of the children in the low PMC profile remained in the same profile in middle childhood at 7-11 years. This study utilised the middle childhood profiles in the low PMC profile (n=287, 57% girls). We explored the low profiles' associations with MC, physical literacy, physical activity (PA), enjoyment in PA, amount of exercise, participation in organised sports, time spent outdoors, and media use in late childhood (11-13 years, n=118, girls 62%). **Methods and Results**: MC was evaluated using a Finnish Move system, physical literacy with the Physical Literacy in Children Questionnaire, and PA with triaxial accelerometers. Additional information was gathered through questionnaires. The latent profile analysis (Mplus), and the Bolck-Croon-Hagenaars method were used to analyse the data. Results showed that low PMC in middle childhood predicted less enjoyment of PA ($p<0.001$ in girls, $p=0.002$ in boys), lower physical literacy in the physical domain ($p<0.001$ in girls, $p=0.001$ in boys), and lower amount of exercise ($p<0.001$ in girls, $p=0.004$ in boys) in late childhood. In girls, it also predicted less time spent outdoors ($p<0.001$), less participation in sports ($p<0.001$) and increased media use ($p=0.002$). In boys, lower PMC predicted lower scores of catch-throw combination ($p<0.001$), less mobility in the lower back ($p=0.002$), and lower psychological domain scores in physical literacy ($p=0.001$). The low perceptions did not predict light ($p=0.267$ in girls, $p=0.342$ in boys) or vigorous PA ($p=0.235$ in girls, $p=0.053$ in boys); however, they were associated with higher sedentary time and less moderate PA. **Conclusions**: The early years are crucial for future motor development; therefore, high-quality interventions are needed to improve children's PMC and MC.

Relevance

This study highlights the societal need for early interventions of PMC and MC. Low PMC can impact children's physical health, mental well-being, and lifestyle habits. Addressing these issues early can foster healthier habits into adulthood, benefiting society as a whole. This study emphasises the potential of such interventions to impact children's health and quality of life positively.

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148 - Development of 3-to-5-year-old children at risk of Developmental Coordination Disorder: a longitudinal observational study

Amy De Roubaix, Lynn Bar-On, Ghent University; Griet Dewitte, Nina Vens, Ghent University, University Hospital Ghent, Ghent; Franny Faes, University Hospital Ghent; Jill G. Zwicker, University of British Columbia, BC Children's Hospital Research Institute; Bernard Dan, Université Libre de Bruxelles; Herbert Roeyers, Dominique Van de Velde, Hilde Van Waelvelde, Ghent University

Background: As Developmental Coordination Disorder (DCD) is usually diagnosed at primary school age, understanding of the early development of these children is limited. This study aimed to compare the development of children at risk of DCD (rDCD) and typically developing (TD) children at ages 3, 4, and 5 years (y) and examine the stability of motor performance. **Methods**: Following a longitudinal design, 69 preschool children participated (35 rDCD and 34 TD). The multidisciplinary team at the Center for Developmental Disabilities identified children at rDCD. Children were evaluated yearly with the Movement Assessment Battery for Children (MABC-2-NL), Beery-Buktenica Test of Visual-Motor Integration (Beery VMI-6), Little DCD Questionnaire (LDCDQ-BE), Motor Skill Checklist, DCD Daily Questionnaire, Functional Strength Measurement, Body Mass Index (BMI), and Child Behaviour Checklist. Between group comparisons were conducted with multiple linear mixed model analyses, adjusted for the effect of maternal education. **Results**: The rDCD group scored significantly worse on all outcome measures and at all ages compared to the TD group, except for visual perception and frequency of participating in activities of daily living. Only the rDCD group's performance on the MABC-2-NL, Beery VMI-6 subtest Motor Coordination, and LDCDQ-BE, scores were >1SD below-average. Development was stable in the rDCD group with only a significant improvement in LDCDQ-BE from 3 to 5y. **Conclusions**: From the age of 3y, developmental differences are present in high-risk children at rDCD. They do not outgrow the impairments nor do the difficulties increase between 3 and 5y.

Relevance

This study emphasizes the importance of early detection for children at risk of Developmental Coordination Disorder (rDCD). Our findings reveal that preschoolers at rDCD exhibit enduring impairments in motor skills and activities of daily living. Notably, these challenges extend beyond primary motor performance, affecting visual-motor integration, physical fitness, and behavioural aspects.

149 - How can therapists use motor learning strategies to promote implicit and explicit motor learning in children?

Ingrid van der Veer, Hasselt University; Caroline Bastiaenen, Maastricht University; Eugene Rameckers, Hasselt University, Maastricht University, Centre of Expertise, Adelante Rehabilitation Centre; Katrijn Klingels, Hasselt University

Background: Therapists use motor learning strategies (MLSs) to enhance children's motor learning. However, limited is known about how MLSs can be used to promote implicit and explicit motor learning. This study aimed to explore experts' perspectives on therapists' use of MLSs to promote specific learning processes in children with and without developmental coordination disorder (DCD). **Methods and Results**: This mixed-methods study explored the opinions of 29 international experts, with different backgrounds in research, education and/or clinical care in children's motor learning. Two consecutive digital questionnaires were used, questionnaire 2 explored the findings of questionnaire 1 in greater depth. In addition to open-ended questions, 5-point Likert scales were used to reach a certain level of agreement about the classification of MLSs as promoting either (more) implicit or (more) explicit motor learning. A conventional content analysis approach was used to analyze the open-ended questions, taking both questionnaires as one dataset. Open coding was performed by two reviewers independently, categories and themes were discussed within the research team. The results of the Likert scales showed large variation in the classification of MLSs. The qualitative analyses resulted into two themes. Theme 1, experts found it difficult to classify motor learning strategies as promoting either implicit or explicit motor learning, with limited knowledge about children's learning mechanisms being mentioned as an important barrier. Theme 2, experts stressed the need for clinical decision making when choosing MLSs. Additionally, they gave many suggestions on modelling MLSs in general. **Conclusions**: The experts provided insufficient insight into how MLSs could promote (more) implicit or (more) explicit motor learning in children in general, and in children with DCD specifically. However, they stressed the importance of clinical decision making to model and adapt MLSs to child, task and environment, and underlined therapists' knowledge of MLSs as an important prerequisite in teaching motor tasks. To better understand the various learning mechanisms of children, and how to manipulate these mechanisms, further research is needed.

Relevance

This mixed-methods study resulted in many suggestions on how to model MLSs to enhance motor learning in children with and without DCD. These suggestions can inspire researchers and clinicians in their use of MLSs. Awareness was raised about the importance of having adequate knowledge about the use of MLSs, and the need for adapting MLSs to characteristics of child, task and environment.

150 - How do pediatric physiotherapists adapt motor learning strategies when teaching motor tasks to children with Developmental Coordination Disorder?

Ingrid van der Veer, Hasselt University; Eugene Rameckers, Hasselt University, Maastricht University, Adelante Rehabilitation Centre; Bert Steenbergen, Radboud University; Caroline Bastiaenen, Maastricht University; Katrijn Klingels, Hasselt University

Background: Pediatric physiotherapists (PPTs) use various motor learning strategies (MLSs) when teaching motor tasks to children. They adapt MLSs to suit the individual child and the task being practiced. However, knowledge about the clinical decision-making process of PPTs in choosing and adapting MLSs when treating children with Developmental Coordination Disorder (DCD) is currently lacking. This qualitative study aimed to explore PPTs' use of MLSs when teaching motor tasks to children with DCD. **Methods and Results:** Twenty-six PPTs (median age: 49 years; range: 26-66) participated in 12 semi-structured individual interviews and two focus-group interviews. The PPTs had a wide range of experience in treating children with DCD. A conventional content analysis approach was used to analyze the interviews, all transcripts were open-coded by two reviewers independently. Categories and themes were discussed within the research group. Data were collected until saturation was reached. Six themes emerged from the data: (1) PPTs treated children in a tailor-made way; (2) PPTs' teaching style was either more indirect or direct; (3) PPTs used various strategies to improve children's motivation; (4) PPTs reached the optimal level of practice when children experienced challenge and success; (5) PPTs gave special attention to automatization and transfer during treatment; and (6) PPTs considered task complexity when choosing MLSs, which appeared to be determined by task constraints, environmental demands, child and therapist characteristics. **Conclusions**: PPTs mentioned providing tailor-made treatment, taking several child characteristics and task complexity into consideration when choosing and adapting MLSs. However, their clinical decision-making processes appeared strongly influenced by characteristics of their own, like knowledge, beliefs, preferences and experiences. This resulted in large variation in the use of MLSs and teaching styles to enhance motivation, automatization, and transfer. This study underlined the importance of the level of education on using MLSs to teach children motor tasks, and clinical decision making. Future research should focus on implementing this knowledge into daily practice.

Relevance

This study showed that PPTs' choice in MLSs was mainly guided by their own level of knowledge and experience, and only to a limited extent by the child and task. PTTs should be aware that their background influence their clinical decisions, and should invest in adequate knowledge about MLSs. Moreover, they should take child and task factors into consideration more consciously.

151 - Manual dexterity abilities and dual tasking in children with Developmental Coordination Disorder and typically developing children

Eleonara Bieber, IRCCS Fondazione Stella Maris

Background: Poor manual skills in children with Developmental Coordination Disorder (DCD) may be dependent on task complexity and due to difficulties in the automatization phase of the motor learning process. Increased task demands and the dual task paradigm can be used to test these hypotheses. We aim to investigate (1) manual dexterity abilities using increased levels of difficulty; (2) dual tasking using an experimental protocol of the Tyneside Pegboard Test (TPT). **Methods and Results**: Sixteen children with DCD and 16 age-matched typically developing (TD) children, 6-10 years old, were included. Various experimental conditions of the TPT were administered: unimanual (dimension of pegs, hand dominance, crossing the midline), bimanual and dual task. The dual task paradigm comprised a primary unimanual task and a cognitive task (auditory-choice reaction task). Parents were asked to fill out the eConners questionnaire to report attentional difficulties. Repeated measures ANOVAs were used to compare the tasks and possible differences in effects on the performance of the groups. Pearson correlation coefficients were calculated between dual task performance and ADHD index. Children with DCD performed significantly worse in all task conditions (unimanual, bimanual, dual task) compared to TD children. During unimanual and bimanual tasks their performance was not higher impacted by task constraints compared to TD children. Dual task performances did not have a differential effect between groups and were not interfered by attentional difficulties. **Conclusion**: Our results confirm an overall slowness of children with DCD in performing manual dexterity tasks. Task constraints do not have a higher impact in children with DCD compared to TD children. Our findings do not support the automatization deficit hypothesis as a plausible explanation of manual dexterity difficulties in children with DCD.

Relevance

Children with DCD have difficulties on manual function which highly impact their activities of daily living. Manual function problems may be represented either by execution difficulties and/or by motor learning difficulties. The present work offers new insights from both sides allowing clinical helps in the delineation of target interventions programs.

154 - Mental arithmetic performance of adults with and without Developmental Coordination Disorder (DCD): the role of working memory and maths anxiety

Anna-Stiina Wallinheimo, Judith Gentle, University of Surrey

Previous studies have shown that children with Developmental Coordination Disorder (DCD) have poorer maths performance compared to neurotypicals (NT). Children with DCD have impaired performance in subitising, nonsymbolic and symbolic number comparison tasks, position-to-number tasks, and arithmetic number tasks compared to NTs (Gomez et al., 2015; Pieters et al., 2012; Vaivre-Douret et al., 2011). However, studies into adult DCD maths performance are lacking. Hence, this study investigated the role of working memory (WM), maths anxiety (MAS), and maths self-efficacy on the DCD mental arithmetic performance. Forty-three individuals participated in this between-subjects study, in a laboratory environment. Adults with DCD exhibited lower working memory (WM) and mathematics performance and were more mathematically anxious than their NT peers. WM resources had a positive association with the DCD mathematics performance of individuals with DCD. They might have relied more on WM resources and lacked automaticity with the simple mental arithmetic tasks than NTs. Conversely, MAS had an inverse relationship with NT maths. Our research has highlighted crucial cognitive and emotional factors contributing to inadequate mathematics performance among adults with DCD. We have established a starting point for future experimental studies. Our objective is to better comprehend the difficulties that adults with DCD face in maths.

Relevance

Given the significant impact of mathematical fluency on academic achievement and employment status, more research is needed to inform future interventions for adults with DCD to help navigate this everyday skill, which is essential in adulthood.

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155 - Urgent need to refresh strategy for identifying and supporting children with motor skill deficits

Lucy Eddy, University of Bradford, Centre for Applied Education Research; Megan Wood, University of Leeds, Centre for Applied Education Research; Farid Bardid, University of Strathclyde; Rebecca Murray, University of Bradford; Nat Merrick, Centre for Applied Education Research; Mark Mon-Williams, University of Leeds, Centre for Applied Education Research

Background: Recent research demonstrates a downtrend in childhood motor skill levels, with a large proportion of children struggling to develop age-appropriate skills. Due to services often taking a diagnosis-led approach to supporting motor skill deficits, children that would benefit from additional support are being missed, particularly in disadvantaged communities. This study aimed to understand barriers and facilitators in the current Developmental Coordination Disorder (DCD) pathway in Bradford, to highlight gaps in provision and to guide changes to service delivery. **Methods and Results**: The Connected Bradford dataset was searched, which links healthcare records (primary and secondary) of over 600,000 individuals across the last 40 years, including relevant diagnoses. Interviews, based on the COM-B model of behaviour change (Capability, Opportunity, Motivation, Behavior), were then conducted with the District's clinical services involved in DCD pathways, including Occupational Therapy, Physiotherapy and Paediatrics. Searches in Connected Bradford highlighted only 159 historic cases of children with relevant DCD diagnoses (e.g., 'developmental disorder of motor function') were found. In comparison, 4984 autism cases were identified (despite an estimated prevalence approximately five times lower than DCD). Clinicians provided insights into (i) processes followed, (ii) information used to underpin decisions, (iii) resources for families, (iv) time and resource barriers and, (v) inefficiencies in the system. **Conclusions**: DCD is being under-diagnosed and children with motor skill deficits are being left unsupported due to issues in clinical service capacity. These findings have led to the creation of novel approaches in Bradford that move away from traditional diagnosis-led medical models and empower schools to identify and support specific motor skill problems in partnership with families and healthcare services.

Relevance

This research offers an insight into the current system for identifying and supporting children with motor skill deficits. It highlights the need to shift from a diagnostic-led system to reduce the burden on healthcare services, tackle inequalities in service access, and improve support for children both with DCD and those with motor skill deficits that would not meet diagnostic thresholds.

156 - Let’s sleep on it: considering neural underpinnings of visuomotor learning and retention after a night of sleep in children with DCD

Griet Warlop, Ghent University; Mireille J. C. M. Augustijn, Ghent University, Research Foundation Flanders; Emiel Cracco, Jan R. Wiersema, Frederik J. A. Deconinck, Ghent University

Developmental Coordination Disorder (DCD) poses challenges in learning daily motor tasks, yet the underlying deficiencies remain unclear. This study examines the hypothesis that motor learning in individuals with DCD is related to impaired error processing, more specifically perception of the mismatch between the kinematics of the intended movement and perceptual feedback. Data collection of the study protocol below is ongoing. The results will be presented at the conference. Our first objective is to assess the perception and processing of errors arising from altered interactions between movements and feedback. Therefore we compare the rate of adaptation in movement kinematics during a visuomotor rotation task of 20 children with DCD and 20 typically developing children. In addition, EEG recordings, measuring the error-related negativity, are used to compare the neural underpinnings of error processing between the two groups, as a fundamental mechanism of motor learning. Our second aim is to evaluate the retention of these adaptations after a night of sleep. This approach complements the predominant focus on daytime learning in DCD research and tackles the concern among therapeutic professionals regarding hindered consolidation of newly learned motor skills and their automatization. Therefore, the participants repeat the visuomotor rotation task after a night of sleep, allowing for the quantification of offline changes to newly acquired visuomotor relations. Finally, considering emerging suggestions of impaired sleep in DCD, we also assess sleep behaviors using the Pittsburgh Sleep Quality Index, actigraphy, and a sleep diary. This comprehensive approach enables the exploration of potential associations between sleep quality and retention of altered visuomotor relations observed in the sample. By combining behavioral assessments, neurophysiological measures, and sleep-related data, this study aims to enhance our understanding of the mechanisms underlying motor learning difficulties in DCD.

Relevance

This study aims for a better insight into error perception as an essential mechanism underlying motor adaptation deficiencies. Moreover, it is the first to address the role of sleep in motor learning in DCD. Recognizing the potential impact of impaired sleep, this research pioneers a comprehensive approach and forges paths for holistic, yet targeted interventions for those with the disorder.

157 - Movement pattern classification for children with autism using an instrumented sock: the DANS project

Pieter Bauwens, imec, Ghent University; Paula Veske, imec, Ghent University; Sofie Boterberg, Ghent University; Frank Deruyck, Cornelis Stal, Sheilla Odhiambo, HOGENT University of Applied Sciences and Arts; Herbert Roeyers, Ghent University

Background: Motor stereotypies are among the first signs of autism. They can be observed as early as 6 to 12 months and high rates at age 2 are a good predictor of a later diagnosis. Tiptoe behavior (TTB) such as walking, standing, and running on tiptoes is significantly more prevalent in autistic children (19-82%) than in typically developing (TD) children (3%). Electronic textiles (E-textiles) are textile-based wearables that can assist in comfortable continuous monitoring. The goal of the DANS project is to design and develop a smart sock with integrated sensors to detect specific movement patterns in young children, supporting health professionals in the evaluation of motor stereotypies typically associated with autism. **Methods and Results**: Movements are measured with a number of Inertial Measurement Units (IMUs) that consist of an accelerometer, a gyroscope, and a magnetometer. These IMUs are interconnected with a communication bus and integrated into a customized child sock. A removable central control unit holds the battery, reads out the sensors, and sends the data over Bluetooth to a custom app where it is logged. During the pre-pilot phase, TD-children were asked to perform a series of movements, among which TTB. The procedure was video-recorded and movements were annotated. This allowed the training of a machine learning algorithm, a Random Forest Classifier (RFC), to detect specific patterns. The RFC shows an accuracy of over 90% for the detection of TTB, with a low variance over the children. The device is currently being tested in a pilot phase, with both TD and autistic children aged 2 to 6 years. Given sensory hypersensitivity in autism, the sensorial comfort of the smart sock was evaluated by both parent-report and clinical observation of autistic children during a practical trial with different iterations of mock-up socks. **Conclusions**: Overall, the acceptability of the smart sock (both the sensor integration and central unit) was very good. Early detection of autism can provide support and improved outcomes. A comfortable sock that is able to register specific movements in the child's own environment might help health professionals during diagnostics. The presented smart sock is able to detect these motor stereotypies with high accuracy.

Relevance

We show the efficacy of a smart sock, which, together with a machine learning algorithm, is able to detect motor stereotypies associated with autism. Our goal is that this would assist the health professionals during diagnostics.

158 - The BabyGrow project: predicting infants' social-communication skills from early motor features

Mohammad Saber Sotoodeh, University of Sussex; Georgina Donati, University of Oxford, Warneford Hospital, University of London; Ori Ossmy, Jazmin Hall, University of London; Hannah Rowan, Aman Kaur, Gillian Forrester, University of Sussex

Motor development plays a crucial role in development. Standard motor development tests have been instrumental in revealing a link between early motor skills and subsequent cognitive abilities. However, it is unclear whether specific movement features (e.g., motion frequency, acceleration and velocity) predict later socio-communication development. Our ongoing BabyGrow study aims to address this gap in a large-scale longitudinal study predicting neurodevelopmental disorders based on early movement features. For this preliminary analysis, we enrolled thirty newborn infants, and their parents or caregivers, who were instructed to record five minutes of video footage of spontaneous movement once per week (24 videos for each participant) from birth to six months, while the infant was awake and comfortably lying down in a supine position. We analysed infant videos using computer vision (Python Mediapipe model) and obtained the coordinates of infants' body keypoints (X, Y and Z coordinates) during two active minutes between birth and eight weeks of age. From the keypoints, we extracted movement-related features including frequency of movement, acceleration, angular velocity, and symmetry/asymmetry of arms and legs. Concurrently, we tracked infants' socio-communication development in the third and sixth months of life using the Vinland Scales parent report which was recorded bi-weekly. We then used longitudinal data analysis to predict the Vinland scores from the movement features and identify which features are the best contributors for prediction. The weekly video recordings provide a unique opportunity to monitor the trajectory of motor development, enabling us to pinpoint the earliest time frame for predicting emerging social-communicational abilities. This study not only contributes to our understanding of the intricate relationship between early movement and socio-communication skills but also paves the way for developing new diagnostic tools. By leveraging computer vision, we aspire to facilitate early diagnoses of developmental disorders, ultimately improving outcomes for infants' families and practitioners.

161 - Understanding the impact of sex and year of training on musculoskeletal fitness components in youth water polo players

Francesco Sgro', Mario Lipoma, Michele Barca, Antonella Quinto, Chiara Branciforte, University of Enna "Kore"

Developing adequate musculoskeletal fitness (MSF) components, such as cardiorespiratory fitness and muscular endurance and strength, has demonstrated particular benefits in enhancing physical activity across the lifespan. At the same time, extensive participation in sports during adolescence, especially high-demand ones and those requiring high functional motor competencies, may promote healthy lifestyle choices throughout one's life. Waterpolo (WP) is a high-demanding sport with a significant growth in youth participation in the last years. Previous studies on WP pointed out the relevance of anthropometric characteristics in explaining some performance aspects of youth players whilst controlling for age. Nevertheless, there is a research gap in understanding how sex and years of training are associated with MSF components in young practising WP. This study investigated the impact of sex and years of training on youth WP athletes. A convenient sample of forty-six athletes (females: 43%; mean age: 13.06, SD: 2.06; mean years of training: 4.04, SD:2.44) participated in a quasi-experimental study. Indicators of MSF (handgrip, PACER, long jump, and plank) were measured. Allometric normalization was also performed by using body mass and appropriate force-specific allometric parameters for handgrip, long jump, and plank. ANCOVA main effect statistics, adjusted mean difference (AMD), and Cohen's d measure, as the effect size of contrasts (ES), were used to explain how sex influences MSF measures whilst controlling for years of training. Significant between-sex differences were found for PACER, handgrip, and long jump measures. Males obtained significantly better measures than females, even when controlled for years of training: PACER: AMD=14.21 laps, ES=1.0; handgrip: AMD=6.09 kg, ES=.66; long jump: AMD=21.61 cm, ES=1.08. AMD of normalized measures were large for the handgrip (ES=.80) and moderate for the long jump (ES=.72). Our findings emphasize the importance of sex and years of training when evaluating MSF indicators. Accordingly, coaches and practitioners could consider these elements while defining their training plan to support talent identification and promote lifelong sports participation.

Relevance

Recently, there has been a notable increase in youth participation in waterpolo (WP). Thus, it could be interesting to investigate how youth WP athletes develop their musculoskeletal fitness (MSF). MSF components are relevant health and sports factors, therefore effective measures of MSF are essential for coaches and practitioners to support athletes' growth, prevent burnout, and identify talents.

162 - A systematic review of procedural perceptual-motor learning in neurodevelopmental disorders: which place for motor disorders?

Elodie Martin, Université de Toulouse, University Hospital of Toulouse; Sarah Seiwert, Ysia Clausses, Jessica Tallet, Université de Toulouse

Background: Individuals with DCD are expected to exhibit deficits in procedural learning but such deficits also exist in other neurodevelopmental Disorders (NDDs). Moreover, recent neuroscientific models suggest the existence of two distinct types of procedural perceptual-motor learning: motor sequence learning and sensorimotor adaptation (Doyon et al., 2003). This literature review aims to provide an overview of deficits and preservation of both types of procedural learning in all NDDs. **Methods and Results**: We conducted a systematic review according to the PRISMA guideline. A total of 98 studies were included in the analysis. The most extensively studied NDDs are Developmental Dyslexia (26%) and Specific Language Impairment (23%). Despite its specific impact on the perceptual-motor domain, DCD receives less attention (14%). Moreover, the majority of studies focus on children rather than adults (82% vs. 18%). Motor sequence learning has been more extensively investigated than sensorimotor adaptation (77% vs. 21%). Behavioral outcomes are more frequently reported than cerebral results (89% vs. 11%). **Conclusion**: Beyond the diagnosis, individual and external characteristics have to be considered in relation to the deficits and preservation of procedural learning. Better understanding the perceptual-motor learning in NDDs could benefit from an integrated explanatory framework considering individual, task and environmental constraints, which is consistent with the recommendations of Blank et al. (2019) on DCD.

Relevance

Diagnosis gives a tendency, but an evaluation of motor sequence learning and sensorimotor adaptation at an individual level is required to accurately assess learning abilities and deficits prior to any rehabilitation intervention.

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163 - Born ahead of time - prematurity, its functional consequences and the challenges of research in Brazil

Lívia C Magalhães, Larissa A Godinho, Lilian Barbosa, Maene Silva, Lorena Sales, Universidade Federal de Minas Gerais; Alessandra Cavalcanti, Universidade Federal do Triangulo Mineiro; Iasmin Maia, Universidade Federal de Minas Gerais; Maíra Amaral, Universidade Federal do Triangulo Mineiro

Background: Preterm birth impacts child development, with a high prevalence of developmental coordination disorder (DCD). Despite extensive studies in affluent nations, little is known about children born preterm in low- and middle-income countries. Our research seeks to: (a) explore the link between preterm birth and motor development, uncovering the functional repercussions of prematurity; and (b) assess the appropriateness of our tools while addressing research challenges. **Methods and Results**: Case-control study with and estimated sample of 82 preterm (PT) children born with gestational age (GA) ≤ 32 weeks, matched with term (FT) children (GA ≥ 37 weeks) aged 6-8 years. We assessed motor skills (ACOORDEM), sensory processing (Sensory Profile), cognitive skills (KBIT-2), functional performance (PEDI-CAT), and parents' concerns about their child's learning and development, alongside socio-demographic data. The study is ongoing, and we are tracking babies born 2014-2017 in a public hospital. Initially, 61 families were identified, only 6 children participated, prompting recruitment from other public hospitals, resulting in 33 assessed children (6 FT). Mean GA for the PT was 30.40 weeks (±2.5) and 1.285 grams (±375.4), while for FT it was 39.9 weeks (±1.2) and 3.440 grams (±336.2). Economic levels C-E were predominant (71.9%). The PT group exhibited poorer motor (PT=27.8±13.2, FT=18.5±21.4), cognitive (percentile: PT=43.35±29.7, FT=64.0±22.8) and functional (PT=45.2±8.6, FT=49.8±8.3) measures. PT-group global sensory processing score (33.4±15.2) suggests hyper-responsiveness, while FT scores were average (23.0±7.3). Concerns about behavior and development were expressed by 65.2% of PT-parents, compared to only 16.7% of FT-parents. **Conclusion**: The PT group exhibits poorer developmental outcomes and heightened parental concerns, indicating a likely high prevalence of DCD. The suitability of assessment tools was confirmed, as they effectively distinguish between PT and FT group performance. Challenges in achieving the desired sample size arebeing actively addressed through ongoing outreach efforts and expanded recruitment strategies.

Relevance

This study aims to give voice to children and their mothers, shedding light on the functional difficulties faced by the children in their daily lives and the challenges they encounter in accessing services. In Brazil, preterm children receive little attention. Our goal is to raise awareness regarding the importance of providing developmental follow-up and appropriate support for these children.

164 - An individually tailored virtual reality intervention in children with Developmental Coordination Disorder – an intervention protocol

Maja Van Grinderbeek, UHasselt; Alessandro Crippa, IRCCS Eugenio Medea - Ass. La Nostra Famiglia; Pieter Meyns, Katrijn Klingels, Evi Verbecque, UHasselt

Background: Postural control problems are highly prevalent in children with developmental coordination disorder (DCD) (60-87%). Postural control is multisystemic and at group level, children with DCD present with difficulties in several systems, e.g. limits of stability, but at individual level not all children experience problems in the same systems. Therefore, based on the child's specific postural control profile, we propose an individualised targeted intervention, to improve their postural control. Moreover, interventions in children with DCD can alter brain activity, measurable with functional near-infrared spectroscopy (fNIRS) while performing balance tasks. The Computer Assisted Rehabilitation Environment (CAREN), one of the most advanced biomechanical and virtual reality training labs, can be used to train postural control in these children. It creates interactive environments and consists of a dual-belt treadmill mounted on a movable platform. The CAREN allows training within a variety of challenging and adjustable applications while simultaneously collecting data. With this intervention protocol, we will provide more insights in the neurological processes and potential neuroplastic changes after an individually tailored intervention in children with DCD and whether the changes in cortical activity underly changes in postural control. **Methods:** Children with DCD (age 7-12) will be assessed 10 weeks prior to intervention (T0), pre- (T1) and postinterventional (T2), including a 10-week follow-up (T3). Postural control is measured with the Kids Balance Evaluation System Test (Kids-BESTest). During preselected tasks of the Kids-BESTest, cortical brain activity will be recorded with fNIRS in frontal and parietal areas. The children receive a 10-week intervention on the CAREN with two 45-minute sessions per week. The protocol consists of 7 games. In each session the games are selected by the therapist, using the individual postural control profile, with increasing difficulty level. **Conclusion:** This intervention protocol introduces a new type of individually-tailored intervention providing novel insights regarding changes in brain activity after a postural control intervention in school-aged children with DCD.

Relevance

The protocol provides novel insights into the effects of a virtual reality postural control intervention in children with DCD. It informs about the added value of a targeted approach based on the child's postural control deficits. The collection of brain activity combined with balance tasks will increase our understanding of postural control and the interventional effects in these children.

165 - Characteristics of the outdoor environment affording physical and social activity in children 3-7 years: a systematic review.

Nicola Taylor, Andy Pringle, Clare Roscoe, University of Derby

Background: Research indicates that access to outdoor play throughout the preschool day can significantly contribute to daily physical activity, motor development as well as wider social benefits. Despite these positive outcomes, it is less clear as to what characteristics of the outdoor physical environment enable or inhibit physical activity and social interactions. This review aims to address this gap by synthesising the current body of evidence to identify associations between the features of the outdoor environment and physical and social behaviours. Additional objectives seek to evaluate previously applied observational methods that capture the complexities of the child in environment interactions. **Methods:** Searches will be conducted using six databases: PubMed/MEDLINE, Scopus, ScienceDirect, ERIC, PsychINFO, and ProQuest databases. Articles will be screened and selected appropriate to the inclusion [literature published January 2010 to February 2024, peer-reviewed English language articles examining the outdoor environment and physical/social behaviours in 3- to 7-year-old children, quantitative, primary data-based studies] and exclusion [review articles] criteria. The Mixed Methods Appraisal Tool will be used to assess data quality and bias risk, whilst the COSMIN checklist will be used to assess reliability and validity of observational tools. Effect plots will be used to summarise findings and narrative synthesise will be conducted where outcomes may not be grouped. This synthesis will address the question of whether there is evidence of associations between outdoor environmental features and movement/ social behaviours. A table to summarise previous observational methods and tools will provide an overview of the characteristics, methodological quality and psychometric properties. **Conclusion:** The key findings from this review will summarise and highlight the current strength of evidence for associations between characteristics of the outdoor environment and physical activity, motor competence and social interactions of children 3-7 years. Furthermore, a quality assessment of previously applied observational methods will provide guidance for future researchers conducting studies of this nature.

Relevance

This research aims to identify features of the outdoor environment that are pivotal for enabling physical and social activity in children (3-7 years). The findings will highlight research gaps and make recommendations for methods and tools appropriate for conducting observational based research in the field.

166 - Impact of virtual movement analysis skills in physical education teacher education

Helena Baert, Emily Baert, SUNY Cortland; Cathal O'Sullivan, Atlantic Technological University

Background: Physical Education (PE) educators play a crucial role in enhancing students' physical literacy by observing, assessing, and improving gross motor skills. Fundamental motor skills (FMS) are vital for lifelong physical literacy in children. Prospective PE teachers must grasp critical elements and phases of motor development (MD) to analyze movement and design developmentally appropriate lessons. This study investigates the impact of online video modules on preservice PE teachers' knowledge of MD and movement analysis. **Methods and Results:** This study was conducted during the semesters from Spring 2020 to Fall 2021, with retention data collection in Fall 2021 to Spring 2023. Participants included (N = 205, retention n = 53) teacher candidates (TCs) enrolled in a PE teacher education program. The modules included sixteen FMS focused on locomotor, manipulative and stability skills. A pre-and post-test during TCs sophomore/junior year and a retention test during senior year were conducted. Two one-way ANOVAs were used for comparison across TCs pre, post and retention test, semesters (Spring 2020, Fall 2020, Spring 2021, and Fall 2021; Semesters: $F = 2.11$, $p > 0.05$), and instructor impact (Instructors: $F = 0.797$, $p > 0.05$; adjusted $R2 = .029$). A Two-way Repeated Measures MANOVA (pre-test ($M = 46.63$, $SD = 17.49$), post-test ($M = 73.40$, $SD = 11.47$), and retention test ($M = 69.08$, $SD = 13.12$) was conducted to determine the effect of the modules on long-term retention across four different semesters of TCs. Significant differences were found among pre- post- and retention scores for TCs movement analysis tests (Wilk's $\lambda = 0.33$, $F = 50.97$, $p < 0.001$, $\eta 2 = 0.67$). **Conclusions:** The results showed a consistent impact of the modules, irrespective of instructors or semesters, suggesting standardized effectiveness. Retention scores were significantly higher compared to pre-test scores, indicating consistency in the effect of the modules long-term. Post-test scores consistently surpassed pre-test scores across all semesters, demonstrating positive influence of the modules on TCs knowledge of critical elements and stages of MD.

Relevance

In the context of the educational landscape in PE teacher education, understanding the effectiveness of online learning modules to acquire knowledge about MD and movement analysis becomes increasingly relevant. This study targeted the evaluation of mastery-based online modules to help TCs gain the knowledge related to analyzing a variety of FMS to better suit their individual learning needs.

167 - Exploring the relation between Gross Motor Function Measure scores and orientation preferences in infants during free play

Marziyeh Shabani, Julie Schneider, Emily Marcinowski, Louisiana state university

Background: The orientations in which infants engage during play hold potential significance in shaping their motor development. Different orientations during play, such as facing towards versus away from a parent, could imply various levels of social interaction and feedback, which may have an impact on infant's engagement and developmental cues. Furthermore, the diversity of play orientations may also be a sign of an infant's gross motor abilities, with higher motor skills potentially resulting in a greater variety of physical engagement and play-related interaction styles with caregivers. The purpose of this project is to examine the relation between gross motor skill and infants' orientation to the parent during free play. **Methods:** Thirty-six infants, recruited upon sitting emergence, were assessed across four visits (Baseline, +3 months, +6 months, and +12 months). For all visits, the Gross Motor Function Measure (GMFM) assessment has been completed. Also, they were given five minutes of unstructured play time with one parent. Infants were coded for their body orientation during play which includes a) location relative to the parent (front or behind), and b) orientation to the parent (towards, perpendicular to, parallel with, and away from the parent). **Results:** GMFM scores and count of each orientation were correlated using a Spearman's rank order correlation. According to preliminary results of the baseline visit (n=23), the frequency of infants facing towards the front (front-oriented positions) showed a positive correlation with their GMFM scores (ρ=0.599, p=0.003). Infants who were more frequently oriented towards the front during play tended to have higher GMFM scores, suggesting a link between their preferred orientation in play and their level of gross motor development. **Conclusion:** Future analyses will expand the sample size (n=36) and include all visits, so that we will be able to gain a more comprehensive understanding of the relation between GMFM scores and orientation during play. Strategies to encourage motor skills in a supportive setting can be informed by understanding how orientation to a social partner can support a children's development.

169 - Online 3-minute calisthenics improve coordination, core symptoms, emotion, and adaptive behavior in children with neurodevelopmental disorder traits.

Sumiko Okugawa, Akio Nakai, Mukogawa Women's University

Background: Interventions to DCD can be divided into body-function-oriented approaches and activity-oriented or participation-oriented approaches. Although there are international recommendations to apply activity- or participation-oriented approaches (Blank et al. 2019), some children require body-function-oriented approaches to be used simultaneously to accomplish the tasks. Radio calisthenics is a full-body exercise that includes elements of stretching, strength training, balance, and aerobic exercise, and also requires coordination of each limbs, as well as auditory and physical motor coordination. It is widely known in Japan, and it takes only about 3 minutes and can be performed indoors. The purpose of this study is to examine the effects of a small-group intervention using online-based radio calisthenics on the coordination, core symptoms and emotional and adaptive behaviors of children with neurodevelopmental disorder traits. **Methods and Results:** Radio exercises were performed using an online conferencing system (Zoom) with 25 children (20 boys and 5 girls) in the second to fifth grades of elementary school with neurodevelopmental disorder traits. The subjects were divided into two groups and the study was conducted as an 8-week cross-trial. The DCDQ, M-ABC2, the ADHD-Rating Scale (ADHD-RS), the Strength and Difficulties Questionnaire (SDQ) and Vineland-II were used for evaluation. The study was approved by the ethics committee of their institution. Results showed that even a 3-minute radio calisthenics, performed by a small group of participants online, improved coordination, especially hand-eye-hand coordination. In addition, core symptoms such as social skills, emotion, and adaptive behavior improved. In questionnaires from parents, improvement in sleep rhythm was often noted. **Conclusions:** The results suggest that the three-minute online radio calisthenics for children with neurodevelopmental disorder traits improved coordination through a combination of small groups, visual feedback, and sleep effects, and also had a positive effect on core symptoms, emotions, and adaptive skills.

Relevance

An online, radio calisthenics intervention for children with neurodevelopmental disorder trait improved not only coordination, but also in core symptoms, emotional and adaptive behaviors. The significant improvement in manual dexterity suggested the importance of combining top-down with bottom-up approach. The study also provides evidence for online interventions in the new normal era.

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171 - The challenge of rhythmic motor task automatization in children with Developmental Coordination Disorder: a systematic review

Michelle Verhoeven, Frederik Deconinck, Ghent University; Ruth Van der Looven, Ghent University Hospital, Ghent, Belgium; Lynn Bar-On, Ghent University

Background: Automatization of rhythmic motor tasks (e.g. walking) is an essential part of motor skill development in typically developing children (TDC) and is positively associated with everyday participation and well-being (Robinson et al., 2015). It has been hypothesized that children with developmental coordination disorder (DCD) show impaired motor skill acquisition and automatization (Bo et al., 2013). Consequently, the performance of rhythmic tasks likely requires more attention and effort, especially in challenging conditions. Using a dual task (DT) paradigm, we aim to investigate the capacity of children with DCD to perform a rhythmic motor task under challenging conditions and gain insight into their ability for motor automatization. **Methods and Results:** For this systematic review, four electronic databases were searched in August 2023 on terminology related to DCD and DT conditions. A total of only five studies were included, including data on 232 children (DCD=135 (79m/56f), TDC=97 (66m/31f); age=4-14 years) performing either overground walking, finger tapping, seated cycling, or alternative stepping as the primary rhythmic motor task and a cognitive or motor task as additional task. In general, it was found that children with DCD performed relatively well in DT conditions, which was reflected by either low dual task cost (DTC; single task versus DT performance) or no differences with TDC. Children with DCD only showed a higher DTC compared to TDC when sufficiently challenged, which was solely the case when combining the primary rhythmic motor task with a difficult additional motor task. Nevertheless, two studies did find that, compared to TDC, children with DCD experienced more fatigue and showed increased cortical activation patterns when dual tasking. **Conclusions:** Despite the low number of studies, these results suggest that the performance of rhythmic motor tasks requires increased attentional demands, hinting at some difficulty with the underlying automatization process. To build on this hypothesis, future research is needed to unravel and capture the underlying mechanisms of rhythmic motor automatization in DCD.

Relevance

Daily life participation is a common hurdle for children with DCD, partially caused by their difficulties with motor skill acquisition and automatization. Performing rhythmic motor tasks effortlessly allows for continuous performance of dual tasks throughout the day. Thus by first understanding the underlying problems with motor skill automatization, we can improve this daily life participation.

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174 – Self-reported motor competence and weekly participation in physical activity in Greek young adults: a pilot study

Ioannis Pappas, Ermioni Katartzi, Maria Kontou, Sofia Monastiridi, Symeon Vlachopoulos, Aristotle University of Thessaloniki

Developmental Coordination Disorder (DCD), also known as dyspraxia, is a neuro-developmental disorder that predominantly impacts fine and gross motor skills, causing motor difficulties that are likely to persist from childhood to adolescence in a percentage of 50–70%. Literature supported that motor difficulties related to DCD affect engagement in physical activity throughout life. The purpose of the present study was to assess self-reported motor competence and weekly physical activity in Greek young adults. Two hundred and twenty-six adults (N=226; 76 males and 150 females) filled in the Adult Developmental Coordination Disorders/Dyspraxia Checklist (ADC), a screening self-reported measure for DCD in adults which provides information in two sections regarding child history and current functioning and the Godin-Shephard Leisure-Time Physical Activity Questionnaire. The results showed acceptable indices of internal consistency, in the scores of the checklist's sections (Cronbach alphas >0.70). Frequency analysis (N=226) regarding motor competence as a child showed that 2.2% (N=5; 3 males and 2 females) met the criteria of having past difficulties in childhood. Additionally, results regarding the total score in ADC showed that 0.9% (N=2; 1 male and 1 female), had probable DCD and 0.3% (N=1 female) was at risk of developing DCD. Moreover, none of these who were found to have motor difficulties received an allowance. Regarding weekly physical activity participation, the results showed that, for young adults who were found to have probable DCD, only one participated in sports, yet none of them met the criteria of physical activity for health. For those who were found to be at risk of developing DCD, the results in physical activity showed that they participated in sports and was moderate active with inadequate health effects. In conclusion, the results of the present study showed evidence that motor difficulties due to DCD seemed to persist from childhood to adulthood with negative impact in physical activity participation and possible negative effects in young adult’s well-being.

Relevance

The present study provides information regarding the relationship between self-reported motor competence and weekly participation in physical activity among Greek young adults, in order interventions promoting physical activity to be informed with positive effects on their health and other aspects in their lives demanding motor competence.

175 - Motor difficulties in children with autism: prevalence and associations with social-communicative challenges and stereotyped and repetitive behaviour.

Sofie Boterberg, Herbert Roeyers, Ghent University

Background: Motor difficulties are currently not part of autism diagnostic features, yet emerging literature suggests high prevalence rates as well as a significant number of diagnoses of Developmental Coordination Disorder (DCD). Studying the characteristics of these motor difficulties and the association with social-communicative challenges, stereotyped and repetitive behaviour and/or Intellectual Disability (ID; IQ≤70) is needed to understand their role and impact in autism. The aims of this study were to examine: 1) prevalence of DCD and types of motor difficulties, 2) associations with autism features and ID, and 3) utilization of physical support services. **Methods and Results:** Participants were 100 autistic children (3-11y; 71% boys). The Movement ABC (MABC-2) was used to assess motor ability and identify DCD risk. Severity of autism features was measured through both parent report (Social Responsiveness Scale; SRS-2) and clinical evaluation (Autism Diagnostic Observation Schedule). ID was measured through the Wechsler Nonverbal Scale of Ability. MABC-2 Total Scores indicated that 63.22% of the children were at risk for DCD: 42.53% was classified ≤P5 (DCD likely) and 20.69% between P6-P15 (Monitor for DCD). 64.78% scored <P16 on Manual Dexterity, 47.19% on Aiming and Catching and 35.95% on Balance. Clinical reports indicated a DCD diagnosis in 15%. Group comparisons between DCD risk (n=45; MABC-2<P16) and DCD no-risk (n=42; MABC-2≥P16) revealed significantly higher SRS-2 scores in the first group (M=106.11 and M=93.06 respectively; $U(87)=1221.50, p < .05$). Further, ID was significantly more present (24.44%) in DCD risk as compared to DCD no-risk were no one had ID ($p<.001$, FET). SRS-2 scores did not differ between DCD risk groups with and without ID ($U(45)=171.50, p=.687$). Lastly, 79.07% of the children with DCD risk received physical support as compared to 45% of the no-risk group ($\chi^2(1)=10.28$; $p<.01$). **Conclusions:** Almost two thirds of the autistic children were at risk for DCD, 15% of them received a diagnosis. This is in line with previous studies. Also consistent with earlier findings is that most motor difficulties were present in fine motor skills. While DCD risk was associated with ID, higher autism severity was found in children with DCD risk independent of ID. Almost 80% of children with DCD risk received physical support.

Relevance

The results show that screening and evaluation of motor difficulties should be part of the diagnostic procedure and intervention in autism. The association found between motor difficulties and autism features, regardless of the presence of ID, provides insight into the manifestation of motor difficulties in autism. However, additional research is needed to further determine its role and impact.

176 - Motor competence and metabolic health in children

Daniel Chagas, Lívia Oliveira, Larissa Almeida, Blena Marinho, Maria Joia, Maria Peixinho, Cecilia Lacroix, Fernanda Jannuzzi, Ariel Rezende, Paulo Solberg, Isabel Madeira, Rio de Janeiro State University

Background: Metabolic Syndrome (MetS) is a complex disorder characterized by a cluster of risk factors, including glucose intolerance, dyslipidemia, hypertension and central obesity. There is a growing prevalence of MetS in children and adolescents (Codazzi et al. 2023), raising the risk of developing diabetes and cardiovascular disease at an early age. On the other hand, motor competence has been associated with a number of health benefits in children. Recently, a causal chain between motor competence and metabolic health was hypothesized (Lima et al. 2022), yet evidence is missing. The purpose of this study was to investigate the relationship between motor competence and risk factors of MetS. **Methods and Results:** We assessed 18 Brazilian children (11 girls and 7 boys, mean age = 9.6 years) attending health facilities in University Hospital Pedro Ernesto, from Rio de Janeiro State University. Motor competence was assessed using Körperkoordinationstest für Kinder (KTK3+). MetS risk factors (waist circumference, blood pressure, glucose, triglycerides and insulin) were acquired through an existing database. Pearson correlations showed that motor competence was inversely associated ($p < .05$) with waist circumference ($r = -.777$), diastolic arterial pressure ($r = -.617$), triglycerides ($r = -.587$) and insulin ($r = -.540$). On the other hand, multivariate analysis of variance indicated that motor competence was not significantly associated with risk factors of MetS as a combined variable when adjusted for age and sex. **Conclusions:** Motor competence was inversely associated with risk factors of MetS, confirming its importance for child health. The development of adequate motor competence across childhood can be a promising strategy to promote cardiometabolic health and to prevent MetS in young people.

Relevance

MetS is a major health risk in children. In addition, pediatric MetS tracks into adulthood and is associated with health complications across the life course. Therefore, strategies for prevention are urgent. This study provided preliminary evidence that the development of motor competence across childhood can be a path to promote cardiometabolic health and to prevent MetS in children.

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178 - Healthy development of children: a spiral of (dis)engagement?

A.R. den Uil, Amsterdam University of Applied Sciences,Radboud University; V. Busch, Public Health Service (GGD) Amsterdam; M. Janssen, Amsterdam University of Applied Sciences; R.H.J. Scholte, Radboud University

Background: Healthy development of children is under pressure. While governments, schools and organizations are trying to stimulate physical activity in children, reduce overweight and improve motor skills, they are facing challenges in finding effective strategies. The model proposed by Stodden et al. (2008) is an interesting framework for studying healthy development of children, as it encompasses the physical aspect (motor skill competence, physical fitness, weight status), the mental aspect (perceived competence) and a behavioral component (physical activity). Importantly, it acknowledges the developmental stages of children by including age. Therefore, this model serves as the basis for this study in which we are looking for insights to effectively influence healthy development of children. **Methods and Results:** We measured these five variables in a large sample (N > 1000) of children in the Netherlands (age: 4-12, 50% girls). Through structural equation modeling we searched for cross-sectional as well as 1-year longitudinal relationships. Our results showed concurrent relationships between all variables and a tipping point at which relationships emerged or strengthened. The results indicated that targeting motor competence at a young age might be a feasible way to ensure continued participation in physical activities. However, longitudinal analyses revealed no effect of motor skill competence (T1) on physical activity (T2). Physical fitness appeared to be more important as a potential mediator than perceived motor competence. As a follow-up study, the five variables will be analyzed via a person-centered approach (latent profile analyses). This will guide us towards tailoring future interventions to the specific needs of subgroups of children. Analyses of this study are ongoing and will be presented at the conference. **Conclusions:** Our multiple analyses have shed additional light on the complexity of healthy development of children. In the upcoming presentation we will unite our study findings and delineate implications for developing effective strategies.

Relevance

Children are showing delays in motor development and decreased physical activity participation. Better understanding of how relevant factors interact towards (un)healthy development of children, will provide us with tools to developing effective strategies to stimulate healthy development.

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185 - Beyond boundaries: The MO|REdata eResearch infrastructure and its role in enhancing motor performance research through sensitive data pooling

Claudia Niessner, Katja Klemm, Tanja Eberhardt, Hannah Kron, Klaus Boes, Alexander Woll, Karlsruhe Institute of Technology, Institute of Sport and Sport Science

Background: The Institute of Sports and Sport Science at Karlsruhe Institute for Technology (KIT) has emerged as a leading center for human motor performance (MP) testing, amassing over 250,000 data points across various projects. Despite the wealth of data, the field of MP research lacked a centralized data management, storage, and publication solution, particularly for motor performance test data. This gap is particularly noticeable when considering the broader context of MP research, where there exists a clear demand for a dedicated data repository (Lang et al., 2023). The MO|REdata eResearch Infrastructure initiative, funded by the German Research Foundation, seeks to address this gap by providing a disciplinary repository for sports science motor activity research data.
Methods and Results: MO|REdata (https://www.ifss.kit.edu/more/english/index.php) facilitates the archiving and publishing of MP data, offering sports scientists and practitioners a platform for data sharing and utilization. It emphasizes standardization, raw and aggregated data handling, and quality checks. Key features include publishing, mapping, citing, storing, and searching capabilities. However, challenges remain in linking health and MP test data due to data protection laws, and the current model does not support sharing sensitive data, suggesting a need for alternative solutions such as remote access or guest researcher workstations. **Conclusions:** MO|REdata represents a significant advancement in sports science research, enabling enhanced data sharing and collaboration. Despite existing limitations, the repository has the potential for international expansion and interdisciplinary research, promising to transform the way motor performance data is utilized. To maximize its impact, further development and optimization are essential to address data protection challenges and expand its functionalities.

Relevance

The MO|REdata eResearch Infrastructure stands as a pioneering example of how sensitive data pooling can revolutionize motor performance (MP) research. By facilitating the sharing and analysis of data, it not only advances sports science but also opens new avenues for interdisciplinary studies, ultimately contributing to our understanding of human MP and their implications for health and education

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187 - Measurement estimation abilities in children with Developmental Coordination Disorder

Bert Reynvoet, Joke Hufkens, Koen Luwel, KU Leuven; Ilse Tydgat, Dominiek Savio; Delphine Sasanguie, HOGENT

Background: Children with Developmental Coordination Disorder (DCD) experience cognitive difficulties that penetrate academic learning, also in different branches of mathematics. Here, we examined measurement estimation abilities in children with DCD, which is the process of making reasonable guesses of, for instance length, without using measurement tools which is a necessary skill to complete several mathematical tasks efficiently. This study aims to reveal difficulties with it in DCD. **Method and Results:** Forty-five children with DCD participated (Mage = 15.11 years (range 12-18), 39 males). Performance on different length estimation tasks (e.g., how long is this wooden stick?) was measured. Different dimensions (short/long; horizontal/vertical; lines/everyday objects; with/without visual interference) were manipulated across trials. Estimates were collected in standardized (cm) and non-standardized units (e.g. number of pencils) and had to deviate less than 30% from the correct answer to be correct. Mean performance was slightly above 60%. Older children performed better and children in vocational education performed worse. Comparing different tasks revealed that estimates were more accurate with a) standardized units than non-standardized units, and b) shorter than longer objects. Other manipulations did not impact performance. Currently, the strategies that the children have used to obtain their answers (the use of benchmarks, unit iteration…) are being analyzed. **Conclusions:** Length estimations by DCD children were relatively poor (comparable with typically developing 11y old children1) and affected by age and education. Estimations were better with standardized units and for shorter objects. The current insights can help to develop compensating strategies.

Relevance

Children with DCD struggle with several aspects of mathematics learning. Upon request and in collaboration with special need educators we wanted to get more insight into the measurement estimation abilities of DCD children in order to develop appropriate instruction in this domain.

188 - An intervention protocol of a highly intensive activity-based balance training camp in children with Developmental Coordination Disorder

Maja Van Grinderbeek, Silke Velghe, UHasselt; Eugene Rameckers, UHasselt, Maastricht University, Adelante Rehabilitation Centre; Pieter Meyns, Ingrid Van der Veer, UHasselt; Charlotte Johnson, UHasselt, University of Antwerp; Ann Hallemans, University of Antwerp; Evi Verbecque, Katrijn Klingels, UHasselt

Background: Developmental Coordination Disorder (DCD) is a neurodevelopmental disorder that is characterized by clumsy, uncoordinated movements and affects all F-words of childhood disability (functioning, family, fitness, fun, friends and future). Up to 87% of these children experience balance problems (fitness), impacting their daily participation (functioning, friends, family) and resulting in potential consequences on self-esteem and mental health (fitness, fun, future). There is high demand for focused balance training. However, current literature on this topic is limited. **Methods:** Based on this study protocol, we will investigate the effects of a highly intensive individually tailored, six-day functional balance camp in children with DCD. We will investigate effects on balance control (fitness), neuromuscular processes (fitness), self-perceived competence (fitness, fun), self-chosen goals (future, fun) and participation (functioning, friends, family). Based on sample size calculation, we aim to recruit 48 children with DCD (6-12 years) who will receive 40 hours of focused balance training. This intervention is designed to be fun, comprehensive, and includes individual and group activities. The functional therapy is individually tailored (1:1 therapist-child ratio) and implements different motor learning strategies. Participants will be assessed pre- and post-interventional, including at 3-months follow-up. **Conclusion:** This study protocol will be the first to target balance control with a comprehensive balance training camp and investigate outcome measures at all levels of functioning (all F-words).

Relevance

This protocol will provide novel insights into the effect of a highly intensive intervention on balance control in children with DCD. It is transferable towards various clinical practice situations, therefore a large number of children with DCD are expected to benefit from this new type of balance control training.

190 - Integration of psychosocial support of children with Developmental Coordination Disorder in physiotherapy

Ilse Dereu, Veerle Mox, Maya Van den Eede, Nils Goovaerts, COS Brussel

Background: Developmental Coordination Disorder (DCD) is a neurodevelopmental condition impacting on motor skill acquisition and competence. Literature learns that compared to TD children, children with DCD rate significantly higher on social-emotional and peer problems, and significantly lower on prosocial behavior. There is a need for psychosocial support. The aim of this project is to explore if and how psychosocial support is integrated in physiotherapeutic care for children with DCD, in Flanders, Belgium. **Methods:** An explorative literature review was done. A qualitative questionnaire was developed, based on 'The 'National Quality Standard for Psychosocial Care in Pediatric Rehabilitation' and the Measure of Processes of Care for Service Providers (MPOC-SP), both aiming at facilitating systematic implementation of psychosocial support in therapeutic settings. The online questionnaire was send by e-mail to 50 Flemish pediatric physiotherapists. Results will be thematically analyzed by researchers triangulation. **Results:** The need for psychosocial support, follow-up of coping processes and social-emotional problems due to developmental problems, attention for topical questions and needs of the child and his family as a whole, and recognition of the role of stakeholders in information transfer and collaboration. Results of the qualitative questionnaire on psychosocial support of children with DCD in physiotherapeutic settings, will be analyzed. **Conclusions:** A structural framework would be helpful to implement psychosocial support in pediatric physiotherapeutic settings.

Relevance

Literature confirms the importance of psychosocial support for children with DCD. DCD is associated with a higher risk in mental health problems en social difficulties, which profoundly impact on quality of life until adulthood. An holistic approach is recommended.

193 - Current approaches for training postural control in children with developmental coordination disorder: a scoping review

Silke Velghe, Evi Verbecque, Hasselt University, Eugene Rameckers, Hasselt University, Maastricht University, Adelante Rehabilitation Centre, Maja Van Grinderbeek, Rehabilitation Research Centre - REVAL, Faculty of Rehabilitation Sciences, Hasselt University, Hasselt, Belgium; Katrijn Klingels, Hasselt University, Pieter Meyns, Hasselt University

Background: Postural control deficits are highly prevalent among children with Developmental Coordination Disorder (DCD), affecting their self-esteem and participation, and are one the most common requests for help. Yet, the deficits children with DCD experience are different for each individual, indicating the need for comprehensive postural control training. To what extent do currently available training programs in children with DCD target postural control? **Methods and Results:** A scoping review was performed, for which Pubmed, Web of Science and Scopus were searched systematically. Studies were labelled as: 1) Intended (I) if their primary goal was to target postural control or 2) Non-Intended (NI) if they evaluated the effect of their intervention on postural control as a secondary outcome measure. Postural control systems (1. Anticipatory Postural Adjustments (APA), 2. Reactive Postural adjustments (RPA), 3. Orientation in space, 4. Control of dynamics, 5. Sensory orientation, 6. Biomechanical factors, 7. Cognitive functioning) were mapped. Fifty studies (I: 23; NI: 27) were included. The main targeted systems were: APA (I: 64%; NI: 39%), Control of Dynamics (I: 44%; NI: 55%) and Orientation in Space (I: 40%; NI: 12%). Only one study (I:1, NI: 0)) targeted all systems. The majority of the studies targeted three of the seven postural control systems (I: 40%; NI: 33%). **Conclusion:** Postural control training programs applied in children with DCD usually do not target all postural control systems despite the underlying deficits, which is why the design of such interventions considering all underlying systems deserves more attention in future research.

Relevance

Despite the high prevalence of postural control deficits in children with DCD, the currently applied interventions do not consider all postural control systems. The results from this review highlight this lacuna in literature and aid to sensitize therapists to consider all underlying postural control systems, from which children with DCD are expected to benefit at different levels of functioning.

194 - A highly intensive balance training camp can improve balance deficits and self-identified goals in children with DCD - preliminary results

Silke Velghe, Hasselt University, Diepenbeek, Belgium; Eugene Rameckers, Hasselt University, Maastricht University, Adelante Rehabilitation Centre; Maja Van Grinderbeek, Pieter Meyns, Evi Verbecque, Katrijn Klingels Hasselt University

Background: Balance deficits are a main motor problem (prevalence: 60-87%) in children with developmental coordination disorder (DCD), impacting all levels of the International Classification of Functioning, Disability and Health. Due to this high prevalence and the multisystemic nature of balance, interventions targeting balance are needed and should focus on all systems. Highly intensive training is commonly used in paediatric populations, but it is not yet investigated to train balance in children with DCD. Therefore, we aim to investigate the effects of a highly intensive, comprehensive balance training camp in children with DCD. **Methods and results:** Children between 6 and 12 years old with (probable) DCD enrolled in a pre (T1)-post (T2) interventional design including a 3-month follow-up (T3). They participated in an intensive six day balance training camp (40 total training hours) including tailored individual and group activities, targeting all systems of balance and self-identified goals. Effects on balance (Balance Evaluation Systems Test for children (Kids-BESTest); total score) and self-identified goals (Canadian Occupational Performance Measure (COPM); satisfaction (Sat) and performance (Perf) scores) were investigated. The preliminary data of 20 children (16 males; mean(SD) age 8.7 ± 1.7y) were analysed with repeated measures ANOVA. Mean differences (MD) and standard deviations (SD) were reported to describe performance changes. At body function level, total Kids-BESTest scores increased significantly ($F(2,18)=4.9, p=0.020$), immediately after intervention (MD T2-T1(SD)=3.5 (1.3),$p=0.045$) and after follow-up (MD T3-T1(SD)=4.5(1.5),$p=0.017$). At participation level, COPM scores improved significantly for Perf ($F(2,18)=15.6, p<0.001$) and Sat ($F(2,18)=21.2, p<0.001$, with increased clinically relevant changed scores immediately after the intervention and after follow-up (COPM Perf (MD T2-T1(SD)=4.3(0.8),$p<0.001$; MD T3-T1 (SD)=4.2(0.8),$p<0.001$); COPM Sat (MD T2-T1(SD)=4.2(0.6),$p<0.001$; MD T3-T1 (SD)=4.1(0.8),$p<0.001$)). **Conclusion:** A highly intensive, comprehensive training camp targeting balance is effective to improve balance and self-identified goals in children with DCD. These results persist at follow-up.

Relevance

A comprehensive, intensive balance intervention impacts balance and self-identified goals in children with DCD. These findings suggest that options to implement this intensive type of intervention for children with DCD in clinical practice should be explored. Hence, more children with DCD can benefit from this approach and improve on body function and participation level.

196 - Secular trends in physical fitness of children since 2012: an analysis of pooled data with the database MO|REdata

Tanja Eberhardt, Klaus Bös, Alexander Woll, Karlsruhe Institute of Technology, Institute of Sports and Sports Science; Reinhold Kliegl, University of Potsdam; Claudia Niessner, Karlsruhe Institute of Technology, Institute of Sports and Sports Science

Physical Fitness (PF) is one of the fundamental determinants for the development of a healthy and active lifestyle. There exists already evidence which stated declines in PF of children compared to previous generations. A meta-analysis of Fühner et al. (2021) attributed cardiorespiratory endurance to have the largest effects in declining secular trends since 1986, but to stabilize since 2010. This "stagnation on a low level" was also stated by Eberhardt et al. (2020). With the spread of the COVID-19 pandemic, affecting the children´s life, another influencing factor came along and points out the need of monitoring PF. Therefore, we examined secular trends in PF of children over a long-term period by pooling data. Data of PF was assessed with the German Motor Test and pseudonymized published in the MO|RE data repository. We pooled the data of eleven cohorts into one cross-sectional sample and included 194.756 test scores from 29.824 children aged 3-10 years in the analyses. Secular trends were estimated using a Linear Mixed Model. A Regression Discontinuity Design was integrated in the model, which allows to consider the COVID-pandemic as quasi-experiment. The final model selection has not yet been completed. First analyses reveal that COVID-pandemic has changed the trends negatively in the running tasks. There is less evidence for secular trends and PF seemed to be stable over the years. Overall, there is no international standard on examining and reporting changes or secular trends in PF of children and adolescents. For an evidence-based surveillance and monitoring, long-term and adequate samples provide insights into the youth populations PF level. Pooling data from several data sets can help to solve these challenges and also promote international cooperation.

Relevance

Monitoring of trends in PF is important to find out critical developments and specific groups, where intervention is needed to encourage an active and healthy life of children globally. A well-trained PF and active lifestyle helps to reduce the risk of many diseases. With an evidence-based surveillance and monitoring, stakeholders and actors could be sensitized for the topic and driven to action.

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197 - Exploring correlates of children's motor development and physical activity

Sergio Montalt-García, Jorge Romero-Martínez, Nuria Ortega-Benavent, Cristina Menescardi, Isaac Estevan, University of Valencia, Xavier García-Massó, University of Valencia

Background: To improve children's well-being and promote healthy lifestyles, it is essential to understand the different variables that contribute to their motor development. The concept of physical literacy encompasses social, psychological, physical and cognitive dimensions that strongly influence lifelong physical activity (PA). Investigating the relation of these factors with PA practice seems essential to improve knowledge of motor development. The aim of this study was to analyze the correlates of the above domains and children's daily PA practice. **Methods and results:** A total of 194 children (48.96% girls) with an average age of 10.61 years (SD=.45) took part in this study voluntarily. Participants completed questionnaires to assess social (i.e., social identity [SI]) and psychological (i.e., intrinsic motivation [IM] and perceived motor competence [PMC]) variables. Additionally, physical elements were assessed through cardiorespiratory fitness (CF), actual motor competence (AMC) and BMI percentile. Time spent in daily moderate-to-vigorous PA (MVPA) was determined by accelerometer recording. Cognitive ability (CA) was assessed by means of working memory test. Correlations between variables were conducted with age and gender as control variables. The results indicated a significant positive correlation between PMC, IM, CF, AMC and daily MVPA. A negative correlation was found between BMI percentile and daily MVPA. SI and CA were not associated with MVPA. Furthermore, a strong positive correlation was observed between CF and AMC. BMI percentile was negatively associated with both of the aforementioned variables, also with IM. SI showed a strong correlation with PMC and IM. **Conclusions:** Our study highlights the importance of psychological factors and physical elements in promoting MVPA in children. Further research should be conducted on social and cognitive variables from diverse perspectives. These findings underscore the necessity of interventions that address both psychological and physical aspects to promote sustained PA in children.

Relevance

This study contributes to both the education and health communities. It provides an opportunity to address factors that are not typically considered in physical activity (PA) promotion. The research shows that children's perceptions have a direct impact on their daily PA levels. Promoting positive values in these perceptions can benefit them and indirectly influence their motor development.

198 - A four-year longitudinal study of relationships among actual and perceived motor competencies and physical activity in Spanish primary school children

Jorge Romero-Martínez, Sergio Montalt-García, Nuria Ortega-Benavent, Cristina Menescardi, Xavier García-Massó, University of Valencia, Isaac Estevan, University of Valencia

Background: Motor competence (MC) may play an important role in student engagement in Physical Education (PE) and the development of active lifestyles. According to the conceptual model of motor development, MC is positively associated with physical activity (PA). Additionally, this association seems to be mediated by perceived MC. However, longitudinal studies supporting the aforementioned model are scarce. The aim of this study was to analyze the longitudinal relationship between the variables of the conceptual model of motor development such as actual MC (AMC), perceived MC (PMC) and PA when students are followed up for four years. **Methods and results:** A sample of 111 Spanish students (48.6% girls) aged 8 to 10 years in Time 1 (T1) took part in this study voluntarily for four years. Participants completed questionnaires to assess AMC, PMC and self-reported PA level. A four-waves cross-lagged model was used to analyze the associations longitudinally in Mplus. Structural equation modelling revealed a positive association between the majority of the variables in the model in each measurement time point over time. The model showed that AMC-T1 was related to both PMC-T1 and PA-T1. The same pattern was found in T2. Additionally, AMC-T1 influences later PMC-T2 and PA-T1 also influenced AMC-T3, and the same appears for the data in the last two time points. These results support the idea of the reciprocal longitudinal association between variables. **Conclusions:** Based on these results, it is recommended PE teachers to promote both, children's AMC and PMC throughout Primary Education, to foster PA engagement.

Relevance

A longitudinal description of the associations among factors of the conceptual model of motor development may provide insights for Physical Education teachers and stakeholders who are interested in promoting healthy life-styles across the whole Primary School period.

200 - Motor difficulties in autism: is it co-occurring with Developmental Coordination Disorder? Report from a cross-national study in Belgian and Italian children

Alessandro Crippa, Scientific Institute IRCCS Eugenio Medea; Charlotte Johnson, University of Antwerp, Hasselt University; Gaia Scaccabarozzi, Scientific Institute IRCCS Eugenio Medea; Massimo Molteni, Scientific Institute IRCCS Eugenio Medea; Ann Hallemans, University of Antwerp; Pieter Meyns, Evi Verbecque, Katrijn Klingels, Hasselt University

Background: Beyond the core condition features, altered motor behavior is often reported in autism. However, those difficulties are rarely recognized as a co-occurring diagnosis of Developmental Coordination Disorder (DCD) and families might struggle to obtain adequate support. There is currently no consensus about the prevalence of DCD in autism and on whether the degree of motor impairment is similar between the two conditions. Furthermore, it is still unclear whether autistic children with DCD present higher levels of autistic features than those without DCD. **Methods**: We retrospectively evaluated a combined sample of data from 27 children with DCD and no signs of autism at UAntwerp & UHasselt, Belgium, and from 76 autistic children at IRCCS MEDEA, Italy, aged 5-11 years. All participants were assessed with the DCD Questionnaire and the Movement Assessment Battery for Children–2 (MABC-2); the presence of other pathologies and age at symptoms onset were also controlled. The diagnostic criteria for DCD were assessed in autistic participants following the international recommendations. Group differences (DCD-only, autism-only, autism+DCD) on MABC-2 scores were assessed by ANOVA. Differences in age, IQ, and severity at Autism Diagnostic Observation Scale (ADOS) between autism subgroups were also investigated. **Results**: 49 of the autistic children met criteria for DCD (64.5%). Both autism+DCD and DCD-only participants scored lower on manual dexterity than their autism-only peers ($p=.002$ and $p<.001$). DCD-only children also scored lower for aiming/catching and balance than autism-only (both $p<.001$) and autism+DCD peers ($p=.004$ and $p=.036$), who scored lower than autism-only ones ($p=.004$ and $p=.003$). No differences were found in age, IQ, and ADOS scores between autism subgroups. **Conclusions**: This cross-national study adds to prior studies documenting the under-recognition of co-occurring DCD in autism. Our results show that, although the observed motor issues were similar in severity, different motor profiles can be described in autism+DCD and DCD. Understanding the shared motor phenotypes of these conditions can support the development of more comprehensive diagnostic approaches and lead to better tailored trainings.

Relevance

This cross-national study adds to prior studies documenting the under-recognition of co-occurring DCD in autism. Although similar in severity, different motor profiles can be described in autism+DCD and DCD. Understanding the shared motor phenotypes of these conditions can support the development of more comprehensive diagnostic approaches and lead to better tailored training programs.

201 - Are animal-assisted interventions relevant to adults with DCD or ADHD?

Emily Meachon, Cristina Carvajal Garcia, Agnes M. Detert, Alexander Grob, University of Basel

Animal-Assisted Interventions (AAI) include forms of therapy and support that incorporate human-animal interactions. AAI are known to have numerous positive benefits toward mental and physical health for humans, including reduced anxiety, increased socialization, and improved gait highly relevant to symptoms of Developmental Coordination Disorder (DCD) and Attention-Deficit/Hyperactivity Disorder (ADHD). However, few studies have examined AAI in the context of symptoms for either condition. Therefore, we conducted an online study to fundamentally assess interest and perceived relevance of AAI in an adult sample. To date, n = 10 participants diagnosed with DCD and n = 82 with ADHD completed the online survey including novel questions about interest in AAI, as well as standardized measures including the Adult DCD/Dyspraxia Checklist (ADC) and Dog Phobia Questionnaire (DPQ). The preliminary sample was, on average, 26.8 years old (SD = 1.8, Range: 18-66) and, by majority, female (68.5%), single (84%), students (62%), and pet-owners (55.4%). Overall, 60.9% of participants reported interest in AAI relevant to their own symptoms and 73.9% reported AAI could generally benefit people with neurodevelopmental conditions. There were no significant differences ($p > .05$) between adults with DCD and ADHD regarding awareness of AAI, personal interest in AAI, and relevance of AAI to neurodevelopmental conditions. However, independent samples t-tests indicated scores on The ADC and DPQ were significantly elevated in the DCD group compared to the ADHD group [ADC: $t(82) = 3.9$, $p < .001$; DPQ: $t(81) = 2.8$, $p = .003$]. Scores on the ADC and DPQ were also significantly correlated ($r = .312$, $p = .004$). While ADC scores were in expected directions for each group, it is unclear why those with DCD indicated increased fear of dogs and how this might impact interest in AAI. The preliminary results broadly point toward general interest and perceived relevance of AAI for adults with DCD or ADHD.

Relevance

This study examined the perception of Animal Assisted Interventions in adults with DCD and/or ADHD for the first time.

202 - Judgements of visuospatial task performance in adults with DCD and ADHD

Emily Meachon, Liezl Launspach, Agnes Detert, Alexander Grob, University of Basel

Adults with Developmental Coordination Disorder (DCD) and Attention-Deficit/Hyperactivity Disorder (ADHD) often perform similarly to their typically developed peers on cognitive tasks, even when mechanisms underlying performance and mental effort differ. Furthermore, adults with DCD frequently have reduced self-efficacy and lower confidence compared to their peers. However, little is known about the nature of subjective performance expectations versus objective performance in DCD and if this differs between DCD and ADHD. Therefore, we conducted an exploratory online study to investigate performance judgement on a visuospatial task in adults with DCD, ADHD, and typical development. In an initial sample, N = 37 adults (DCD: n = 7; ADHD: n = 7; typical development: n = 23) completed ten trials of a Raven's Standard Matrices Test with judgements of performance accuracy before and after each trial rated on a scale of 0-100%. On average, participants were 36.4 years old (SD = 16.0, Range: 18-76) and a majority were female (61.4%). Despite few differences in objective performance (2/9 trials), there were significant ($p < .05$) group differences in predicted performance accuracy before (6/9) and after (8/9) trials. These differences tended to be driven by the DCD group who judged their accuracy to be significantly lower than those with ADHD and typical development. Furthermore, there were group differences in ratings of discouragement and experienced stress during the task, similarly driven by the DCD group who reported significantly higher levels of stress and discouragement compared to other groups. These preliminary findings indicate dissonance between an actual good performance capability yet under-confident subjective ratings in adults with DCD. Further testing is required to confirm these patterns, which will be reported in a larger sample.

Relevance

This study showed that individuals with DCD often expect themselves to perform worse on tasks when they actually perform well and comparable to typically developing peers and those with ADHD.

204 - The motivational impact of autonomy support on motor learning of children with and without developmental coordination disorder

Miriam Palomo, Miguel Villa-de Gregorio, Irene Ramon-Otero, Universidad Complutense de Madrid; Reza Abdollahipour, Palacky University

Background: The deficits in motor learning observed among children with developmental coordination disorder (DCD) influence the development of age-appropriate motor skills. While previous studies have shown that autonomy support or the provision of incidental choices can enhance skill acquisition and motor learning in typically developing children (TDC), research has yet to examine the influence of autonomy support on motor learning in children with DCD. The aim of the current study was to examine the impact of a 10-week training program, incorporating autonomy supports on motor learning of children with DCD and TDC. **Methods and Results**: A total of 141 children (M_{age} = 14.45 ± 0.63, age range: 14-16 years) participated in this study. Motor competence levels were assessed for all children using the Movement Assessment Battery for Children-2. Subsequently, DCD children were diagnosed based on the criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition. Next, utilizing a randomized controlled trial, both TDC and DCD children were randomly assigned into either an autonomy-supportive group (choice) or a control group (no-choice). Following a baseline test, all TDC and DCD children underwent a 4-week intervention (supervised by a physical education teacher, 3 sessions per week, 20 min per session, 10 sessions in total) on three different task domains: manual dexterity, ball skills, and balance. TDC and DCD children in the choice group were provided the opportunity to choose the order of task performance before each training session. In contrast, participants in the no-choice group were yoked to the order chosen by their counterparts in the choice group. One week later, a follow-up retention test without providing any choice was conducted for all children. The results showed that both TDC and DCD children in choice groups outperformed the no-choice control groups across all task domains during practice and retention. **Conclusions**: The findings of this study revealed that interventions incorporating autonomy support by offering choice enhance skill acquisition and motor learning in both TDC and DCD children.

Relevance

This study emphasizes the importance of incorporating autonomy support in intervention programs for enhancing skill acquisition and motor learning in DCD children. The practical implications of these findings are relevant for practitioners working with DCD children, suggesting the importance of creating autonomy-supportive conditions when delivering interventions for this population.

205 - Motor profiles and indication of Developmental Coordination Disorder (DCD) in children diagnosed with Childhood Apraxia of Speech (CAS) in the USA

Priscila Tamplain, Justine Phan, Peyton Johnson, Kassandra Miranda, University of Texas at Arlington; Jenya Iuzzini-Seigel, Marquette University

Background: Preliminary data suggest that most children with CAS have motor deficits severe enough to be diagnosed with DCD. There is a critical need to determine to what extent DCD is prevalent among children with CAS, so that targeted assessments and treatment can be provided to help children in this population thrive. The current study aimed to determine the prevalence of DCD in a sample of children diagnosed with CAS in the United States. **Methods and Results**: Children were recruited for the study by having a CAS diagnosis across 9 sites in the USA. The study had 2 phases: phase 1 (virtual, confirmation of CAS diagnosis) and phase 2 (in-person, motor skills testing). Sixty-three children between ages of 3 and 10 years (11 females) had a diagnosis of CAS confirmed and were tested in phase 2. Children were tested with the Movement Assessment Battery for Children, 2nd ed. (MABC-2) and the Little/ Developmental Coordination Disorder Questionnaire (Little DCDQ, DCDQ). Results showed that 52 (82%) of the children scored below the 16th percentile on the MABC-2 and 42 (66%) scored as "possible DCD" on the DCDQ. Thirty-eight (60%) children had matching scores on the DCDQ and MABC-2 (suspect for DCD on the DCDQ and below the 16th percentile on the MABC-2). **Conclusions**: We conclude that the majority of the sample has motor difficulties according to the MABC-2 results, and over half could be diagnosed with DCD based on the DCDQ and MABC-2 scores. This is consistent with previous research. Despite the high rate of motor deficits, only a few participants had a formal diagnosis of DCD. These results indicate that formal assessments of motor skills and a thorough investigation of DCD characteristics is needed in children diagnosed with CAS.

Relevance

Children with CAS often show motor problems that can affect their daily living, participation and be associated with physical and mental health problems. Having a proper diagnosis for motor problems such as DCD can help these children receive early services, intervention and support to improve their motor skills and offset the consequences of motor problems.

206 - The DCD brain: research into neuroplasticity and motor learning in adults with DCD

Mireille J.C.M. Augustijn, Helena Verhelst, Griet Warlop, Ghent University, Research Foundation Flanders, Frederik J.A. Deconinck, Ghent University

Background: It is known that brain structure alters in response to learning, however, little is known about the effects of motor learning on the Developmental Coordination Disorder (DCD) brain. Therefore, this study aims to examine the effect of a 6-weeks balance training on brain structure in adults with DCD and typically developing (TD) peers. **Methods and Results**: Thirteen adults with DCD and 13 TD peers (18-35y) participated in a 6-weeks rolla bolla balance training (3x30 min/week). At four timepoints [baseline (-6 weeks), pre (0 weeks), post (+6 weeks), retention (+3 months)] balance was assessed and diffusion weighted imaging was conducted. After six weeks training, the two groups showed on average similar improvement on the loose role ($p=0.744$). The TD group showed 100% retention of the acquired motor skill, whereas 85.8%±28.2% retention was observed in the DCD group ($p=0.086$). On the fixed role, the DCD group displayed a significantly slower learning pattern compared to TD peers ($p\leq0.001$). Fixel-based analyses were applied to examine fiber density and cross-section (FDC) in four sensorimotor white matter (WM) tracts of interest: inferior cerebellar peduncle (ICP), superior longitudinal fasciculus, corticospinal and dentato-rubro thalamic tract. At baseline, individuals with DCD showed lower FDC in the ICP ($p_{FDR}=0.024$) compared to TD peers. Repeated measures ANCOVAs revealed no changes in FDC in both groups neither after 6-weeks balance training nor after 3-month retention period ($p_{FDR}>0.05$). **Conclusions**: Adults with DCD are able to learn a new motor skill, but the gap between both groups increases when the task becomes more complex. Greater reduction in performance after retention suggests decreased automatization. Remarkably, DCD was accompanied with altered WM organization in the ICP, a WM tract playing a crucial role in maintaining balance and potentially also automatization. Finally, the absence of structural brain changes in response to training suggests that there was no neuroplasticity in the examined sensorimotor tracts. Instead, it could be that changes occurred in surrounding regions, such as the prefrontal cortex, which plays an important role in cognitive processes related to learning.

Relevance

By studying the neural effects of motor learning, we aim to provide a better understanding of the human variation in adaptability and learning. Ultimately, our aim is to identify predictive biomarkers of motor learning and to provide ways for optimization of motor interventions for people with DCD.

207 - How are individual contextual factors associated with fundamental motor skills in preschool-age children over time?

Kip Webster, Kevin Becker, Dimetri Brandon, University of Tennessee; Amanda Staiano, Pennington Biomedical Research Center

Background: Individual contextual factors may influence fundamental motor skills (FMS) even in the early years. The purpose of this study is to examine associations of individual contextual factors with preschool children's FMS over one year. **Methods and Results**: Pause & Play, a naturalistic study, occurred over one year with 156 children ages 3-5 y (48% male). FMS was measured by the Test of Gross Motor Development (TGMD-3) and the Movement Assessment Battery for Children (MABC-2). Individual contextual factors included: height and weight, and BMI percentile was calculated with age-and-sex-specific values; parental sociodemographics; and children wore an accelerometer for 7 days to objectively measure sleep, sedentary behavior, light, moderate, and vigorous physical activity (PA) using age-appropriate cut points. Multiple regressions were used to analyze cross-sectional (N=82) and longitudinal (N=64) associations with the individual contextual factors of year 1 and FMS performance at year 1 and 2. Cross-sectionally, sex, screen time, sedentary time, and light PA significantly predicted TGMD-3 scores ($p<0.001$, adjusted $R^2=22.6\%$). Boys outperformed girls. Light PA and sedentary behavior were inversely associated with TGMD-3 scores (B=-0.049 and -0.070, respectively), while screen time was positively associated with TGMD-3 scores (B=0.015). No variables were significant for MABC-2 performance. In models predicting TGMD-3 scores 1-year later, sex, light PA, and MVPA were significant predictors ($p=0.004$, adjusted $R^2=16.1\%$). Higher MVPA was associated with better TGMD-3 performance (B=0.128), while light PA was inversely associated with TGMD-3 performance (B= -0.077). No variables were significant for MABC-2 longitudinal results. **Conclusions**: Less strenuous activities (i.e., sedentary time, light PA) were negatively associated and screen-time was positively associated with FMS, and MVPA predicted FMS one year later. Affordances for FMS practice are likely driven by early PA opportunities but also socioeconomic status, which also allow resources to acquire screen devices. More work is needed to understand the nuances of individual contextual factors on FMS performance and opportunities for targeted intervention.

Relevance

This study underscores the importance of individual influences on FMS development. Results suggest prioritizing reducing sedentary time and promoting MVPA to enhance FMS performance in preschoolers; gender-specific approaches may also be crucial to addressing disparities. Future work should also examine other contextual factors (e.g., familial, or environmental) on FMS development.

208 - Auditory and visual motor planning skills and the relationship with gross motor coordination and balance in children starting school

Amelia Braithwaite, Leanne Johnston, Emily Berrios, The University of Queensland

Children with DCD face challenges acquiring the fundamental movement skills essential for school readiness. Motor planning difficulties have been implicated in coordination difficulties, but their relationship is not well understood. Our study aimed to describe the profile of motor planning and determine its association with gross motor performance or balance in children starting school. Participants were 65 children mean age 5 years, 3 months (SD=5 months; n=36 males) in their foundational year of mainstream school. Children completed upper limb position sequencing assessments of visual (Visual-MP) and auditory motor planning (Auditory-MP) (Cratty's tests), gross motor coordination (TGMD-2) and balance (BOT-2). Results showed that the median total motor planning score (Total-MP) was 6/10 points, and median Visual-MP and Auditory-MP scores were both 3/5 points. Subgroup analyses were performed with children grouped by (i) gender, (ii) Total-MP score (Lower score 0-5/10 points and Higher score 6-10/10 points), and (iii) Visual-MP and Auditory-MP scores (Lower score 0-2/5 points and Higher score 3-5/5 points). Compared to children with higher Total-MP scores, children with lower scores demonstrated poorer gross motor coordination ($p=0.031$) and balance ($p=0.024$). Compared to children with higher Auditory-MP scores, children with lower scores demonstrated poorer gross motor coordination ($p=0.03$) and balance ($p=0.028$). There were strong, positive correlations between higher Auditory-MP scores and higher TGMD-2 Total scores ($r=0.28$, $n=62$, $p=0.026$), higher TGMD-2 Object-Control scores ($r=0.26$, $n=62$, $p=0.043$) and higher BOT-2 Balance scores ($rs(59)=0.29$, $p=0.026$). No relationship was found with Visual-MP alone. These results provide new insights into the profile of motor planning in children starting school. On average, children at this age can accurately plan 3 movements in sequence from an auditory or visual cue. Gross motor coordination and balance are related to motor planning ability in children starting school. It is important to include assessments of Auditory-MP and Visual-MP as part of a suite of assessments when examining the fundamental movement skills of children starting school.

Relevance

Our findings are relevant to therapists working with children in the school readiness domains of physical health and well-being. Implications include early identification of children with low motor planning abilities and recognition of the role of motor planning in gross motor coordination and balance when assessing poor performance of fundamental motor skills in children starting school.

209 - Tablet-based drawing assessment in preschool children: I. Basic features of handwriting skills

Yosuke Kita, Keio University, University of Helsinki; Yasuko Okumura, Hiroshima University; Yuka Shirakawa, Keio University; Hidehiko Matsumoto, Kochi University; Sora Hirose, Kochi University; Ken Kikuchi, Child and Family Support-room KNOT; Hisakazu Morofuji, Sysnet Inc. Healthcare Division

Background: Children with developmental coordination disorder (DCD) often show severe difficulty in fine motor skills, including handwriting. Poor handwriting skills may lead to poor academic performance in early school and eventually to mental health problems. Thus, intervention may be necessary as early as in preschool age. The existing evaluation methods for handwriting skills tend to be subjective and empirical, in which the quantitative aspects of handwriting, such as accuracy, speed, and pen pressure, has been difficult to assess. In this study, a tablet-based drawing assessment was administered to clarify basic quantitative features of preschoolers' handwriting skills. There is no conflict of interest. **Methods and Results**: Participants were 257 preschool children (126 males, 68-82 months) with written informed consent from their parents. They were instructed to trace three line-figures (circle, plus-sign, sine-wave) displayed on a tablet computer as accurately as possible with a stylus pen. Their drawings were automatically sampled at 25Hz by TraceCoder software (Sysnet Inc.). Based on the recorded data, we calculated the accuracy, speed, acceleration, and pen pressure as performance indicators of handwriting. As a result, 239 children completed all tasks (completion rate = 93%). Accuracy, as defined by the deviation between a pen-tip position and the nearest location on the model figure, was the highest for the plus-sign figure compared to the other two figures. Average speed and acceleration were the slowest for the circle, followed by the sine-wave, then the plus-sign figure. Average pen pressure was the weakest on the plus-sign figure (all p's < .001). There was no significant correlations between age and all performance indicators. **Conclusions**: Almost all children participated were able to complete the tasks, suggesting that this assessment is highly applicable to preschoolers before they begin learning to write. Among the three figures, tracing of the plus-sign figure was the easiest to for the preschoolers as reflected by the highest accurately and speed, which suggests plus-sign as the most useful figure to assess handwriting skills of preschoolers.

Relevance

The present findings may allow for quantitative assessment of handwriting skills in preschoolers. It may also reduce the risk of misdiagnosis and overdiagnosis of DCD due to subjective and empirical assessment. In addition, it will be useful for early identification and intervention for children with DCD if standard norms are established in the future.

210 - Tablet-based drawing assessment in preschool children: II. Assessment norm to identify children at-risk of handwriting difficulty

Yasuko Okumura, Hiroshima University, Keio University; Yosuke Kita, Keio University, University of Helsinki; Yuka Shirakawa, Miyuki Fujiwara, Keio University; Hidehiko Matsumoto, Sora Hirose, Kochi University; Ken Kikuchi, Child and Family Support-room KNOT; Hisakazu Morofuji, Sysnet Inc. Healthcare Division

Background: Children with Developmental Coordination Disorder (DCD) often exhibit handwriting difficulties that could lead to serious academic and psychological problems from early school years. Given the importance of early identification and intervention, the establishment of assessment norms for prewriting skills, such as drawing, in preschool children is crucial. Methodologically, the recent advancement in portable tablet devices enables detailed quantitative evaluation of drawing easily in short time. The present study administered a tablet-based figure-tracing task in a large sample of children aged 5-6 years and aimed to establish accuracy norms to identify those at-risk of handwriting difficulty. There is no conflict of interest. **Methods and Results:** Participants, assessment tasks, and apparatus were identical to our previous study (Kita et al., 2024). The norm focused on the accuracy of the tracing, which was indexed by the minimum straight distance between a pen-tip position and the nearest location on the model figure (i.e., deviation). As a result, the normative sample consisted of 246, 243, and 246 children for tracing circle, plus-sign, and sine-wave respectively, after the exclusion of data with insufficient quality. From the normative data, we derived a maximum deviation allowed for each data point (i.e., acceptable deviation, grand mean deviation + 5 SD) and defined poor tracers as those exceeding the acceptable deviation in over 20% of the data points for each figure. Application of this norm identified 9 poor tracers for circle (3.7% of the normative sample), 7 for plus-sign (2.9%), and 10 for sine-wave (4.1%). Their drawings were characterized by apparently distorted shapes and/or non-smooth trajectories of curved lines. **Conclusions**: Tablet-based drawing assessment and our accuracy norm successfully identified preschool children with distinctively low tracing skill. The chance for these children to develop handwriting difficulty at school age should be clarified in future studies.

Relevance

The present study adds a more clinically practical approach to the early assessment and identification of handwriting difficulty, a major fine-motor problem in children with DCD. Application of the present findings is expected to promote early intervention for at-risk children from preschool years, which would improve their future academic achievement and psychological well-being at schools.

References

Kita et al. (2024). Tablet-based drawing assessment in preschool children: I. Basic features of handwriting skills. Poster session presented at: DCD15-IMDRC6, June 5-8; Ghent, Belgium.

211 - The relationship between perceived motor competence and musculoskeletal fitness: the role of behavioural regulations in sport and exercise

Federico Mollame, Simona Nicolosi, University of Enna "Kore"; Ryan Hulteen, Louisiana State University; Soraya Pinto, Rosaria Schembri, Francesco Sgrò, University of Enna "Kore"

Background: The Self-Determination Theory perspective assumes that the tendency to internalize and integrate social norms and regulations is central to psychological growth and wellness. Ideally, physical activity is performed out of passion (intrinsic motivation), but the practice could include externally regulated behaviours, such as following a plan for improving own performance (controlled motives). This study examined the causal relationships among perceived motor competence, behavioural regulations in sport and exercise, and some components of musculoskeletal fitness (MSF). **Methods**: A convenience sample of 82 Italian college students (Males=35, Females=47; Mean age=21.09, SD=5.66) attending sports sciences degree courses or sociology master's degree participated in the study. Measures used were: Marsh's Perceived Motor Competence Scale, to assess perceived general sport and games competence; the 5 subscales of the Behavioural Regulation for Exercise Questionnaire-2 (BREQ-2), to measure sport motivation (Amotivation and External, Introjected, Identified, and Intrinsic regulations); Plank and PACER tests, to measure muscular endurance and cardiorespiratory fitness. Multivariate and mediational regression analyses were conducted to test direct or mediated causal relationships among perceived motor competence, BREQ-2 subscales, and MSF tests. **Results**: A significant multivariate regression model (R^2=0.355, p<.001) showed that perceived motor competence (β =0.464, p < .001) and introjected regulation (β =0.386, p =.002) had a significant and positive effect on the PACER scores. On the contrary, amotivation (β = -.217, p = .05) and intrinsic motivation (β = -.337, p < .05) had a significant negative influence on the PACER scores. The results of the mediational regression analysis were not significant. **Conclusion**: Perceived motor competence and introjected regulation had a positive impact on MSF, while intrinsic motivation negatively affected MSF. Introjected regulations are typically associated with contingent self-esteem, shame, or internal conflicts. Also, in an assessment context, introjected regulations appear to be more adaptive and consistent than intrinsic motivation.

Relevance

Physical activity impacts psychological and physical wellness. Perceived motor competence and intrinsic motivation are related to higher levels of physical activity. Understanding external and internal controlled behaviors can help to explain why individuals may or may not choose to be physically active.

212 - Influence of sex, maturity offset and grip strength on throw and catch performance in primary school children

Antonella Maria Vittoria Quinto, Francesco Sgrò, University of Enna "Kore"; Vera Zymbal, Instituto Politécnico de Setúbal; Greta Diquattro, Roberto Coppola, University of Enna "Kore"

An appropriate level of Functional Motor Competence (FMC) is critical to support physical activity and sports participation throughout life. Throwing and catching (TC), when combined in a single task, can be used as an indicator of FMC. In this context, the study aimed to assess the influence of sex, grip strength (GS), and maturity offset (i.e., years away from peak height velocity (PHV)) on TC. Seventy-six prepubertal students (8.48 (1.47) years; 36 females, 40 males) participated in this study. Anthropometric measurements (i.e., height, sitting height, and weight) were assessed and used to predict maturity offset (MO). GS, as an indicator of overall strength, was measured using a digital dynamometer. TC was counted by a trained operator and the best score from two 30-second trials was used as the outcome of further analysis. A Poisson Linear Regression revealed that boys have 1.52 times higher rate of TC compared to girls ($\exp(\beta)=1.52$, $p=0.013$). This translates to an average rate of 6.14 TC for boys and 4.03 for girls, respectively. As the MO increases by one year, the rate of TC decreases 42% ($\exp(\beta)=0.58$, $p=0.007$). An interaction term showed a 3% increase in the rate of TC while each unit increases in both MO and GS ($\exp(\beta)=1.03$, $p=0.031$). The study emphasizes the importance of considering sex and MO when monitoring FMC. Males scored higher in TC than females; the same result was obtained by children who were closer to their PHV than their peers who were further away from PHV. In addition, the interaction results emphasize the role of strength in children's FMC development. The interaction between GS and MO seems to show the positive effect of strength on the TC score of the less mature children. This could be explained by the positive correlation between GS and throwing speed: an increase in strength and a subsequent increase in throwing speed may help less mature children to complete more TC per trial. Therefore, these results open future research perspectives by suggesting the need for a detailed analysis of TC sequences. This approach could provide a better understanding of how somatic maturity status may differentially affect the various components of the task.

Relevance

This study is significant as it emphasizes the holistic nature of Throw&Catch (TC) test. TC is a composite task which accounts for several motor competencies. Therefore, low levels of TC should invite practitioners and teachers to account for possible biological and physiological cofactors. As a whole, these aspects can lead to more effective strategies in teaching and developing motor competence.

213 - Do Greek school-aged children, complying with the 24-hour movement guidelines, have better motor competence?

Martha Spanou, Ellinogermaniki Agogi, University of Athens; Konstantinos Soutos, Sofoklis Sotiriou, Ellinogermaniki Agogi; Antonis Kambas, Democritus University of Thrace; Fotini Venetsanou, University of Athens

Background: Although the relationship between physical activity (PA) and motor competence (MC) has been the focus of much research in recent decades, there are few studies investigating the associations between the 24-hour movement guidelines, which include not only PA, but also sleep, and sedentary behaviors, with MC in school-aged children. Greece is a country with very high rates of childhood obesity. However, there is virtually no data on children's compliance with the 24-hour movement guidelines and their association with MC. Therefore, the aim of the present study was to examine the association between MC and the compliance with the 24-hour movement guidelines in Greek school aged children. **Methods and Results**: In total, 201 children (n=111 girls; mean age: 9.70 ± 1.29 years) from Athens volunteered to participate. Their MC was assessed with (a) two ball skills items from the Short Form of the Bruininks-Oseretsky Test of Motor Proficiency, (BOT2-SF) and (b) the Körperkoordinationstest für Kinder (KTK). PA and sleep were measured objectively with Actigraph wGT3X-BT accelerometers worn for seven consecutive days, while screen time (ST) was self-reported. Children were classified as compliant or non-compliant to the 24-hour movement guidelines if they had 60 minutes of moderate to vigorous PA (MVPA), 9-11 hours of sleep, and less than two hours of ST, daily. Frequency analyses revealed that only 5.5% of children adhered to all three guidelines, while 20.4% of them did not meet any. Comparisons conducted revealed that children who met PA guidelines had better ball skills than their peers who did not ($p<.001$). Also, children who met one ($p=.007$) or two guidelines ($p=.032$) had better ball skills than those who met none, and children who met two guidelines had better total KTK scores than those who met none ($p<.001$). **Conclusions**: A very small percentage of school-aged children living in the Greek capital meets all three guidelines. MVPA is associated with better MC; however, compliance with more (ideally all three) movement guidelines is considered critical, as those meeting any two guidelines had better MC, than children meeting none.

Relevance

This work examines critical factors for children's development. Moreover, it provides first scientific evidence regarding Greek children's 24-hour movement behaviors. The results on the associations between compliance and MC, an important factor for children's daily life, inform parents about the importance of their children's participation in MVPA, ST reduction and adequate sleep.

214 - Motor coordination and sensory responsiveness among women and infants: The role in exclusive breastfeeding

Adi Freund Azaria, Tami Bar-Shalita, Tel-Aviv University; Rivka Regev, Clalit health organization and neonatal follow-up clinic; Orit Bart, Tel-Aviv University

Background: Although exclusive breastfeeding (EBF) is recommended for the first 6 months of life, EBF rates in most developed countries are low. Numerous studies are concentrated on exploring the reasons for the early cessation of EBF while efforts are being made to improve EBF engagement in order to promote the health of women and infants. Developmental coordination disorder (DCD) and Sensory over-responsivity (SOR) have been found to interfere with infant, women and childcare routines, but have not yet been examined as breastfeeding barriers. The aim of this study was to explore the associations between women and infant motor coordination, sensory responsiveness and exclusive breastfeeding at 6 months of age. **Methods**: In this cohort prospective study 164 mothers and their infants were recruited 2 days after birth in a maternity ward. At this time, participating mothers completed a demographic and delivery information questionnaire. At 6 weeks, mothers completed the Infant Sensory Profile2, reporting their infants' sensory responsiveness in daily activities. At 6 months, mothers completed the Adult DCD/Dyspraxia Checklist and the Sensory responsiveness questionnaire while infants were assessed using the Test of Sensory Functions in Infants (TSFI). After completing all the assessments, mothers provided information about their breastfeeding status and were divided into two groups accordingly: EBF and non-exclusive breastfeeding (NEBF). **Results**: The incidence of atypical sensory responsiveness at 6 weeks was twice as high among NEBF infants compared to EBF infants (36% vs. 17%, χ^2=7.4, p=.006). In addition, NEBF displayed more SOR behaviors than EBF infants in the TSFI deep touch (F=2.916, p=.001) and tactile integration subtests (F=3.1, p<.001). They also had lower scores in the adaptive motor functions subtest (F=2.4, p=.013) which indicate decreased motor coordination performance. At 6 months, the incidence of DCD and SOR was significantly higher among NEBF compared to EBF mothers (10% vs. 2%, χ2=5.6, p=.018; 25% vs. 11%, χ2 =5.4; p=.020, respectively). **Conclusions**: Infant and mother decreased motor coordination and atypical sensory responsiveness were found to be correlated with NEBF at 6 months after birth.

Relevance

This study contributes to the understanding of EBF barriers, which may cause struggles in achieving and maintaining EBF over time and as a result may lead to a decrease in breastfeeding rates. Findings may suggest developing early intervention plans and providing individualized breastfeeding support tailored to the infant and mother unique sensory profiles and motor needs.

216 - How does daily practice impact the development of locomotive postures over the 1st year of life?

Do Kyeong Lee, Valeria Reyes, Melanie Trujillo, Alicia Springfield, California State University Fullerton

Over the 1st year of life, infants gain various new skills via exploration, repeated efforts to achieve goals, and the cooperation of multiple subsystems. With bit-by-bit daily practice, infants seek new and more efficient solutions as circumstances, intrinsic and extrinsic, enable them to do so. Here, we are longitudinally tracking daily practice infants spend in each locomotive posture change, within the 1-year of life. Additionally, we are examining how infants' posture practice is constrained by childrearing practice and their motor ability. 14 infants (6 girls) were observed from around 3 months old until the onset of independent walking (13 months) in a naturalistic setting. Monthly visits to infants' homes involved videotaping play sessions. Through frame-by-frame video coding, we delineated 8 different locations and postures. The study also determined whether infants received assistance in maintaining each posture. Our longitudinal observations are aligned with previous work from cross-sectional studies: Young infants (3-5 months old) spend time mostly in bed or on devices with a supine posture. Changing postures were only facilitated by caregivers, but infants did not receive assistance in maintaining each posture. As infants aged, their posture repertoire diversified even before they mastered each locomotive posture. Independent transitions between postures were increased, while caregiver assistants were notably observed in upright postures. The length of each posture practice bout remained consistent with age. Postural practice was strongly associated with current postural skill levels, reaching a peak upon skill acquisition before transitioning to new postures. U-shaped patterns emerged in the practice of each posture. As infants developed their postural skills, they explored a broader array of locations. Nevertheless, their postural practices remained unrestricted by the specific places they visited.Longitudinal analysis revealed a pattern of postural practice to mastering locomotive postures. Daily postural practices collectively lay the groundwork for the subsequent motor skills.

Relevance

Understanding the impact of daily practice contributes to a comprehensive understanding of infants' motor development and has implications for optimizing childrearing strategies to enhance motor skill acquisition.

217 - The effect of a 10-week intervention training program on jumping and kicking kinematic characteristics in preschoolers

Georgia Axeti, Ioannis Gkisis, Ermioni Katartzi, Georgios Komsis, Aristotle University of Thessaloniki

Background: Given the fact that movement is considered a significant factor in a child's development and preschool age a key period for the development of fundamental movement skills (FMS), play opportunities and instructional experiences focusing on FMS should be promoted in kindergarten. **Methods and Results**: The purpose of the present study was to evaluate the effect of an intervention training program on jumping and kicking skill performance in preschoolers. 40 typically developed preschoolers were assigned to two groups: an experimental group (N= 20, mean age 4.9±0.2 years) and a control group (N=20, mean age 4.8±0.3 years). Both groups were measured in two fundamental motor skills; a counter movement jump (CMJ) and kicking a ball towards a wall, pre and post an intervention training program. Two video cameras (JVC 9800- NCS 120 fr/sec) and APAS software were used for 3D video kinematic analysis of both skills. A 10-week intervention training program consisted of exploration and guided discovery activities and motor games. All measurements and the intervention training program took place at the school gymnasium. Repeated measures ANOVA indicated statistically significant differences ($p<0.05$) in all CMJ kinematic variables and in right ankle's angular velocity and right knee's angle during the acceleration phase in kicking. Thus, the experimental group showed improvements in adequate technique of both measured skills, after the implementation of the intervention training program. **Conclusion**: The results showed evidence that fundamental motor skills can be improved after an appropriate intervention training program in preschoolers. Moreover, the present study stressed the need for training interventions including targeted motor activities and teaching methods in kindergarten, a suitable place for motor development and promotion of an active lifestyle in childhood and adolescence.

218 - Capturing individual differences in motor functioning as a window on coordination difficulties in adulthood

Luisa Girelli, University of Milano-Bicocca

Background: Motor performance varies dramatically between individuals as a result of biological, cultural, and experiential factors. In case of unattended and persistent motor difficulties, one may suspect a Developmental Coordination Disorder (DCD). Despite the impact of DCD on daily living across the lifespan, motor difficulties are largely overlooked in clinical practice, as reflected by the paucity of standardized assessment tools, especially for adults. This study aims to provide agile tools capable of discriminating between typical and atypical motor skills as they emerge in daily activities. **Methods and Results**: Three different groups of adults were involved: semi-elite athletes (N=35), SLD individuals (N=41), and controls (N=103). Each participant filled out two questionnaires: Adult Developmental Coordination checklist (ADCq, Kirby et al., 2010) and a newly developed Self-Assessment Motor scale (SAMs). SLD individuals are at risk of motor difficulties, as reflected by a higher ADCq global score. Besides confirming the standard 3-factor model of ADCq (difficulties as a child, self-perceived current difficulties, current difficulties perceived by others), an Exploratory Factor Analysis suggested five dimensions: writing speed; executive control; driving, space, sport; clarity of writing, and coordination. The latter resulted as the dimension that most differs across groups. This finding was confirmed and extended by the SAMs, where a higher general coordination factor characterized semi-elite athletes, and lower planning and fine/manual movement factors characterized the SLD group. **Conclusions**: The self-reported assessment of motor functioning offers a valuable procedure to detect variability in young adult motor performance. Motor coordination emerges as most relevant in distinguishing high and low achievers. The present study supports the importance of detecting motor difficulties in daily activities, primarily associated with SLD and largely overlooked in clinical practice.

Relevance

The present study provides standardized screening tools for detecting motor difficulties in adults. It promotes attention towards persistent motor difficulties, so far largely overlooked in the clinical practice despite their impact on daily living and quality of life.

References

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219 - The effect of group occupational therapy for ADL in clumsy children with neurodevelopmental disorders: A pilot study

Takuya Higashionna, Kilchoon Cho, Tokyo Kasei University; Akio Nakai, Mukogawa Women's University; Ryoichiro Iwanaga, Nagasaki University Graduate School of Biomedical Sciences

Introduction: The diagnosis, assessment, and intervention for Developmental Coordination Disorder (DCD) need to focus on activity and participation. While the effectiveness of occupational therapy for children with DCD has been demonstrated, it is unclear whether occupational therapy is effective for activities of daily living (ADL) difficulties in children with DCD. The aim of this pilot study was to explore the effectiveness of group occupational therapy for ADL difficulties in children with neurodevelopmental disorders. **Methods**: Ten children aged 6-8 with neurodevelopmental disorders participated in this pilot study. The children were assigned to the intervention group (n=5, 3 males, 2 females, mean age 6.80±0.84 years) and control group (n=5, 4 males, 1 female, mean age 7.00±0.71 years). The intervention group received group occupational therapy (once a week, 60 minutes per session, 7 sessions). Motor coordination abilities were assessed using the Japanese version of the Developmental Coordination Disorder Questionnaire (DCDQ-J), and ADL difficulties were assessed using the DCDDaily-Q. This study has been approved by the Tokyo Kasei University Research Ethics Committee. **Results**: The intervention group showed a significant improvement in the DCDQ-J "Control during movement" (p=.039), while there was no significant change in the DCDQ-J scores in the control group. Additionally, the intervention group demonstrated significantly lower difficulty in the DCDDaily-Q "Participation" (p=.045) and "Acquisition" (p=.046) compared to the control group in after intervention. **Conclusion**: Group occupational therapy showed potential effectiveness in ADL difficulties associated with DCD in children with neurodevelopmental disorders. In future research, it is necessary to investigate whether occupational therapy is effective in improving ADL in children with DCD.

Relevance

This study highlights the importance of activity and participation in intervention for children with DCD. It was showed that significant improvements not only in motor coordination abilities but also in ADL difficulties. The results of this study contribute to the development of interventions for ADL in children with DCD.

220 - I can decide MyGOALS! Developing an online tool for child-led goal setting using user-centred design

Aisling Ryan, Leanne Johnston, University of Queensland

Background: Children's participation in goal-setting has the potential to enhance their engagement and improve therapeutic outcomes. However, goal-setting is frequently driven by caregiver or therapist priorities. There is a lack of available child-led goal-setting tools which can support children of diverse physical, communication, and cognitive abilities. This study aimed to use user-centred design principles to develop an online tool which is appropriate, accessible, practicable, and acceptable for child-led goal-setting. **Methods**: This study used a mixed-methods, integrated participatory design. Purposive sampling techniques were used to recruit: 1) children aged 5≤15 years accessing community allied health services and their caregivers, 2) paediatric allied health professionals. Participants took part in a series of technology co-design sessions to provide ideas and feedback. Data gathered supported iterative tool development at key stages. The tool was then piloted with participants during goal-setting to evaluate clinical utility and user experience. Data was categorised, synthesised and interpreted using qualitative analysis. **Results**: Seven children-caregiver dyads and eleven allied health professionals took part in technology co-design sessions. Participant input revealed key considerations that shaped the development of the user interface, design and functionality. Factors included the need for multiple input methods, well-organised and comprehensive goal setting content, the use of child-friendly language, and engaging visuals. The finalised 'MyGOALS' tool supported children to take an active role across multiple phases of goal-setting and evaluation. Feedback indicated acceptability and usability of the tool for children, caregivers and allied health professionals. **Conclusion**: The 'MyGOALS' tool has potential to facilitate child-led goal setting for allied health intervention. Findings can inform the design of future technology aimed at engaging children with disabilities and delays in goal-setting activities.

Relevance

The 'MyGOALS' tool can be used by allied health professionals to engage children in the steps to discuss, identify and prioritise intervention goals. These goals can then be used by therapists to work with children and families to select and implement child and family-centred intervention options. Using a child-centred approach can build children's self-determination skills for the future.

221 - Learn-to-Move. Move-to-Learn. Gross motor coordination, balance and proprioception in children starting school: a cross-sectional study.

Emily Berrios, Amelia Braithwaite, Sally Hannah, Leanne Johnston, The University of Queensland, Brisbane, Australia

Children with gross motor and balance difficulties, including those with Developmental Coordination Disorder (DCD), can struggle with the physical demands of school. We aimed to examine how proprioception influences gross motor coordination and balance of school-starters. We hypothesised associations between: overall proprioception and gross motor coordination; upper limb (UL) proprioception and object-control skills; and lower limb (LL) proprioception and locomotor skills and balance. Participants were 53 school-starters aged 4-7 years (mean = 5 years 2 months [SD = 4 months]; male n=25). Gross motor coordination was assessed via the Test of Gross Motor Development, second edition (TMGD-2, percentile rank) and balance via the Bruininks-Oseretsky Test of Motor Proficiency, second edition (BOT-2, balance raw score). Proprioception was assessed using the Neuro-Sensory-Motor Developmental Assessment joint position sense test for the UL and LL. Two conditions were presented: (1) visual cue, and vision and proprioception response (V:VP); and (2) proprioceptive cue, and proprioception response (P:P). Assessments were performed by physiotherapy students, physiotherapists and teachers. Performance profiles were established via descriptive statistics, relationships between measures via correlations; and key explanatory factors determined via multiple regression. Median (range) scores were: TGMD-2 – Total 42%(5-97%); Object-control 37%(9-91%); Locomotor 50%(5-95%); BOT-2 Balance 31/37(13-37); and Proprioception – UL 29/36(14-36); LL 30/36(16-36); and Combined 57/72(34-72). Better TGMD-2 Total(raw) scores correlated with better UL, LL and Combined Proprioception scores ($p<0.05$). Better TGMD-2 Object-control(raw) scores correlated with better Proprioception-UL scores. Upper limb proprioception explained the variance in TGMD-2 Total (18.8%), Locomotor (8.4%) and Object-control (14.9%) raw scores. Lower limb proprioception explained 11.6% of variance in BOT-2 Balance scores. School-starters with poor proprioception are more likely to have gross motor coordination and balance difficulties. Children starting school would benefit from proprioceptive screening to identify those needing intervention.

Relevance

Having established a profile of proprioceptive function for children in their first year of school, paediatric practitioners can screen children who may be at risk of gross motor or balance difficulties. Our results can guide treatment interventions for those identified as being at risk of motor delay, or children who already have a diagnosis such as DCD or developmental delay.

222 - Quality of Life in Children with Developmental Coordination Disorder: A Meta-Analysis

Gayatri Kumar, Christian Hyde, Ian Fuelscher, Deakin University; Jacqueline Williams, Victoria University, Jill Zwicker, University of British Columbia; Kaila Bianco, Mervyn Singh, Mugdha Mukherjee, Pam Barhoun, Deakin University

Background: Reduced quality of life (QoL) is often reported in children with developmental coordination disorder (DCD). However, comparison across studies reveals substantial variability in reported effects across different QoL domains. These mixed findings limit our understanding of the QoL profile in children with DCD, including if (and how) QoL is differentially impacted in specific domains of QoL. To address this, meta-analyses (separate for parent and child-report) were conducted of research investigating QoL in children with and without DCD. Subgroup analyses across the physical, emotional, social, and school QoL domains determined whether the varied QoL domains were differentially impacted in DCD. **Methods and Results**: A systematic electronic search identified eligible studies examining QoL in children (<18 years) with DCD relative to healthy controls. Separate meta-analyses were conducted for parent (N = 8) and child QoL reports (N = 7). Each meta-analysis pooled domain QoL scores (i.e., physical, social, emotional, and school), providing estimates of QoL for each domain and overall QoL, for parent and child reports respectively. Subgroup analyses examined difference in QoL between children with and without DCD across the four domains. Concordance between parents and child-report was also examined. Participants were 831 children with DCD (369 males, M = 10.10 years) and 10,283 typically developing children (5765 males; M = 10.04 years) aged 4-15 years. Results showed that children with DCD had significantly lower overall and domain QoL (i.e., physical, social, emotional, and school) compared to controls, regardless of report type. Parents reported significantly worse overall QoL for children with DCD than children themselves, an effect driven by social, and school QoL reports. **Conclusion**: This meta-analysis reports a general reduction in QoL in children with DCD, regardless of domain and report type. It also highlighted discordance between parent and child perceptions of QoL, an effect that was specific to the 'school' and 'social' QoL domains. Parent and child reports may provide different perspectives on QoL in children with DCD, underscoring the importance of using both reports when examining QoL in DCD.

Relevance

Our meta-analytic findings are relevant to the society as they highlight the psychosocial impact of DCD on children. This review also stresses the need for using both child and parent measures to assess QoL in this group, given that the QoL profile in this group differed for children with DCD and their parents.

223 - Quality of Life in Children with Developmental Coordination Disorder and Co-occurring ADHD

Gayatri Kumar, Christian Hyde, Ian Fuelscher, Pam Barhoun, Deakin University; Jill Zwicker, University of British Columbia

Background: Approximately 50% of children with attention deficit hyperactivity disorder (ADHD) also experience co-occurring developmental coordination disorder (DCD). While children with ADHD alone experience poor quality of life (QoL), few studies have examined whether co-occurring motor problems (i.e., DCD) exacerbate QoL issues in children with ADHD. This cross-sectional study firstly aimed to examine QoL in children with co-occurring ADHD+DCD relative to those with ADHD alone. Secondly, we aimed to investigate whether this effect varied depending on whether reports on QoL were conducted by the child or their parent. **Methods and Results**: Participants were 27 children with ADHD-only (M = 8.30 years, SD = 2.11), 18 with co-occurring ADHD+DCD (M = 9.11 years, SD = 2.63), and 59 healthy controls (M = 8.36 years, SD = 2.78) aged 5-15 years. Data on QoL was collected via the Paediatric Quality of Life Inventory (PedsQL), both parent and child reports. The PedsQL contains four domains, i.e., physical, emotional, social, and school. Separate one-way ANOVAs compared groups on each QoL domain. This occurred separately for each report type (parent and child). First, there was a significant main effect for group for parent-reported overall, physical, social, and school QoL. Post hoc tests showed significantly lower parent-reported QoL for children with co-occurring ADHD+DCD relative to controls on all domains, and in comparison to those with ADHD on the social and school QoL domains. For child report QoL, there was a significant main effect for overall QoL and school QoL. Post hoc tests showed significantly lower child-reported QoL for the ADHD+DCD group relative to controls (driven by the school domain), but not the ADHD group. Further, the ADHD group only showed significantly worse school QoL relative to healthy controls. No other group comparisons were significant. **Conclusion**: Our study demonstrated that QoL in children with ADHD and co-occurring motor problems (i.e., DCD) was reduced relative to those with ADHD alone, as reported by parents. This work highlights the impact of impaired motor skill on QoL in those with ADHD, supporting recent calls for motor assessments to be considered when identifying and treating ADHD.

Relevance

This study is relevant to the society's work in developing a better understanding of the psychosocial aspects of DCD where other neurodiversity co-exists, e.g., ADHD. Further, this study highlights the additive impact of motor and attention problems on the quality of life of children.

224 - Fundamental movement skills in grassroots soccer: a comparative study of coaches' perceptions and practices in 9 European countries

Laurens Gilson, Ghent University; Ricardo Martins, Matteo Crotti, Coventry University; Christian Thue Bjorndal, James Rudd, Siv Gjesdal, Norwegian School of Sports Science; Maxime Beuckels, Ghent University, Morten Bredsgaard Randers, University of Southern Denmark; André Seabra, Portuguese Football Federation; Mikko Julin, Laurea university of Appled Sciences; Jakub Kokstejn, Martin Musalek, Charles University; Stephen Behan, Aine Macnamara, Dublin City University; Liam Sweeney, Maynooth University; Nicola Lovecchio, University of Bergamo; Farid Bardid, Strathclyde University; Antony Weldon, Birmingham City University; Matthieu Lenoir, Ghent University; Michael Duncan, Coventry University

Fundamental Movement Skills (FMS) are important for healthy development and form the basis for long-term athlete development in many sports, including soccer. The awareness and understanding of FMS in soccer is growing, reflected by FMS being a key feature of many soccer coaches' education programs across Europe. However, in daily practice coaches appear to focus more on soccer-specific exercises than on developing FMS (Duncan et al., 2022). Mapping the perceptions and practices of grassroots soccer coaches concerning FMS might be a first step in promoting FMS in this context. Therefore, this study aimed to assess the perceptions and practices regarding FMS of grassroots soccer across 9 European countries. 1060 grassroots soccer coaches (87.5% male) participated in an online survey (1) on coaches' perceptions (e.g. 'developing a broad base of FMS is useful for the players I coach') and practices ('my own coaching sessions contribute to the development of children's FMS') concerning FMS. The respondents represented a large age range (>18 years), coaching experience (<10 years), age groups coached (U7 - U17), and coaching qualifications. They responded to 13 Likert-scale questions (1 = strongly disagree – 5 = strongly agree). The current analysis focuses on the between-country differences, while the effects of expertise and gender will be analysed separately. Overall, coaches' knowledge and practices of FMS were scored very high (average scores on 11 out of 12 questions were > 4.0 (mean = 4.29). However, a 9-country MANOVA revealed a significant variation between coaches from different countries (Wilks's Lambda: $F = 7.729$, $p < 0.001$). Further, 14 out of 14 questions had a significant post-hoc test (mean $F = 11.326$, $p < 0.01$). European soccer coaches are well aware of the concept and benefits of FMS in grassroots soccer. However, significant differences between countries remain, with Finnish coaches responding more positively, and Belgian coaches showing more conservative attitudes towards FMS.

Relevance

Grassroots sports organizations have the potential to be an excellent gateway for the promotion of FMS in children on a large scale. Further research into barriers to implementing FMS in grassroots soccer training is critical to achieving this aim.

References

Duncan, M. J., Weldon, A., Barnett, L. M., & Lander, N. (2022). Perceptions and practices of fundamental movement skills in grassroots soccer coaches. *International Journal of Sports Science and Coaching*, 17(4), 761-771.

226 - Key motor skill deficits in children with probable Delopmental Coordination Disorder based on the Movement Assessment Battery for Children

Evi Verbecque, Hasselt University; Marisja Denysschen, North-West University; Ludvik Valtr, Palacky University; Dané Coetzee, North-West University; Emmanuel Bonney, University of Ghana, University of Minnesota; Bouwien Smits-Engelsman, North-West University, University of Cape Town

Background: The nature and severity of motor problems in children with Developmental Coordination Disorder (DCD) are heterogeneous. Worldwide, most children suspected of DCD are tested with the second edition of the Movement Assessment Battery for Children (MABC-2) and selected on poor performance on only eight activities per age band (AB). We explored retrospectively on which MABC-2 items children with severe motor difficulties, labelled here as probable DCD (pDCD), differ most from their typically developing (TD) peers and the extent to which the MABC-2 items predict pDCD/TD. **Methods and Results**: Based on their MABC-2 total score, we selected 4980 TD children (49.5% boys) and 785 pDCD children (53.1% boys) from a large dataset (6722 European and African children). Per AB, Hedges' g was calculated to establish the standardized mean difference (SMD) between both groups (considered substantial when the absolute value >1.4). Logistic regression was applied per AB to define the sensitivity/specificity of the raw item scores of the MABC-2 to predict pDCD or TD. In AB1, children with pDCD performed substantially weaker on posting coins with the non-preferred hand (SMD: -1.4), threading beats (SMD: -1.76) and jumping on mats (SMD: 1.83). By combining all items, the sensitivity to identify pDCD was 60.0% and the specificity for TD 98.3%. In AB2: walking heel-to-toe forwards (SMD: 1.78) was a substantially poorer in pDCD. By combining all items, the sensitivity to identify pDCD was 76.8% and the specificity for TD was 97.3%. In AB3, pDCD children performed substantially weaker for catching with both the preferred (SMD: 1.8) and non-preferred (SMD: 1.61) hand and for walking heel-to-toe backwards (SMD: 1.78). All items combined resulted in a sensitivity to identify pDCD of 94.4% and a specificity of 99.6%. **Conclusions**: Not all items are equally sensitive to pick up different performances in pDCD and TD children, and in their raw form they are particularly useful to identify TD children (high specificity across all ABs). The sensitivity was only moderate in AB1 and AB2, the age at which children (start to) learn culturally biased motor skills, highlighting the importance of culturally-adapted skills to identify pDCD.

Relevance

Worldwide, the MABC is most frequently applied in the diagnostic process of DCD. Our results, from a large multinational sample, show that MABC tasks mainly predict TD, but not pDCD in AB1-2. Task-specificity is crucial: in AB1-2, ball and locomotor skills are lacking, which require more precision and skill-related fitness needed for participation in leisure and sports (e.g. KTK, BOT, PERF-FIT).

228 - Early observable motor markers for detecting neurodevelopmental disorders in children aged 0-2

Marthe Van de Keere, Marieke Coussens, Lynn Bar-On, Ghent University

Background: Currently, diagnostics of Autism Spectrum Disorder (ASD), Attention Deficit (Hyperactivity) Disorder (AD(H)D) and/or Developmental Coordination Disorder (DCD) in children often occurs at a later stage of development. Investigating the motor markers of these Neurodevelopmental Disorders (NDDs) is crucial for an early diagnosis, which, in turn, can significantly enhance the efficacy of interventions and overall outcomes for each child. However, a notable lack of consensus exists regarding the most indicative motor markers for children aged 0 to 2 years and how these signs manifest during this crucial developmental period. Research indicates that a common denominator of NDD's can be identified in the motor development of young children. Thus, there is a need for clarity and a concise overview in this age range before it can be applied in clinical practice. The research question states: "What are the early motor markers of ASD, AD(H)D, and/or DCD in infants and toddlers aged 0-2, which can be used to facilitate early identification of these NDDs?". **Methods**: This review is written according to the 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses' (PRISMA). A systematic search of the PubMed and Web of Science databases was conducted using relevant keywords; ASD, AD(H)D, DCD, early identification, and diagnostics. Ultimately, 18 articles were included, all within the last decade. **Results**: This study identifies several factors that may indicate the likelihood of an NDD diagnosis in the future, including (a) poor motor control and abnormal general motor behaviour; (b) some delays in achieving milestones; (c) atypical postural control of the head while sitting, during engaged states of attention; (d) asymmetry of the head, related to hypotonia; (e) difficulty with head control movements like head lag during a pull-to-sit task; (f) low muscle tone; (g) poor coordination of movement and difficulties coordinating between upper and lower body; (h) reduced fine motor skills and grasping activity. **Conclusion**: These motor functions and early qualitative motor abnormalities, observed as early as three months for ASD, six months for DCD and one year for AD(H)D, may serve as early warning signals.

Relevance

A contradiction arises as studies promote early detection of NDDs before the age of 2, while the research on early detection primarily involves children aged 3 years and older. Detection of motor skills in the first two years continues to be an area with limited understanding and exploration. This review addresses the gap in the literature, providing a starting point for further investigation.

229 - Relationships among Motor Proficiency, BMI, Sports Participation, and Non-Verbal Intelligence in Czech Children (Ages 6–11)

Martin Musalek, Jan Chrudimsky, Chipo Malambo, Šárka Vokounová, Radka Bačáková, Jakub Kokštejn, Charles University

Background: The correlation between physical and mental health in children constitutes a focal point in numerous national health strategies, albeit not comprehensively elucidated, particularly within the context of school-aged individuals. The study investigates associations among commonly assessed health parameters: 1. motor proficiency, 2. body mass index (BMI), 3. sports participation, and 4. nonverbal intelligence, a construct associated with academic achievement. **Methods and Results**: Using data from 324 children (172 boys, 152 girls) aged 6 to 11 (mean age for boys 9.0±1.2; girls 8.9±1.3), divided into three age groups (6-7y, 8-9y, 10-11y), measurements included height, weight, complete BOT-2, Sport Participation Model Questionnaire, and Raven Progressive Matrices (RPM). Backwise regression analyses were employed for data analysis. The coefficient of determination R2 varied among age categories, with significant regression models identified in the 8–9 and 10–11 years groups. For 6–7-year-olds, no predictors reached significance for RPM performance. Despite significant changes in BOT-2 performance, these were not reflected in RPM performance in this age group. Backwise regression for the 8–9 age category revealed BOT-2 performance and chronological age as equally important predictors for RPM. Similar results were found for the 10–11 age category, confirming BOT-2 as a significant predictor for RPM. Weekly sports participation did not predict RPM performance significantly, but its significance increased with age (6–7 years: p=0.67; 8–9 years: p=0.25; 10–11 years: p=0.08). **Conclusions**: These findings highlight the necessity of integrating motor proficiency development into intervention and movement education programs within the school environment, particularly starting from the second grade. This approach is crucial for enhancing the cognitive development of younger school-age children.

Relevance

Exploring relationships between motor and mental development constitutes a fundamental area of interest for I-MDRC. Understanding the mechanism of enhancing cognitive development through aspects of motor performance is crucial for addressing the current role of physical education and strategies targeting increased adherence to physical activity among child populations.

230 - Analysis and visualisation of children's movement using wearable sensors and unsupervised machine learning

Huw Summers, Swansea University

Wearable accelerometers allow high frequency capture of human movement in natural settings. When allied to machine learning and multivariate analyses, the resulting data provides quantitative assessment of complex motion patterns. Typical studies are comparative, assessing movement patterns against a known standard which provides the training set for machine learning algorithms. However, often it may not be possible to acquire sufficient data for clear pattern differentiation and categorisation, or the movement patterns of importance may be unknown. Thus, there is a need for unsupervised approaches that provide an agnostic exploration of differences across a cohort. Here, computational algorithms must provide quantitative scoring or relative ranking of participants with no a-priori assumptions about the key movement features. Movement of children (9-11 yrs) was captured by wrist and ankle-worn accelerometers. Data analysis followed a 2-stage process: i. trace comparison through signal analysis to obtain a similarity matrix, ii. visualisation and quantification of individual performance in a 2-D mapping, produced by dimensional reduction. Our approach has been applied to analysis of gait in graded exercise tests and in broader movement analysis of children in a multi-exercise physical literacy assessment (Barnes et al., 2018). Our normative approach produces a cohort ranking and relative scoring, based on an individual's position within the 2-D performance map. Results from the graded exercise test provide a means for accurate prediction of time-in-test, whilst those for the multi-exercise assessment provide close agreement of machine scores with those of expert human observers. Our current research is applying these techniques to a study of DCD in children with the aim of differentiating between typically developing or low motor proficiency children and those diagnosed with DCD.

Relevance

Automated movement analysis using wearables provides quantitative measures of children's movement and coordination, enhancing diagnostic accuracy and aiding health professionals in delivery of physical therapy programmes. The time-domain sensor data can also be translated to a spatial representation to allow us to 'picture a performance'.

References

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231 - What's in the value of a name? Do caregivers value a Developmental Coordination Disorder diagnosis to inform their child's care?

Lucinda McMillan, The University of Queensland; Leanne Johnston, Children's Health Queensland Hospital and Health Service, The University of Queensland; Rosemary Mason, Bronwyn Thompson, Children's Health Queensland Hospital and Health Service

Background: A diagnosis of Developmental Coordination Disorder (DCD) can significantly assist clinicians to guide management, however whether caregivers of children with multiple developmental concerns value this diagnosis is unknown. The aim of this study was to explore caregiver-reported perceptions of the value of a DCD diagnosis. **Methods and Results**: Participants were caregivers (98 mothers, 11 fathers, 1 grandmother) of 110 children aged 3-15 years (mean=5.9, SD=2.23) referred to a tertiary child development service who scored 'suspect for' DCD on the DCD Questionnaire (DCDQ) relevant for their age: Little-DCDQ (3-5 years, n=53) or DCDQ (5-15 years, n=35). Caregivers completed the Caregivers' Perceptions of DCD Diagnosis Survey, developed for this study. Descriptive statistics (median, interquartile range, frequency reports) were used to profile responses, and factors contributing to perceived importance were analysed using non-parametric Mann-Whitney U tests. Most caregivers (89%) reported a DCD diagnosis as moderately or very important. Higher importance was assigned by caregivers of children with a greater number of developmental concerns (U=0.268, p=0.005) and more non-motor concerns (U=0.26, p=0.006). The three most common factors contributing to caregivers' perceived value of diagnosis were: better understanding of their child, access to school services, and minimising future impacts. The most common factors caregivers perceived as important for professionals were: better understanding of their child, provision of medical or therapy services, and provision of participation support (e.g., at school, in the community). **Conclusion**: Caregivers do value provision of a DCD diagnosis for their child, even if their child has multiple other developmental diagnoses/concerns.

Relevance

The abstract is of a survey of caregivers of children with multiple developmental concerns, and their perceived value of a DCD Diagnosis. "Thinking outside the box" is addressed as the topic is previously little-explored, and findings can translate into practice. This is relevant to the society as it directly addresses aims of advocacy and collaboration with families, researchers and clinicians.

232 - Young children’s compliance with the WHO 24-h movement guidelines and its association with their development: a review of the SUNRISE project findings

Konstantina Trampa, Nikolaos Lazarou, Emmanouil Emmanouil, National and Kapodistrian University of Athens; Dimitris Vlachopoulos, University of Exeter Medical School; Fotini Venetsanou, National and Kapodistrian University of Athens

WHO released guidelines on physical activity (PA), sedentary behaviour (SB), and sleep for children < 5 years in 2019. Since then, research findings on young children's adherence to these guidelines and its association with developmental parameters, such as motor competence (MC) and executive functions (EF), have been conflicting. This is not only due to the multifactorial nature of MC and EF, but also due to the lack of a common methodology among the published studies. Addressing this gap, the SUNRISE project aims to collect international data, using the WHO guidelines as benchmarks. The aim of this study was to provide a review of the SUNRISE findings so far. A search was conducted in four electronic databases (Medline, Google Scholar, Scopus, Sport Discus), using key-words relevant to the SUNRISE Study. Only studies following the project’s protocol were included. Fourteen studies (most of them pilot), comprising 3,524 individuals aged 3-5 years, across the six continents were included. According to their results the compliance of young children with each of the WHO guidelines is relatively high [PA: 53% (India)–90.3% (Sweden); Screen Time/SB: 17.5 (Bangladesh)-88.2% (China); Sleep: 16% (Hong Kong)-86% (South Africa)]. However, the percentages of children complying with all three guidelines are low [7.2 (Japan)-19.8% (Canada)]. In 7 of the studies, the association between guideline compliance and body composition (n=4), motor skills (n=5), and EF (n=5), individually or combined, was also investigated. Results revealed that MC is positively associated with meeting both total PA and MVPA guidelines, either individually or in combination with meeting one of the rest guidelines. Moreover, children’s BMI is negatively associated with meeting SB and PA guidelines, as well as meeting all three guidelines. Findings about EFs do not provide a clear picture. Although SUNRISE results are so far mainly based on pilot studies, they provide useful information on young children’s daily movement behaviors and highlight that these behaviors seem to associate with important health and development aspects. However, further research is needed for a comprehensive approach to the 24-hours movement behaviors in preschool age.

Relevance

This paper critically reviews the findings of the SUNRISE project, that examines young children’s adherence to the 24-hour movement guidelines and its association with important aspects of health and development, providing an initial understanding of how motor behaviours are associated with key outcomes in early childhood, globally.

233 - Motor performance and fitness in a random group of children attending special and regular primary schools

Dorothee Jelsma, University of Groningen

Background: Several factors are involved in the referral process of children to special education. It is known that poor gross motor performance of children with emotional, behavioral and pervasive developmental disorders may result in self-perceived incompetence (Emck et al., 2009). It is still unknown which gross motor skills are specifically hampered. The aim of this study is to gain insight in the motor behavior in agility and power tasks and motor skill performance of children attending special education compared to peers. Task analysis of the different test items will reveal the more conditional needs of the movement tasks, such as the physical components (strength, power, speed), but also components as balance, planning, fast responses, automatized movements and inhibitory control. **Methods and Results:** A random group of children (6-12 years old) attending special education (n=100; mean age 9.3 (1.4)) and regular education (n=300; mean age 9.5 (1.2)) performed the Performance and Fitness test (PERF-FIT). Significant differences were found between the groups in the total test performance. More specifically, the items that were scored most differently were the dynamic balance items (d=.777), stepping ladder (d=-.758), jump and hop items (d=.638), side jump (d=.630), ball skills bounce (d=.583) and throw and catch (d=.435) and ladder running (d=.529). Both upper and lower extremity power items and the static balance item were not different between the groups. **Conclusions**: Preliminary it is concluded that children attending special education do not lack power nor static balance, but have problems in tasks that need precision planning, inhibitory control (controlled stepping) and object control. The specific problems in tasks that contain inhibitory control and automatized balance during self-initiated actions may lead to problems in participation during sports and playing games with their peers.

Relevance

Of great practical relevance is the knowledge that children attending special education present with poor motor performance compared to their peers. It is important to be aware of the social impact of poor automatization of certain skills to participate in active leisure. Physical education teachers at special education schools should be aware of the risk of this gap.

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234 - Association between Developmental Coordination Disorder traits, Autism Spectrum Disorder, and emotional/behavioral problems among preschool children

Sumika Fujisawa, Aya Saito, Ochanomizu University, Japan; Akio Nakai, Mukogawa Women's University

Background: Few studies have examined the association between Developmental Coordination Disorder (DCD) and emotional/behavioral problems among preschool children, considering the effect of Autism Spectrum Disorder (ASD), and inconsistent results have been obtained. This study aimed to investigate how DCD traits in preschool children are related to emotional/behavioral problems, while controlling for the effect of ASD traits. **Methods and Results**: A questionnaire survey was administered to 277 parents of preschool children (155 boys, 74.0 ± 3.9 months) in Y city in Japan between October and December 2021. DCD traits were assessed using the DCDQ-J (Nakai et al., 2011), ASD traits using the short version of the ASSQ-J (Ito et al., 2014), and emotional/ behavioral problems using the SDQ (Goodman, 1997). In the hierarchical multiple regression analysis, each subscale of SDQ was the dependent variable – with gender in step 1, ASSQ in step 2, and DCDQ in step 3. The results showed that, even when controlling for ASD traits, higher DCD traits had a significant relation with higher conduct problems, hyperactivity/inattention, and peer problems and lower prosocial behavior among preschool children. **Conclusions**: The results suggest that early awareness of and support for DCD traits could be effective not only in reducing problems related to motor skills but also in preventing and improving emotional/behavioral problems. Further study is needed to determine which components of the DCD traits and what types of support may be effective in this regard.

Relevance

The present study provides readers with new, as yet underexplored insights into the relationship between DCD traits and emotional/behavioral problems in preschool children and considers the effects of ASD traits as well. The results indicate a need for awareness and support for higher DCD traits in the early stages of development.

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235 - Understanding and modelling children's outdoor activities based on interdisciplinary research

Boris Jidovtseff, Elodie Razy, Elodie Willemsen, Andora Vidal, University of Liège; Elodie Pools, KU Leuven; Joëlle Mottint, Recherche et Innovation Enfants-Parents-Professionnel·le·s (RIEPP); Anne-Françoise Dusart, Recherche et Innovation Enfants-Parents-Professionnel·le·s (RIEPP); Florence Pirard, University of Liège;

Background: The literature shows that children are spending less and less time outdoors, and that is a problem because numerous scientific studies emphasize the benefits of outdoor activities for children's overall development, and particularly for their physical, psychological, social and cognitive health, but also for their connection with nature, the awakening of their senses, autonomy and learning to manage risks. Spending time outdoors also means taking ownership of the living environment and discovering and respecting nature. It is important to encourage outdoor activities in children, while recognizing the fundamental role of supervising adults (parents or childcare professionals). This interdisciplinary research aims to better understand and model the outdoor activities of children aged 18 months to 18 years in the Wallonia-Brussels Federation (WBF), and to identify the factors that influence them. **Methods and Results**: The interdisciplinary methodology combines online quantitative surveys of a large number of subjects, specific qualitative analyses of exemplary contexts and anthropological monographs in contrasting fields. The various methods all focused on the perceptions (benefits, obstacles, dangers, levers) and practices of the adults involved (parents, childcare professionals), as well as the children themselves. The results of this interdisciplinary research provide an overview of how children in WFB engage in outdoor activities in different settings and at different ages. It also shows that while the vast majority of the population is in favor of outdoor activities, there are still many obstacles. The interdisciplinary approach proved optimal for providing results that were both comprehensive and nuanced, revealing the complexity of each situation studied. An overall model of the problem is proposed on the basis of the mechanisms observed. Finally, a number of courses of action are proposed to increase children outdoor activities. **Conclusion**: The interdisciplinary research has enabled us to gain a better understanding of the problems associated with children's outdoor activities in WBF and has led to the emergence of possible solutions, the effectiveness and relevance of which will need to be verified.

Relevance

This research on outdoor activities is important because it focuses on a phenomenon that is associated with the level of physical activity, but also with the development and well-being of the child. Furthermore, outdoor activities are essential from a sustainable development perspective.

236 - Preservice and Newly Qualified Physical Education teachers' understanding of planning for teaching fundamental movement skills.

Cathal Óg O'Sullivan, Atlantic Technological University; Helena Baert, Emily Gilbert, SUNY Cortland

Background: Fundamental movement skills (FMS) serve as the building blocks for more advanced, complex movements required to participate in games, sports, or other context specific physical activity (Logan et al., 2018). Individuals are more likely to acquire and refine FMS in a learning environment where they receive instruction and activities that are developmentally appropriate, are challenging, and enjoyable (Barnett et al., 2016). To create supportive and effective learning environments, physical education (PE) teachers must design, instruct, adapt teaching methods, and modify motor skill activities to meet the evolving needs of each learner. The purpose of this study was to examine preservice and newly qualified PE teachers' understanding and experiences of planning and teaching FMS. **Methods and Results**: Participants included three Preservice Teachers (PST) and two Newly Qualified Teachers (NQT) who completed a movement education course in their undergraduate PE degree programme in the USA where they analysed, planned, and delivered FMS to preschool children. Qualitative data consisted of semi-structured one to one remote interviews. The qualitative data was thematically analysed (Clarke et al., 2021), resulted in three themes: Planning confidence; Motor development content knowledge (CK); and Developmentally appropriate planning. **Conclusion**: The PST and NQT highlighted the importance of acquiring motor development CK to successfully analyse, and plan developmentally appropriate tasks and activities. PST and NQT depended on peer's support and online resources to plan meaningful tasks. Field experiences played a crucial role in challenging the teachers application of their motor development CK, particularly planning for and teaching children of low motor skill ability.

Relevance

The significance of this study lies in its exploration of preservice and newly qualified PE teachers understanding of planning to teach FMS, crucial for the physical development of children. Examining their understanding and experiences can inform improvements within PE teacher education programmes, fostering effective motor skill development in preschool and primary school children.

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237 - Upcoming study: the effects of Animal Flow training on motor competences, physical fitness and cognitive flexibility in military personnel

Jáchym Šimsa, Martin Musálek, Charles University

The military environment requires a high level of physical fitness and a body composition that enables performing various demanding activities. Even though military personnel in Czechia are provided a minimum of four hours of physical training each week, resulting fitness and body composition are almost indistinguishable from those found in the general population. These findings suggest that currently applied methods of strength and aerobic training are insufficient in enhancing soldiers' physical readiness. Moreover, modern research (Terlizzi et al., 2022) suggests that military duties not only require physical fitness, but also a rather high level of motor competences, which are currently being overlooked. Another overlooked aspect of overall soldiers' readiness, which can be stimulated via physical training, is cognitive flexibility, an ability crucial for effective decision-making (Morrison et al., 2002). In our planned randomized control trial, we will compare current training methods to Animal Flow, a novel quadrupedal movement training program, which might fill the gap in current training methods (Buxton et al., 2020). The findings of this study might offer a more effective approach to training of these performance aspects, benefiting not only soldiers, but also broader population.

Relevance

The upcoming study will provide information which may be used in creating exercise programs promoting physical activity and healthy lifestyle as well as advance our understanding of the relationship between physical training, motor competencies, physical fitness, and cognitive flexibility.

Reference

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239 – Visuo-spatial abilities in Developmental Coordination Disorder (DCD) and adoption: functional and emotional enhancement activities

Marinella Garotta, Daniele Bergamin, Paola Sbrissa, Parole e Movimento

Background: The comorbidity of Developmental Coordination Disorder (DCD) and pre-adoptive experiences presents unique challenges to individual development and adaptation. The adoption introduces potential traumas and needs emotional, social, and family adjustments. Concurrently, DCD can impact motor and visual processing skills. DCD rehabilitation involves a multidisciplinary approach to enhance visuospatial abilities, self-confidence, and overall child adaptation. A sensitive approach is crucial for adopted DCD children, considering past experiences, family dynamics, and visuospatial weaknesses affecting cognitive functions. The interventions should target both visuocognitive development, emotional and social adaptation. A multidisciplinary team, including professionals as child neuropsychiatrists and psychologists, must be involved to provide comprehensive support, addressing both visuospatial intervention and adoption-related issues. This study aims to analyze the use of specific visuocognitive rehabilitation to enhance the visual perceptual analysis, in order to elevate the ability to process information and their overall functional integration. This approach is applied alongside emotional support for an adopted DCD patient. **Methods and Results**: The patient was assessed for academic and emotional-relational difficulties, including neurological, neuropsychological, emotional skills evaluation, and M-ABC-2 administration. Visuospatial areas influencing neuropsychological development (spatial organization, visual perceptual analysis, visuomotor and visual-verbal integration, visual and spatial attention, and selectivity) were studied for specific enhancement. Emotional aspects were also assessed. Preliminary data analysis indicates improvement in studied visuospatial areas and academic tasks, alongside improvements in emotional-relational skills. **Conclusion**: A more or less traumatic or challenging adoption history increases the likelihood of emotional-relational difficulties in individuals with visuocognitive challenges. Preliminary results suggest that the enhancement in visuocognitive areas leads to improvement in learning-related skills, particularly in reading and writing. Emotional support further enhances performance.

Relevance

The comorbidity of Developmental Coordination Disorder (DCD) and pre-adoptive experiences presents unique challenges to individual development and adaptation. Interventions should target both visuocognitive development and emotional and social adaptation. Preliminary results suggest that enhancement in visuocognitive areas leads to improvement learning-related skills.

240 – Integrated therapeutic strategies in co-morbidity of Developmental Coordination Disorder (DCD) and emotional disorders: a multidisciplinary approach

Alessia Tedesco, Marinella Garotta, Silvia Micheli, Parole e Movimento

Background: The comorbidity of Developmental Coordination Disorder (DCD) and emotional disorders presents a complex interplay of functional and psychological challenges. DCD and emotional disorders can coexist, influencing each other reciprocally. Functional difficulties can trigger frustration and low self-esteem, while interference with daily activities and social interactions increases the risk of social isolation. Coping strategies, e.g. avoiding activities that involve executive functions or adopting adaptive behaviors, may impact the emotional well-being. Limited participation in shared activities with peers can affect social connections, accentuating stress. Psychological interventions and coping strategies are crucial to mitigate the emotional impact, promoting a more balanced management of challenges associated with DCD. A multidisciplinary team, including a child neuropsychiatrist, speech therapist, and psychologist, is involved in providing comprehensive support, addressing both functional and psychological difficulties. The aim of the work is to analyze integrated therapeutic strategies in order to enhance both executive functions and emotional/relational skills in a DCD patient. **Method**: Patients came for an assessment due to academic and emotional-relational difficulties. Functional and emotional skills were assessed. In particular, cognitive abilities, executive functions, and emotional-relational competencies were assessed. **Results**: Preliminary analysis of the data reveals an improvement in certain aspects of the functional and emotional areas, although critical areas persist. **Conclusion**: Recognize interconnection between DCD and emotional well-being is important to provide comprehensive support. A multidisciplinary approach involving professionals addressing both the functional and emotional aspects has yielded significant improvements. Specific approaches have enhanced adaptation, improving both functional skills and emotional responses, emphasizing the effectiveness of personalized strategies in DCD treatment.

Relevance

DCD and emotional disorders can coexist, influencing each other reciprocally. Functional difficulties can trigger frustration and low self-esteem, while interference with daily activities and social interactions increases the risk of social isolation. Specific approaches have enhanced adaptation, improving both functional skills and emotional responses.

241 – Enhancing executive functions (EF) in children with Developmental Coordination Disorder (DCD) through the intersection of therapy and play

Chiara Abbadessa, Marinella Garotta, paroliAmo

Background: Play is a primary tool through which children express their identity and develop knowledge. Numerous studies have highlighted the essential role of free and socialized play in cognitive, creative, and relational skill development. The clinical significance of using games for therapeutic or rehabilitative purposes lies in their potential to enhance executive functions. Board games, in particular, serve as crucial educational tools that clinicians can utilize in rehabilitation settings. This study aims to analyze the use of specific games to enhance executive functions (EF) in individuals with DCD. **Method**: Ten subjects with difficulties in schoolwork, including learning, adaptation, and emotional challenges, were recruited. Neurological and neuropsychological assessments were conducted using M-ABC-2 and M-ABC-2 Checklist. Therapy sessions incorporated the following exercises: (1) 4-in-a-row, targeting attentional control, planning, and inhibitory control; (2) sudoku, focusing on working memory, planning, and cognitive flexibility; (3) draughts/checkers, addressing planning, cognitive flexibility, and visual-spatial organization. **Results**: Preliminary data analysis indicates improvements in investigated EF and adaptive behavior. **Conclusion**: Preliminary findings affirm that board games can assist children with DCD in developing intellectual, cognitive, and social skills crucial for success in both school and life. When used in conjunction with specific therapies, board games present a particularly effective, simple, and cost-efficient approach to helping children with EF difficulties, learning problems, and DCD to make progress in these areas.

Relevance

The clinical significance of using games for therapeutic or rehabilitative purposes lies in their potential to enhance executive functions. Preliminary findings affirm that board games can assist children with DCD in developing intellectual, cognitive, and social skills crucial for success in both school and life.

242 - Synchronization in Developmental Coordination Disorder: effects of metronome characteristics and task complexity on walking and running performance

Mieke Goetschalckx, Peter Feys, Hasselt University; Eugene Rameckers, Maastricht University, Adelante Rehabilitation Centre; Bart Moens, Marc Leman, Gent University; Lousin Moumdjian, Hasselt University, Gent University

Background: Children with Developmental Coordination Disorder (DCD) walk with an increased spatiotemporal variability compared to typically developing children (TDC). This variability worsens during running, along with poorer interlimb coordination. Research in adults has demonstrated that auditory rhythms enhance gait performance, suggesting that auditory cues affect movement efficiency. It remains unclear whether metronome characteristics (tempo, temporal structure) impact walking and running performance in DCD. **Methods**: 21 DCD and 23 TDC performed a three-minute walking and running task to metronomes with different temporal structures (discrete, continuous). The metronome tempo was set to participants' comfortable cadence (0%). During walking, also higher (+10%) and lower (-10%) tempi were used. The outcomes were synchronization consistency, interlimb coordination, and spatiotemporal variability. Mixed model analysis was applied. **Results**: When walking to metronomes, DCD presented a significantly lower synchronization consistency ($p=0.0029$), lower coordination ($p=0.0195$), and higher spatiotemporal variability ($p\leq.0001$) compared to TDC, irrespective of the metronome characteristics. Discrete structures optimized synchronization accuracy ($p=0.0272$), and continuous structures enhanced coordination ($p=0.0396$) in both groups. Optimal synchronization and coordination during walking were achieved at a 0% tempo. Lower metronome tempi evoked lower synchronization ($p<.0001$) and coordination ($p=0.0116$) compared to walking at 0% or +10%, while DCD also showed increased cadence variability ($p<.0001$). These synchronization and coordination challenges were enlarged during running compared to walking, particularly in DCD ($p<.0001$). In both groups, metronomes with continuous structures reduced spatiotemporal variability of cadence compared to walking or running without metronomes ($p=0.0221$). **Conclusions**: DCD exhibited lower synchronization consistency, higher spatiotemporal variability, and inferior coordination compared to TDC, especially during running. The positive impact of utilizing metronomes with a continuous structure on spatiotemporal variability of cadence highlights an encouraging avenue for further exploration.

Relevance

This research enhances our understanding of coordination and spatiotemporal variability in DCD during walking and running, considering task complexity and metronome characteristics. Clinically, results encourage the integration of metronomes with a continuous structure for further exploration of walking and running intervention targeting spatiotemporal variability and coordination in DCD.

243 - Design and validation of a Short Form of the Dragon Challenge assessment of children's physical competence

Harriet Barker, Amie Richards, Emily Williams, Swansea University; Richard Tyler, Edge Hill University; Joanne Hudson, Nils Swindell, Gareth Stratton, Swansea University

There is a strong association between motor competence (MC) physical activity and physical literacy. The Dragon Challenge V1.0 (DC V1.0) includes nine-tasks completed in succession that are scored to produce a measure of children's fundamental movement skills of MC, during COVID-19 it was not feasible to use the DCV1.0 as it requires a small hall and a qualified assessor. To fill this void, we implemented 5 phases of research to develop a Short Form of the Dragon Challenge (SFDC V2.0) requiring minimal training, resources and space. To achieve this we investigated the feasibility, validity and reliability of the six-task SFDC V2.0. A total of 223 children (10±0.7y) participated across five phases of SFDC V2.0 development. The first phase included the conceptual design and development of a scoring system. In phase 2 we recruited 114 children (10±0.8y) across three trials and three trained DC V1.0 assessors scored the SFDC V1.0. Phase 3 refined the SFDC V1.0 to strengthen its validity and reliability resulting in: SFDC V2.0 which comprises of 6 tasks that children completed in circuit type fashion within a 2x2m grid on a flat surface with one side set against a flat, smooth wall. Phase 4 compared children's SFDC V2.0 results to the DC V1.0 in order to determine the validity of the SFDC V2.0; 41 girls and 38 boys (10±0.9y) completed both the SFDC V2.0 and the DC V1.0. There were significant associations between SFDC V2.0 and DC V1.0 scores ($r_s = 0.8$, $p<0.005$). Phase 5 involved 14 girls and 16 boys (9.9 ± 0.6 y), it investigated the interrater, intra-rater and test re-test reliability of the SFDC V2.0. There were also significant relationships for intra- (ICC, 0.97; 95% CI, 0.87-0.99; $p<0.005$) and interrater reliability between an expert assessor and a trained assessor (ICC, 0.96; 95% CI, 0.92-0.98; $p<0.005$). Further the interrater reliability between a teacher with no 'formal' SFDC V2.0 training and an expert assessor (ICC, 0.91; 95% CI, 0.91-0.76; $p<0.005$) and test re-test reliability 7 days apart, (ICC, 0.89; CI 95%, 0.77-0.95; $p<0.005$) were also significant. To conclude the SFDC V2.0 is a valid and reliable measure of MC in children aged eight to twelve years.

Relevance

This tool can be used by teachers with minimal training to regularly monitor children motor competence during the UK transition phase (primary to comprehensive school) of a child's schooling. With regular monitoring comes earlier identification of any potential underlying gross motor impairments and thus appropriate interventions put in place as well as opportunities for talent ID.

244 - A crawling intervention for very premature infants at high risk of neurodevelopmental disorders

Léa Guéret, Université Paris Cité

The aim of this study was to evaluate the feasibility of an intervention involving parents stimulating the motor development of their premature infants by training them to crawl as soon as they leave the hospital. Twenty very premature infants (24-32 weeks of gestation) at high risk of neurodevelopmental disorders (NDD) were recruited to be trained at home by their parents with the help of clinicians to stimulate their crawling on a mini-skateboard, for 10 minutes a day for 8 consecutive weeks from their discharge from the hospital. The feasibility of the protocol was assessed by the parents' compliance with the training and by the infants' ability to perform active propulsion during the training sessions. Despite 5 parents ending the training, principally for infant's health reason, the results obtained on 15 subjects show good compliance with an average rate of 70% of sessions completed, this compliance being lower the lower the parents' socio-economic level ($r=0.9$, $p<0.001$). Generally, the parents respected the 10-minute daily duration of the sessions (average 8.8 min), and despite their fragility, the infants were able to move long distances on the mini skateboard during the sessions (average 7.2 meters/session), whether the sessions were led by the parents or the clinicians. However, these distances were highly variable among individuals and sessions, increasing with the infants' level of excitability ($r=0.79$, $p<0.001$). This pilot study shows the feasibility of this crawling training, even in fragile premature infants, and open new avenue to test if this early crawling training could be used to stimulate the gross motor and cognitive development of these infants with high risk of NDD as it was found previously for premature infants presenting no major risk of NDD (Dumuids-Vernet et al. 2023). This pilot results also highlight that quadrupedal propulsion is possible in very premature infants as well as in typical neonates and open up new directions for comparing the early sensorimotor skills of these premature infants with those of typical ones.

Relevance

Given the heightened risk of impairments in very preterm infants, it is essential to have early intervention programs. These programs should be implemented as early as possible, promote active, self-generated movements, and be feasible for infants limited in their postural control and mobility. Our protocol responds to these recommendations and could now be applied to a larger number of infants.

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245 - Establishing an activity club for children with functional motor difficulties: development, implementation and future directions

Tanya Rihtman, Susan Allen, Anna L. Barnett, Oxford Brookes University

Background: The long-term impacts of DCD are well established, with evident risks of social exclusion (O'Dea et al., 2021), yet support for the social-emotional sequelae of DCD remains under-investigated. The delivery of an Occupational Therapy (OT) DCD Activity Club may underpin a research protocol exploring the impacts of a socially suitable activity club for children with functional motor difficulties. **Methods and Results**: Established in collaboration with a local Support Group (affiliated with the UK Dyspraxia Foundation), the Oxford Brookes University OT DCD Activity Club is an after-school club for children aged 5-12 years with diagnosed/suspected DCD/Dyspraxia. Supervised by faculty, the club is designed, delivered and monitored by OT students, and supports attainment of personalised functional motor skill goals. Offered in 6-week blocks, for up to 8 children per block, the Club also offers opportunities for social interaction, confidence building, and enhanced self-esteem. Parents/carers complete questionnaires and individualised goals are set in online pre-Club meetings with the children. Sessions include group warm up activities, group motor development activities, individual goal-related activities, and end of group wrap up. To date, the Club has run over 3 blocks, with 19 children. Post-Club outcome measurement, captured using the Canadian Occupational Performance Measure, suggest potential for meaningful impacts. Parents/carers feedback has been positive, e.g. "It's been a great opportunity for X to get to know children with similar challenges, which I think is great for [their] confidence" and "The activity club is…beneficial for everyone children and parents." **Conclusions**: Outcomes and feedback suggest that the format and structure of the Club are beneficial for both children and their parents/carers. Information available from initial Club delivery will be used to underpin an ethically-approved research protocol formally exploring the impacts of this offer for children and parents/carers.

Relevance

This promising intervention format, which incorporates socially appropriate support for primary school children with functional motor difficulties, would benefit from empirical investigation. This would enable understanding of the efficacy and utility of this easily implemented intervention, and shed light on potential benefits for children, parents/carers and OT students.

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246 - Environmental and individual influences on infant motor development: a systematic review

Priya Patel, Brittany Rodriguez, Anelisa Razo-Castaneda, Garrett Deiro, California State University-Fullerton

The direct perception theory posits a fundamental linkage between action and perception, suggesting that the manner in which infants perceive their environment critically influences their actions and thereby the development of motor skills. Furthermore, the perception of the environment by infants is shaped by individual constraints, indicating a complex interplay between environmental and individual factors in motor development. Research has explored a variety of environmental (e.g., caregiver presence, toys, home size) and individual factors (e.g., height, birth weight) to understand their impact on the development of motor skills in infants. Through this systematic literature review, our goal is to assess studies that examine these various factors, aiming to provide a comprehensive understanding of their relative importance in early motor development. We reviewed peer-reviewed journal articles from 2000 to 2023 that investigated the effect of at least one environmental or individual factor on motor development in early childhood. Our initial search identified 84 relevant studies, which were meticulously analyzed for assessed factors, study design, participant age and characteristics, measurement methods, analysis techniques, and findings. Our ongoing review's preliminary analysis highlights that environmental factors, particularly the home environment, are more commonly assessed than individual factors. Longitudinal studies are predominant, focusing on typically developing infants and premature infants as the most studied populations. The insights from this systematic review will not only elucidate connections within the existing literature but also lay a foundation for future research aimed at identifying key factors influencing motor development. By providing a robust framework, this review addresses the critical need for understanding the impact of these factors in both typical and atypical development, such as in Autism Spectrum Disorder.

Relevance

This project advances the knowledge of the motor development community by systematically reviewing studies on what environmental affordances and individual constraints shape motor skills, aiding both foundational research and clinical applications.

247 - A longitudinal case study: transition from spontaneous movements to motor milestones through behavioral and movement analysis

Priya Patel, Do Kyeong Lee, California State University-Fullerton

How do infants progress from the initial inability to control their head to achieving major motor milestones such as reaching, sitting, and walking within the first year of life? This intriguing transition is largely attributed to the numerous spontaneous body movements exhibited during their early months. Our case study tracks these movements' evolution into fundamental motor skills, offering both foundational and clinical insights into early childhood motor development. We observed a baby from 1 month until the onset of walking, conducting monthly assessments that combined behavioral observations with quantitative movement analysis. Data collection was home-based, utilizing video for behavioral observations and three inertial measurement units placed on the infant’s arm, leg, and back to capture movement data. We assess sensor data for the quality of limb movements and their interrelations over time and video data for the behavioral patterns associated with eight different postures. Preliminary results, while the study is ongoing, reveal a distinct pattern in limb movement coordination and differences in rotational dynamics. These movement findings quantitatively support our initial behavioral observations in different postures. For instance, rotational dynamics quantify arm waving and leg kicking observed in the supine posture. The alignment of quantitative movement and qualitative behavioral data underscores the developmental trajectory from early movements to motor milestones. This study not only highlights the transition from infantile movements to motor skills but has the potential to provide synergy between behavioral and movement analyses. Our findings suggest a complex interplay of motor skills development, signifying the value of integrating diverse analytical approaches for a comprehensive understanding of early childhood motor milestones which in turn is important from both theoretical and clinical perspectives.

Relevance

This study insights into infant motor skill development through combined behavioral and movement analyses align with the I-MDRC's focus on innovative research in motor development. It offers a unique perspective on the early transition from spontaneous movements to major motor milestones, contributing to both theoretical understanding and clinical applications.

248 - Inclusive Exercise Intervention (InExIn) improves socio-emotional competence of preschool children with and without ADHD.

Antonis Kambas, Democritus University of Thrace; Fotini Venetsanou, University of Athens; Danai Kelaraki, Maria Karageorgopoulou, Democritus University of Thrace; Kostas Soutos, Sofoklis Sotiriou, Ellinogermaniki Agogi

Attention Deficit Hyperactivity Disorder (ADHD) is a dominant neurodevelopmental disorder, causing, among other problems, several socio-emotional difficulties. So far, several studies have revealed the benefits of physical activity programs on children's social-emotional development; however, most of them exclusively involved either children with or without difficulties. Studies using an inclusive pedagogical approach, in which both children with and without difficulties participate are rare. One such approach is the Inclusive Exercise Intervention (InExIn), which is a variant of Psychomotor Therapy. The aim of the present study was to examine the effect of InExIn on the social-emotional competence (SEC) of preschoolers with and without ADHD. A total of 30 children aged 45-56 months (M= 51.23±3.6 months) participated in the study. Among them, 14 had a diagnosis of ADHD and 16 were typically developing (TD). The children's SEC was assessed before and after the InExIn, using the Test of Psychosocial Adjustment. Both groups participated in 50-minute InExIn sessions, 3 times/week, for 27 weeks. Results showed that, at baseline, children with ADHD had low levels of both social competence (SC) and emotional competence (EC), while TD children had an average level of SC, and a low level of EC. Post-measures revealed significant improvements in both groups in SC ($F=19.33$, $p<.001$, $\eta2=.49$) and EC ($F=164.7$, $p<.001$, $\eta2=.89$). Particularly in EC, TD children achieved a high level, and ADHD children reached the upper limit of the low EC level. Although further research is needed for firm conclusions to be drawn, the above results contradict the perception that only ADHD children benefit from such programs. It seems that InExIn, providing an inclusive context, significantly contributes to the improvement of the SEC of both children with ADHD and TD children.

Relevance

The research proposes an alternative exercise method for children with and without ADHD, which seems to have a positive impact on the social-emotional domain of both groups of children. Its results are important for strengthening the idea of inclusion, as it reinforces the view that positive results can be achieved for all children through it.

249 - Re-validation of the MoMo-test profile (test-retest-reliability)

Anke Hanssen-Doose, Katharina Hotz, Sarah Heinisch, Karlsruhe University of Education; Claudia Niessner, Elena Schlag, Karlsruhe Institute for Technology; Annette Worth, Karlsruhe University of Education

The age-appropriate motor performance is regarded as a crucial factor influencing healthy development. Consequently, the assessment of motor performance is integrated into various health monitoring programs. Since 2003, the MoMo study monitors motor performance, body composition, and physical activity among children and adolescents (Woll et al., 2021) and reports population-based trends regularly (Hanssen-Doose et al., 2021). The data are assessed by means of the 'MoMo test profile', which has been validated before starting the baseline measurement. Since 2022, the study has been continued as 'MoMo 2.0 study'. Owing to technological advancements and novel scientific insights, the 'MoMo test profile' had to undergo scrutiny, updating, and re-validation. Aim of this work is to introduce the revised test items and provide an analysis of their reliability. Ten test items from previous measurement waves remained in the test profile ('ergometric endurance test PWC 170', 'standing long jump', 'push-ups', 'sit-ups', 'reaction time', 'jumping sideways', 'balancing backwards', 'static stand', 'stand and reach', 'inserting pins'). Additionally a new item, 'handgrip', was introduced. The reliability was determined using the test-retest method; so we conducted the motor performance assessments twice with intervals ranging from 14 to 19 days, involving a total of 105 children and adolescents (50 females, 55 males). The aim was to cover a wide range of age groups, resulting in a mean age of 9.9 years (min 4, max 17, SD 4.2). Statistically, reliability was analysed by combining correlations and comparing mean values in order to analyse learning effects (Bös et al. 2017). All test items demonstrates a very good or good test-retest reliability with r values ranging from .765-.959: very good retest reliability ($r \geq .7$ and no mean value difference) for 8 items and good test-retest reliability ($r \geq .7$ and mean value difference) for 'reaction time', 'jumping sideways', 'push-ups'. The newly introduced 'handgrip' test displayed a high test-retest reliability ($r = .951$ and no mean value difference). The updated version of the 'MoMo test profile' is reliable for evaluating the motor performance of children and adolescents.

Relevance

This study demonstrates the reliability of the updated 'MoMo test profile' applied in the MoMo 2.0 health monitoring study across Germany. The results are used for policy advice and the derivation of population-related measures to improve the health situation for children, adolescents and young adults, with a particular emphasis on enhancing motor performance and physical activity levels.

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250 - Investigating the utility of a kinematic assessment to track the maturation of visuomotor control in middle childhood

Ewa Niechwiej-Szwedo, Lisa Christian, University of Waterloo

Background: Visuomotor control is fundamentally important for the efficient performance of recreational, daily living, and academic tasks such as catching a ball, tying shoelaces, and writing. At the core of visuomotor control lies eye-hand coordination, which refers to how the hands and eyes work together to enable fast, accurate and precise movements. The development of visuomotor control has been studied using various approaches; however, there is still a lack of evidence examining the maturation of eye-hand coordination in middle childhood. This study sought to assess changes in visuomotor control by measuring kinematics during the performance of a sequencing task in typically developing school-aged children followed longitudinally. **Methods**: Typically developing children (N=15) were tested at two timepoints using a bead threading task which consists of reaching, grasping and precision placement. Children were on average 8.89 years old (SD 0.96) during the first session and returned two years later for the second session. During both sessions, visuomotor control was assessed using a motion capture camera and eye tracking. The outcome measures were defined using limb kinematics and included: total movement time, reach duration, reach peak velocity, and grasp and placement duration. **Results**: The overall task performance in the second session was faster compared to the initial session (mean change 289 ms; p=0.003). This improvement was due to more efficient reaching (mean change 38 ms; p=0.009) and placement execution (mean change 211 ms; p=0.006). In contrast, grasp duration (mean change 28 ms) did not show a significant age-related change. **Conclusion**: Longitudinal assessment of typically developing children reveals significant improvement in distinct phases of visuomotor control between middle childhood and adolescence.

Relevance

This research could be used to inform the development of novel approaches to assess fine motor skills. Harnessing technology, such as motion capture cameras or eye tracking, could provide a novel approach to assess sensorimotor function, ultimately, improving clinical phenotyping and diagnosis of children with neurodevelopmental disorders who might be at risk of poor visuomotor outcomes.

254 - Content validity by experts of a physical literacy questionnaire for children aged 4 to 7: a mixed-methods study

Amélie Brau, University of Liege, Haute Ecole Robert Schuman; Sylvie Herreman, Achraf Abdelmoula, Bérengère Aulit, Laurence Amand, Estelle Balan, Pierre Van Luchene, Haute Ecole Condorcet; Benoît Vercruysse, Haute Ecole Robert Schuman; Alexandre Mouton, Boris Jidovtseff, University of Liege; Willy Lahaye, Elise Bossut, University of Mons

Background: Physical literacy (PL) is the motivation, confidence, physical competence, knowledge and understanding to maintain physical activity throughout life. As a response to the global burden of physical inactivity and sedentary behaviour, PL is a relevant lever in the promotion of a lifelong active lifestyle. The new education reform in Wallonia-Brussels Federation (WBF) of Belgium has incorporated PL into its new health and physical education curricula. However, validated PL assessment tools designed for school children aged 4 to 7 and adapted to WBF curricula are lacking. This study aims to assess the content validity of a pictorial questionnaire that evaluates three domains of PL. **Methods and Results**: A working group comprising representatives from universities and high schools within the WBF was convened to develop a pictorial questionnaire. The concept of PL and the content of four domains were defined. The physical domain is not included into the questionnaire and will be evaluated by a psychomotor circuit. Three subgroups were designated to work on psycho-affective, cognitive, and socio-environmental domains. A gender-neutral human character, created by an illustrator, was chosen by the whole group to feature in the questionnaire. Each subgroup organized meetings to develop scenario content and questions aligned with the new competency framework for physical education and health. Adjustments to some scenarios were made based on subgroup consensus, culminating in the first version of the questionnaire. A mixed-methods study design was used to validate the content of the questionnaire. This first version of the pictorial questionnaire was sent to 20 international French-speaking experts via an online survey, including both Likert scale and open-ended questions. Six experts completed the survey, and their responses are currently under analysis. In February 2024, semi-structured interviews will be conducted with experts willing to participate further, based on their survey responses. **Conclusion**: Experts' qualitative and quantitative feedback will inform the development of the second version of the questionnaire, which will undergo testing for face and content validity with a sample of children.

Relevance

The development of a tool to assess children's physical literacy is part of the implementation of the education reform in the Wallonia-Brussels Federation and of the new health and physical education curriculum.

255 - Building process of a psychomotor circuit for children aged 4 to 7, first steps of validation

Amélie Brau, University of Liege, Haute Ecole Robert Schuman; Achraf Abdelmoula, Laurence Amand, Estelle Balan, Pierre Van Luchene, Sylvie Herreman, Haute Ecole Condorcet; Bérengère Aulit, Benoît Vercruysse, Haute Ecole Robert Schuman; Elise Bossut, Willy Lahaye, University of Mons; Boris Jidovtseff, Alexandre Mouton, University of Liege

Background: Motor assessment is necessary for teachers, coaches, or researchers to place children in their motor development, and determine the effectiveness of teaching or training. Many instruments are available to measure motor competence in young children, and new tools continue to be developed. Many of them occur in a closed environment, where every skill is assessed separately. The use of a motor assessment tool is a compromise between its scientific reliability and its feasibility in the field. The purpose of this project is to develop a psychomotor circuit with a sequence of several situations to evaluate motor competence and tactic skills, for children aged 4 to 7. In this circuit, children must take decisions and choose a level of difficulty to realize a task. **Methods and Results**: A research group was created to build the psychomotor circuit framework. For this psychomotor circuit, children must complete different stations in succession and make choices to be the fastest and most efficient in carrying out a motor and tactic task. This part is timed. In addition to the circuit, children must achieve an isolated motor competence, with a degree of difficulty, selected from the MOBAK tool (Herrmann et al., 2015). A pilot test was conducted to assess the practicability of the psychomotor circuit for children of different ages (4 to 7). Modifications were made. Videos of this circuit and an online survey were sent to international experts in the field of young children and motor competence. Six experts answered this online survey. To get more qualitative information, experts will participate to semi-directed interviews during February 2024. **Conclusion**: Expert advice will lead to changes in the progress of the psychomotor circuit. An adapted version of the psychomotor circuit will be tested with a sample of children.

Relevance

The special feature of this test is the integration of tactical skills to achieve a rapid and efficient sequence of motor skills. The aim is to develop a tool that can be used by physical education teachers during their lessons.

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258 - The brain in action! Neurobiological mechanisms of physical activity in children with Developmental Coordination Disorder

Ian Fuelscher, Jessica Waugh, Mugdha Mukherjee, Pamela Barhoun, Kaila Bianco, Jarrad Lum, Peter Enticott, Karen Caeyenberghs, Tim Silk, Christian Hyde, Deakin University

Background: Physical activity (PA) has been linked to motor function in children with Developmental Coordination Disorder (DCD). However, the neurobiological mechanisms through which PA affects motor function in children with DCD remain to be investigated. The aim of this multimodal neuroimaging study was to examine the role of the brain's grey and white matter systems in explaining the association between PA and motor function in children with and without DCD. **Methods**: A sample of 82 children aged 5-14 years with and without DCD participated in this study. PA was assessed using the Youth Physical Activity Questionnaire and estimated based on Metabolic Equivalent of Task (MET) values. Motor function was assessed using the Bruininks-Oseretsky Test of Motor Proficiency. High resolution structural T1-weighted and high angular diffusion images were acquired on a 3T MRI scanner. Volumetric estimates for cortical and subcortical sensorimotor regions commonly associated with PA and previously implicated in DCD were derived using FreeSurfer. Sensorimotor white matter tracts linked to PA and commonly implicated in DCD were reconstructed using TractSeg, a semi-automated method. For each tract, we estimated white matter microstructure and morphology using Fixel-Based Analysis, a novel and fibre specific framework. **Results**: Data analysis is being finalised and full results will be presented at the conference. Preliminary analysis show that PA levels are positively associated with motor function in children with DCD. Partial correlations indicate that cortical volume in the left inferior parietal lobe is negatively associated with both PA levels and motor function in DCD. White matter data is currently being analysed and results will be discussed at the conference. **Conclusions**: Our preliminary data suggest that grey matter organisation of the inferior parietal lobe may represent a neurobiological mechanism through which PA affects motor function in children with DCD. This evidence provides new insight into the neurobiological principles that underlie the benefits of PA for children with DCD and can assist in the development and validation of targeted and effective PA interventions for children with DCD.

Relevance

This study provides researchers and clinicians with a better understanding of the neurobiological mechanisms through which physical activity (PA) affects motor function in DCD. Findings suggest specific neurobiological targets for objectively evaluating PA interventions in DCD and may assist in optimising PA interventions for children with DCD. These outcomes reflect the goals of the ISRA-DCD.

259 - The impact of inattention on the neuro-structural profile of children with DCD- a multimodal MRI investigation

Christian Hyde, Ian Fuelscher, Pam Barhoun, Kaila Bianco, Jarrad Lum, Peter Enticott, Karen Caeyenberghs, Tim Silk, Deakin University; Jacqueline Williams, Victoria University

Background: Recent research has implicated atypical neural structure within sensori-motor networks in the pathophysiology of developmental coordination disorder (DCD). While 50% of children with DCD present with co-occurring attention deficit hyperactivity disorder (ADHD), few studies have considered the neurobiological mechanisms that may differentiate children with DCD from those with DCD+ADHD. Of the studies probing white matter systems, the bulk have adopted diffusion tensor modelling, a method unable to reconcile complex fibre orientations. Addressing this limitation is critical to understanding how low motor function emerges in childhood, and the mechanisms that might explain the common co-occurrence of DCD and inattention. Here, we adopted multimodal MRI to characterize the neuro-structural profile of children with DCD and co-occurring ADHD. This included a novel Fixel Based Analyses (FBA) which is able to reconcile complex white matter fibre populations. **Methods and Results**: Participants were 82 children aged 5-14 years with DCD, DCD+ADHD, ADHD and healthy controls. In order to characterize white matter organization and cortical morphology, all children underwent higher order diffusion MRI, while high resolution T1 images were also captured. FBA was conducted to obtain fibre specific estimates of white matter micro- and macrostructure within key sensorimotor white matter tracts, the latter of which were delineated using TractSeg. To gain estimates of cortical morphology, T1 images were processed in FreeSurfer. Data analysis is being finalized, with preliminary analyses implicating cerebellar systems in motor skill levels across the sample. Further, those with DCD and DCD+ADHD present with similar patterns of atypical structure in cerebellar systems relative to age-matched controls and those with ADHD alone. **Conclusions**: Preliminary analyses suggest similar profiles of atypical morphology in cerebellar networks in children with DCD and those with DCD+ADHD. These data indicate that the morphological basis of low motor skill may be consistent, regardless of whether DCD co-occurs with inattention or not. Our results support the view that motor difficulties across childhood reflect a distinct symptom cluster, even when they co-occur with ADHD.

Relevance

Where low motor ability arises in childhood, the neural systems that contribute may be consistent regardless of whether DCD arises in isolation of, or in conjunction with, ADHD. This supports recent suggestion that even where DCD co-occurs with other neurodevelopmental disorders, motor difficulties likely reflect a distinct symptom cluster that warrant clinical consideration.

260 - The relationship between toddlers' motor competence, cognition and socio-emotional functioning

Lisa Mertens, Vrije Universiteit Brussel, Ghent University, Research Foundation – Flanders; Eline Coppens, Matthieu Lenoir, Ghent University; Eva D'Hondt, Vrije Universiteit Brussel

Acquiring motor competence (MC) is an essential part of (early) child development, influencing children's daily functioning. Reaching adequate levels of MC is also beneficial for fostering a physically active and healthy lifestyle, from an early age onwards. Recent international studies show signs of a decline in MC in older children. However, MC development and its related factors are hardly documented in 1- to 3-year-olds. Accordingly, the World Health Organisation pinpoints motor development research in this particular age group as a knowledge gap to address. The main goal of this study was, therefore, to investigate the relationship between 1- to 3-year-old toddlers' MC and their cognitive functioning (CF) and socio-emotional functioning (SEF). In addition, we discuss the MC of the current sample in comparison with the assessment tool's reference sample. This cross-sectional study took place in the context of day care centres. We objectively evaluated toddlers' (N = 240) MC using the Peabody Developmental Motor Scales 2nd Edition (PDMS-2), differentiating between Total MC, Gross MC and Fine MC. The cognitive scale of the Bayley-IV test battery was used to objectively assess CF. For SEF, the child's caregiver in the day care centre completed the socio-emotional questionnaire of the Bayley-IV. Pearson's correlation analysis was used to determine the association between MC, CF and SEF. Results demonstrated significant moderate positive correlations between CF and Total MC ($r = 0.358$; $p < 0.001$), Gross MC ($r = 0.250$; $p < 0.001$) and Fine MC ($r = 0.251$; $p < 0.001$). Regarding SEF and MC, there was a significant moderate positive correlation between SEF and Total MC ($r = 0.263$; $p < 0.001$), and SEF and gross MC ($r = 0.269$; $p < 0.001$), but no significant correlation between SEF and Fine MC ($r = 0.059$ $p = 0.376$). Finally, the correlation between CF and SEF showed a significant moderate positive relationship ($r = 0.245$ $p < 0.001$). In conclusion, toddlers' MC, CF and SEF were moderately positively related.

Relevance

This study addresses the gap in MC research in toddlers aged 1 to 3 years, specifically examining its relationship with their CF and SEF as other important developmental domains. It is crucial to gain more insight into the interplay between these developmental domains, to be able to facilitate toddlers' (MC) development in the future.

261 - A ‘crash’ course in understanding collision avoidance strategies in children with and without developmental coordination disorder

Victoria Rapos, Jill Zwicker, University of British Columbia, BC Children’s Hospital Research Institute; Farah Azim, Beatrice Gonzales, Tim Bhatnagar, BC Children’s Hospital; Michael Cinelli, Wilfrid Laurier University; Janice Eng, University of British Columbia

Background: During a school day, children circumvent other people to get to their goal when walking or playing. Individuals use visual information to proactively examine their surrounding and adapt their walking to avoid a potential collision or injury. Children with developmental coordination disorder (DCD) may find it challenging to avoid a collision, as it requires balance, coordination, and higher order neural processing. This study examined neural and behavioural strategies during a collision avoidance walking task in children with and without DCD. **Methods**: Children with DCD (N=12, 9 (1.83) years, 9 males) and neurotypical (NT) controls (N=16, 9 (1.13) years, 10 males) completed two walking tasks. During the stop-distance task, participants walked toward an object or pedestrian, at varying angles, and stopped when they felt they were too close. During the collision avoidance task, participants walked along a 12m path to an end goal while avoiding an approaching pedestrian. Kinematic data were collected using the Qualisys motion analysis system (120Hz) capturing Centre of Mass (CoM) locations for the child and the pedestrian, and neural activity was captured using functional near infrared spectroscopy (fNIRS). Personal space boundaries and clearance distance were determined as the minimum distance between the child and pedestrian’s CoM in the medial-lateral and anterior-posterior directions. **Results**: Preliminary analysis shows that children with DCD have a larger personal space boundary compared to their peers (DCD: N=8, 1.58m; NT: N=13, 1.23m; d=0.53). Children with DCD also have a larger clearance distance at time of crossing and are highly variable compared to their peers [DCD: N=8, 49.36 (15.89) cm; NT: N=13, 35.75 (11.25) cm, d= 0.8]. fNIRS analysis is currently ongoing. **Conclusions**: Children with DCD use different collision avoidance strategies compared to their peers. Specifically, children with DCD approach avoiding objects and other people more conservatively, leaving a greater clearance distance and personal space. By examining the perception-action pathway, results will inform clinical practice in whether children with DCD are at greater risk of injury during daily activities, such as crossing a street.

Relevance

Individuals with DCD have difficulty with motor control and coordination. Without proper intervention, they are at a greater risk of injury. This study identified neural and behavioural strategies used by children with DCD during collision avoidance tasks. We hope to identify potential brain pathways associated with DCD, which may provide evidence for targeted rehabilitation interventions.

262 - The impact of the sensory motor instructional leadership experience program on physical literacy among individuals with disabilities

Emily Bremer, Roxanne Seaman, Mary Sweatman, Acadia University; Kelly Arbour-Nicitopoulos, University of Toronto

Background: Individuals with disabilities engage in lower levels of physical activity than their peers without disabilities. One way to increase engagement in physical activity may be through improved physical literacy, which includes one's movement competence, confidence, motivation, and knowledge to engage in physical activity. The Sensory Motor Instructional Leadership Experience (S.M.I.L.E.) program aims to improve the physical literacy of individuals with disabilities through adapted physical activity programming. The purpose of this program evaluation is to explore the impact of one academic year of S.M.I.L.E. on the physical literacy of its participants. **Methods and Results**: A within-subject repeated measures design was employed to examine changes in physical literacy over one academic year of the S.M.I.L.E. program for individuals with disabilities. Participants were assessed at baseline (March 2023), pre-intervention (September 2023), and post-intervention (March 2024) using the PLAYbasic (participants) and Physical Literaty in Children Questionnaire (PLC-Quest; participants and caregivers). Consented participants (N=55) included 34 males and 21 females between 4-24 years of age (average age = 13.6 years) with a range of disabilities. There were no changes in PLAYbasic ($p>.05$) or PLC-Quest ($p>.05$) scores from baseline to pre-intervention. Post-intervention assessments will be completed in March 2024 and findings will be presented at the conference. **Conclusions**: There was no change in participant's motor competence or perceived physical literacy during their control period (baseline to pre-intervention). Post-intervention results will be analyzed once they are collected.

Relevance

This work is relevant for members of both IMDRC and DCD. It will discuss ways in which to intervene and measure motor competence among individuals with disabilities. Further, many of the participants in the sample have developmental disabilities which often co-occur with DCD even if they have not been formally diagnosed.

263 - Brain activation associated with a virtual decision-making task in children with and without developmental coordination disorder: an fMRI study

Victoria Rapos, Jill Zwicker, University of British Columbia, BC Children's Hospital Research Institute; Michael Cinelli, Wilfrid Laurier University; Janice Eng, University of British Columbia

Background: Developmental coordination disorder (DCD) is a neurodevelopmental disorder that affects motor control and coordination. Children with DCD may find it challenging to avoid collisions when walking, as it requires balance, coordination, and higher order neural processing to be successful. This study investigated brain activation associated with a virtual decision-making collision-avoidance task in children with and without DCD. **Methods**: Seventeen children with DCD (9.47 (1.66) years, 11 males) and 19 neurotypical (NT) controls (9.33 (1.28) years, 11 males) completed a functional Magnetic Resonance Imaging (fMRI) session. During the fMRI, participants responded using controllers to indicate: (1) the direction a virtual person turned to face prior to disappearing; and (2) how they would avoid hitting the person. Each fMRI sequence included 36 trials per task with 30s of a blank screen between blocks of trials. fMRI data were pre-processed using FSL to generate functional images by condition (task, rest) and were 3D motion, slice time corrected, and co-registered to anatomical images. Accuracy of responses and response times (RT) of the decision-making task were compared between groups. **Results**: Children with and without DCD accurately completed the person direction and avoidance tasks ($p > 0.05$). Children with DCD had slower RT for the person direction task (1135 ms) compared to the avoidance task (976 ms), whereas NT control's RT did not differ significantly between task or group ($F_{(1,22)} = 10.74$, $p = 0.003$). Preliminary analysis of functional data (N = 10 per group) shows children with DCD under-activated the posterior parietal cortex (PPC; Cohen's $d = 0.63$), primary motor cortex ($d = 0.71$), and visual cortex ($d=0.59$) compared to their peers during the task. **Conclusions**: Children with DCD had a slower response time compared to their peers when deciding how to avoid a virtual pedestrian. This slower behavioural reaction may be related to brain imaging findings, such that children with DCD exhibit a reduced activation in the PPC and visuomotor regions compared to their peers. By examining the perception-action pathway, results may identify a causal pathway in the observed deficits in daily living in children with DCD.

Relevance

A key aspect to understanding how to identify, treat, or live with a developmental disorder is to understand the cause of the disorder. Findings will increase our understanding of the neural basis of DCD. Specifically, by examining brain differences between children with and without DCD may identify a causal pathway in the observed deficits in daily living and inform rehabilitation interventions.

264 - Lack of engagement in an ehealth intervention for families of children with DCD in the USA

Mary Luz Ocampo-Plazas, Andrea Jackson, Sarah Muhiby Asmaty, Priscila Tamplain, University of Texas; University of Texas at Arlington; Jacqueline Williams, Victoria University

Background: Interventions for mental and physical health in children with DCD must take into account multiple levels in a complex framework that includes community, family, and the individual. A preliminary study in Australia showed that an eHealth intervention was feasible, enjoyable, and successful for this community. Here, explored the effects of an ehealth intervention focused on education and encouragement through membership on a social media group for parents and children in the USA. **Methods and Results**: Participants were randomized in the intervention (N = 12) and waitlist control group (N = 6). Both groups had eight sessions (weeks) of an education-based intervention mediated via social media and were asked to complete baseline and post-test questionnaires. Participants (one parent and child) received a Garmin watch by mail prior to the intervention and were asked to sync their watches for steps, minutes of activity, and sleep every week. Results showed no differences between the intervention and control groups ($p < .05$), with the exception of lower results for the control group during the school break for the holidays. Only two participants in the intervention and one in the control group engaged weekly with the education program and regularly synced watches, and 12/18 families completed the post-test questionnaires, however, that was only done after multiple requests. **Conclusion**: The results show a lack of significant differences in the control and intervention groups. Unlike trials in Australia and the UK, this particular cohort did not engage with the intervention, and we are looking to determine possible causes for this phenomenon. Overall, the average weekly amount of physical activity across the groups was 138.63 min, which is less than half of the recommended amount of 420 min/week (60 min/day). Generally, parents reported that children tended to struggle with the activities suggested (e.g., walking, yoga, etc) and had difficulties finding time to participate in physical activities. The findings indicate that ehealth interventions may have to go beyond education and other variables that may be more relevant for engagement in physical activity need to be considered.

Relevance

Physical activity (PA) is known to improve mood, reduce depressive symptoms, increase self-esteem, among others. Children with DCD have lower PA levels than those recommended for health purposes, due to low motor competence. Interventions for this population may require additional factors such as motivation, teaching of skills related to PA, as well as rewards so adherence and engagement can be determined.

265 - Motor and visual imagery in children with and without Developmental Coordination Disorder: new insights into mental rotation performance

Pamela Barhoun, Ian Fuelscher, Kaila Bianco, Mugdha Mukherjee, Christian Hyde, Deakin University; Jacqueline Williams, Victoria University

Background: Research has consistently demonstrated that children with Developmental Coordination Disorder (DCD) present with deficits in MI ability, as measured via the Hand Rotation Task (HRT). However, much of this work has used group level analysis to infer whether participants engaged in MI during the task, rather than considering performance strategy at the individual level. Therefore it remains unclear whether this commonly reported impairment is attributed to specific difficulties in MI or is reflective of broader deficits engaging in general mental rotation. **Methods and Results**: Children with and without DCD aged 5-14 years were compared on the HRT, a measure of MI, and the Letter Number Rotation Task (LNRT), a common visual imagery task. Only participants whose behavioural performance profile on the HRT demonstrated the use of a MI strategy were included. Given the common co-occurrence of DCD and inattention, levels of inattention were also controlled for in group comparisons. Consistent with previous work, preliminary findings suggest that children with DCD who engage in MI on the HRT are significantly less efficient compared to children with typical motor ability when completing the task. Data collection is being finalised and results of this study, including LNRT performance, will be discussed. **Conclusions**: We anticipate that children with DCD will be significantly less efficient compared to controls when performing the HRT but will show comparable performance on the LNRT relative to children without DCD. Thus, we predict that this data will be consistent with the hypothesis that atypical HRT performance in children with DCD is likely attributable to specific deficits in MI ability, as opposed to broader deficits in general mental rotation. These findings will help further our knowledge of the role of MI and, by extension, internal action representation in motor development and learning in children with DCD. Importantly, this will also inform the application of MI based therapies for the treatment of atypical motor skill.

Relevance

This study aligns with the conference's current theme of 'Underlying mechanisms of motor development, control and learning' by offering valuable insight into the possible cognitive mechanisms contributing to atypical motor skill. This study also informs the application of cognitive therapeutic interventions, aligning with the conference's goal of enhancing the lives of developing individuals.

266 - Motor imagery in individuals with cerebral palsy: a systematic and meta analytic review of hand-rotation task performance

Pamela Barhoun, Ian Fuelscher, Michael Do, Catherine Emerson, Kaila Bianco, Mervyn Singh, Hannah Portogallo, Emily Kothe, Soukayna Bekkali, Christian Hyde, Deakin University; Jacqueline Williams, Victoria University; Deakin University

Background: A growing number of studies have reported deficits in the ability to mentally represent movement, known as motor imagery (MI), among individuals with cerebral palsy (CP) based on performance of the Hand Rotation Task (HRT), a well-validated measure of MI. These studies have typically argued that individuals with CP have a reduced capacity to engage predictive models of action. However, the pattern of deficit reported has varied. Further, whether this deficit differs between individuals with right or left hemiparetic CP remains unclear. It is therefore difficult to draw conclusions about the profile of MI in CP and, by extension, the underlying control mechanisms that MI may provide insight into in this disorder. The current review provides a quantitative analysis of HRT performance in CP, with the objective of clarifying the profile of MI functioning in this disorder. **Methods and Results**: A literature search of the databases Medline, psycINFO, CINAHL complete, and EMBASE yielded a total of 12 studies meeting the inclusion criteria. Reaction time (RT), accuracy and efficiency values were collated for individuals with and without CP. Data is being extracted for overall task performance, as well as for any analyses conducted to determine whether the biomechanical constraints of movement had been adhered to. Standardised mean difference is being generated for each study to compare performance of individuals with and without CP on key metrics. Data extraction is currently underway, including a final update of the review. Findings and their implications will be discussed. **Conclusions**: Consistent with other neurodevelopmental disorders of movement, we anticipate that both individuals with and without CP can engage in MI when completing the HRT, but that overall task performance is reduced in CP. Further, in the likely absence of a speed-accuracy trade off, we predict that efficiency might be a more sensitive measure for detecting group differences in CP, should they exist. These findings will further our knowledge of the role of MI and, by extension, internal action representation in CP. Importantly, this will help inform the viability of MI based therapies for the treatment of motor skill in this disorder.

Relevance

This study addresses the conference's theme of 'Underlying mechanisms of motor development, control, and learning' by contributing to a better understanding of the possible cognitive mechanisms involved in CP. This research also has practical implications for MI-based interventions in CP, aligning with the conference's goal of enhancing the lives of individuals with atypical motor skill.

267 - Atypical motor imagery performance in children with developmental coordination disorder is associated with differences in regional grey matter volume

Mugdha Mukherjee, Christian Hyde, Pamela Barhoun, Kaila Bianco, Jessica Waugh, Jarrad Lum, Peter Enticott, Timothy Silk, Karen Caeyenberghs, Ian Fuelscher, Deakin University

Background: Despite the important role of motor imagery (MI) in typical and atypical childhood motor development, few studies have investigated the neural basis of atypical MI performance in developmental coordination disorder (DCD). To provide novel insight into the neurostructural basis of MI performance in DCD, this study examined the association between volumetric estimates of sensorimotor grey matter regions and MI performance in children with and without DCD. **Methods**: A sample of 62 children aged 5-14 years participated in this study, including 17 children with DCD (12 females, mean age = 11.65) and 45 children (20 females, mean age = 10.31) without DCD. Implicit MI performance was assessed using a mental hand rotation paradigm. High resolution T1-weighted imaging data were collected on a 3T MRI scanner. Volumetric estimates for cortical and subcortical sensorimotor regions commonly associated with MI and previously implicated in DCD were derived using FreeSurfer. **Results**: Children with DCD showed less efficient MI performance relative to children without DCD. Analysis of covariance demonstrated reduced grey matter volumes within the caudal middle frontal gyri, the inferior parietal cortices, and the cerebellum in children with DCD relative to children without DCD. Partial correlations revealed that less efficient MI performance was associated with larger cerebellar volumes in children with DCD. **Conclusion**: Results suggest that atypical organisation of sensorimotor grey matter regions may be associated with less efficient MI performance in children with DCD. These findings offer new insight into the neurobiological mechanisms that may underlie atypical MI performance in DCD and provide an important step towards identifying neurobiological markers of motor development in children with DCD.

Relevance

This study provides new evidence that the brain's sensorimotor grey matter system may underlie compromised motor imagery (MI) performance in DCD. This knowledge can assist in the identification of specific neurobiological targets for objectively evaluating MI training programs and may assist in optimising MI interventions for children with DCD. These outcomes reflect the goals of the ISRA-DCD.

268 - How is socioeconomic status associated with fundamental motor skills in preschool-age children over time?

Dimetri Brandon, Kevin Becker, Elizabeth Kipling Webster, University of Tennessee; Amanda E. Staiano, Pennington Biomedical Research Center

Developing fundamental motor skills (FMS) is a critical part of early childhood development that allows children to engage in lifelong physical activities and a variety of positive health benefits. Nevertheless, FMS levels are low and what remains unclear is the complex nature of varying contextual factors linked to the development of FMS. Thus, the aims of this study were to explore the association between family contextual factors (i.e., socioeconomic status) and FMS in preschool-aged children and whether family contextual factors may predict FMS one year later. A naturalistic study, Pause & Play, took place over one year with 51 preschool-age children having complete data (M_{age} baseline = 3.23 ± .49 years; 50% males). The Test of Gross Motor Development – 3rd edition (TGMD-3) measured FMS, parents completed a sociodemographic questionnaire, specifically focusing on household income and size. Percent of Federal poverty level (FPL), an economic measure used to evaluate eligibility for need-based services, was calculated based on income and household size; higher percent of FPL reflects higher socioeconomic status. A 3 (FPL tertile) x 2 (sex) x 2 (time) factorial mixed analysis of variance with repeated measures on time was calculated to examine FMS performance using TGMD-3 raw scores. Significant main effects were found for both sex ($p = .016$, $\eta_p^2 = .121$) and FPL ($p = .002$, $\eta_p^2 = .243$). Boys exhibited higher TGMD-3 scores than girls, and those in the lowest FPL group scored significantly higher compared to the middle and high FPL groups. The interaction between time and FPL on TGMD-3 scores approached significance, however, this was superseded by a significant 3-way interaction of time, FPL, and sex, $F_{(2, 56)} = 3.76$, $p = .029$, $\eta_p^2 = .118$. Post hoc analyses revealed varying patterns across FPL levels and sex over time. Individuals in the lowest FPL tertile showed no improvement, while middle FPL females demonstrated improvement, and both high FPL males and females improved significantly. Our study suggests that the relationship between socioeconomic status, sex, and FMS is multifaceted. Understanding these dynamics can inform tailored interventions for specific groups with distinct developmental trajectories.

Relevance

These findings underscore the importance of family influences, such as socioeconomic status, on preschoolers' long-term FMS development. Tailored interventions and further research are crucial to address disparities and enhance FMS competency. Further research may explore underlying factors contributing to these observed patterns and explore potential avenues for interventions and support.

270 - Physical literacy, physical activity, and health: quantitative investigation into a holistic model of physical literacy

Richard Tyler, Caitlin Miller, Stuart Fairclough, Mhairi MacDonald, Edge Hill University; Lisa Barnett, Deakin University

Background: There has been significant global utilisation of physical literacy (PL), the creation of conceptual models with wider health outcomes, and the emergence of holistic measures to provide a platform for monitoring and encouraging children's engagement in physical activity. Despite investment into school PL Frameworks, new definitions of PL, and government drives to improve PL in children, the associations amongst PL, physical activity, and health outcomes in children are less known. Therefore, the present study aimed to understand the associations PL has with physical

activity levels and associated health outcomes. **Methods**: Data were collected from 670 primary school-aged children (52% girls; aged 10.0 ± 0.9 years). Children completed the PL for Children questionnaire (four domains under PL), the KIDSCREEN-27 (five domains under health-related quality of life; HRQoL), and Me and My Feelings questionnaire (two domains under mental health). Total physical activity (PA) (Light PA, Moderate PA, and Vigorous PA) was measured using wrist worn accelerometers for 24-hours over 7 consecutive days. Individual factors, age, ethnicity, personality traits, and anthropometrics (to calculate BMIz) and demographics (socio-economic status) were also obtained. Confirmatory Factor Analysis assessed the fit of measured variables into latent factors. Structural equation modelling (SEM) evaluated relationships between measured variables, latent factors, and covariates. **Results**: Goodness of fit values for the SEM showed acceptable model fit (CFI, 0.90; GFI, 0.91; IFI, 0.90). Physical literacy had direct effects on total PA ($\beta = 0.28$, $p < 0.01$), mental health ($\beta = 0.91$, $p < 0.01$), HRQoL ($\beta = 0.93$, $p < 0.01$), and BMIz ($\beta = -0.11$, $p = 0.02$). Physical activity had direct effects on mental health ($\beta = 0.23$, $p < 0.01$) and HRQoL ($\beta = 0.10$, $p = 0.03$), but not BMIz ($\beta = -0.04$, $p = 0.29$). Physical literacy was also indirectly associated with health outcomes mediated by PA. **Conclusion**: This study demonstrated that PL plays a fundamental role for PA and associated health outcomes. This is the first study to quantify a holistic model of PL, PA, and health outcomes and is key to future interventions, particularly in schools, where PL can be embedded into curriculum.

Relevance

Our study is the first to utilise a holistic assessment of children's perceived physical literacy (which includes motor competence/physical competence) and examined its association with physical activity and health outcomes. The results highlight that enhancing physical literacy could improve health outcomes if targeted through interventions or programmes.

273 - From classroom to playground: investigating the educational background of Flemish child caregivers through the lenses of motor and risk competence

Laure Geirnaert, Felien Laureys, Matthieu Lenoir, Jochen Devlieghere, Eline Coppens, Ghent University

Background: Ensuring high-quality early childhood education and care (ECEC) is crucial to foster the holistic development of young children, which encompasses the promotion of motor skills. Nonetheless, recent studies indicate a potential decline in motor competence among toddlers (1-3 years old). Staff education is known to significantly influence the quality of ECEC and, consequently, toddler's developmental outcomes. Therefore, this research aims to investigate the educational trajectories of childcare professionals by screening the curricula with a specific focus on motor and risk competence. **Methods**: In Flanders (Belgium) three main ECEC trajectories exist (i.e. vocational secondary high school, adult educational programs and programs offered by the university college of applied sciences). Of all existing programs offering the ECEC educational trajectory, the course content of at least 30 schools will be collected in order to ascertain to what extend both motor and risk competence are implemented within the curriculum. Firstly, all course content will be transformed to PDF-files. Afterwards, a topic model in Python involving specific key terms associated with motor and risk competence will be constructed. A focus group with educational professionals will be organised to determine these key words. The topic model aims to visually represent the extent to which these topics are integrated into the existing ECEC educational programs, utilizing a quantitative approach to explore course content through the counting of predetermined keywords. Additionally, a comprehensive curriculum map, offering insights into the emphasis and potential limitations of each educational program will be created. In addition to the quantitative analysis, the current study aims to gain a comprehensive insight into the informal curriculum and current needs within educational programs. This will be achieved through an anonymous survey conducted among both (former) students and teachers of the aforementioned programs. This two-way approach intends to unravel the intricacies of the formal and informal curricula, offering a clearer understanding of the factors contributing to potential developmental delays in motor competence of toddlers.

Relevance

By gaining insight into the educational trajectories of caregivers, this study aims to better understand the possible contribution of staff education to the (motor) development in toddlers. The aim is to detect possible gaps within the (in)formal curricula to support childcare professionals' knowledge on development and sensitize professionals to the suggested delay in toddlers' motor skills.

274 - Improved motor outcomes and brain functional connectivity after CO-OP in children with co-occurring autism and developmental coordination disorder

Jill Zwicker, Melika Kangarani-Farahani, University of British Columbia

Background: Up to 88% of children with autism spectrum disorder (ASD) have motor skill deficits consistent with developmental coordination disorder (DCD). International clinical practice guidelines recommend Cognitive Orientation to Occupational Performance (CO-OP) as an effective intervention for children with DCD to learn motor skills, but it is unknown whether CO-OP is effective for children with co-occurring ASD and DCD. The objectives of this study were to: (1) examine motor outcomes in children with ASD+DCD after CO-OP; (2) investigate changes in functional connectivity after CO-OP; (3) determine if brain changes and motor outcomes are maintained three months post-intervention; and (4) explore the relationship of functional connectivity changes with improved motor function. **Methods and Results**: In this randomized waitlist-controlled study, 24 children with ASD+DCD (8-12y) were randomly assigned to either a treatment or waitlist group and had three resting-state MRI scans over six months. The treatment group received intervention between the first and second scan; the waitlist group received intervention between the second and third scan. Resting-state MRI data were analysed using independent components analysis. Motor outcomes included the Canadian Occupational Performance Measure for child ratings of motor performance and satisfaction, Performance Quality Rating Scale (PQRS) for therapist-observed movement quality, and Bruninks-Oseretsky Test of Motor Proficiency – Second edition for overall motor ability. After CO-OP intervention, Mann-Whitney U-tests showed significant improvements ($p < 0.0006$) in all motor outcomes. Participants showed increased functional connectivity in the left precentral gyrus and right middle frontal gyrus (Cohen's $d = 0.76$ and 0.79, respectively). Motor improvements and brain changes were maintained three months post-intervention. Regression analysis revealed increased connectivity between the sensorimotor network and left insular cortex, correlating with PQRS scores ($r = 0.81$). **Conclusions**: CO-OP intervention effectively improved motor skills and brain functional connectivity in children with ASD+DCD, providing further evidence to support advocacy efforts for CO-OP to become standard of care.

Relevance

Our study highlights the effectiveness of CO-OP intervention in improving motor outcomes and brain functional connectivity for children with ASD+DCD. Despite the high co-occurrence of autism and DCD, DCD is under-recognized in this population and motor problems are rarely the focus of intervention for children with ASD. Our findings have the potential to influence future clinical practice.

275 - White matter changes with CO-OP intervention in children with co-occurring autism spectrum disorder and developmental coordination disorder

Jill Zwicker, University of British Columbia

Background: Up to 88% of children with autism spectrum disorder (ASD) experience motor difficulties consistent with developmental coordination disorder (DCD). We recently showed that Cognitive Orientation to Occupational Performance (CO-OP) intervention was effective in improving motor outcomes in children with ASD+DCD, and that these changes were maintained at 3-months follow-up. As a part of this study, we wanted to know if CO-OP induces positive neuroplastic brain changes in white matter pathways. Thus, the objectives of this study were to: (1) investigate changes in white matter microstructure in children with ASD+DCD after CO-OP intervention; (2) determine whether these brain changes are maintained three months after intervention; and (3) explore the relationship of white matter changes with improvements in motor function. **Methods and Results**: In this randomized waitlist-controlled trial of 24 children (8–12y) with ASD+DCD, participants had an initial MRI and were then randomly assigned to either a treatment or waitlist group. The treatment group received CO-OP intervention (once weekly for 10 weeks), had a second MRI post-intervention, and a follow-up scan three months later. The waitlist group waited three months for their second MRI, received the intervention, and then had a post-treatment scan. Diffusion tensor imaging data were analyzed using tract-based spatial statistics. After CO-OP intervention, children with ASD+DCD showed increased fractional anisotropy (reflecting brain maturation) in cerebellar white matter in vermal lobule VI and middle cerebellar peduncle after CO-OP (Cohen's d = 0.88 and 0.85, respectively). Brain changes were maintained three months post-intervention. Regression analysis found no relationship between white matter changes and motor outcomes. **Conclusions**: The improvements in motor function and white matter pathways in children with ASD+DCD underscore the value of CO-OP interventions as a therapeutic approach with this clinical population. We were likely under-powered to detect the relationship of structural brain changes and motor outcomes.

Relevance

CO-OP enhances motor outcomes and brain structural connectivity in motor and cognitive pathways in children with ASD+DCD. As motor challenges are rarely the focus of therapy for children with autism, study findings can be used to inform future clinical care. CO-OP is a valuable treatment for children with ASD+DCD to learn functional motor skills.

276 - The impact of CO-OP approach on coordination, quality of life, and parenting behavior in Japanese children with neurodevelopmental disorders.

Yuuki Katsuhara, Morinomiya University of Medical Sciences, Mukogawa Women's University; Akio Nakai, Mukogawa Women's, Mukogawa Women's University

Background: DCD significantly affects not only physical education (PE) or sports, but also daily life, social, emotional, and mental health, quality of life (QOL) and learning in children. However, there have been few studies on the mental health and parenting behaviors of caregivers of children with DCD and the changes in these behaviors by interventions with the children. Therefore, the purpose of this study is to examine the impact of the intervention on children with neurodevelopmental disorders, not only on coordination of the child but also on the parenting behavior. **Methods and Results**: Five children (9 ± 0.6 year old) with neurodevelopmental disorders and their caregivers were given Cognitive Orientation to daily Occupational Performance (CO-OP), once 40 minutes, twice a month, for approximately two months. Before and after the intervention, the Canadian Occupational Performance Measure (COPM), Performance Quality Rating Scale (PQRS), Movement Assessment Battery for Children – Second Edition (M-ABC2), DCDQ, the QOL Scale, World Health Organization (WHO) Subjective Well-Being Inventory (SUBI), Positive and Negative Parenting Scale (parenting behavior) were administered. This study was approved by the Ethical Review Committee of the Mukogawa Women's University Research Institute of Education. Results showed that the CO-OP approach improved COPM and PQRS in all cases; M-ABC2 improved in three of the five cases, changed little in one case, and decreased in one case, the latter two cases having Deficit in Attention, Motor control and Perception (DAMP) syndrome. The DCDQ did not change significantly in all five cases. The two cases with worsening PNPS after the intervention had decreased SUBI due to environmental changes and busyness of the caregivers, as well as their inability to actively participate in the intervention situation. In contrast, the two cases in which PNPS improved participated in the intervention setting, suggesting that the child's acquisition of nurturing skills and parenting behaviors may have improved as a result of observing the interaction between the child and the occupational therapist. **Conclusion**: The CO-OP approach has little evidence in Japan, but the fact that these improvements were achieved in less time, duration, frequency than the original protocol suggests that it may be feasible in the Japanese health care system. The results also suggest that the CO-OP program may need to be modified for patients with attention deficit hyperactivity disorder comorbidities.

Relevance

This study revealed the effectiveness of CO-OP for the Japanese children and the need to assess ADHD and to conduct concomitant pharmacotherapy or program modification in cases with DAMP syndrome. In addition, the results showed that encouraging caregivers to participate in the intervention and paying attention to and supporting their mental health may help to change parenting behaviors.

277 - Do undernourished children have a specific physical fitness and motor skill profile? A systematic review and meta-analysis

Yabsra Dubale, Evi Verbecque, Hasselt University; Tefera Belachew Lemma, Beyene Wondafrash Ademe, Jimma University; Eugene Rameckers, Center of Expertise in Rehabilitation and Audiology, Maastricht University, Hasselt University

Background: Undernourished (UN) children, i.e. underweight (BMI for age z-score ≤ -1) and stunting (height-for-age z-score ≤ -2), can have impaired physical fitness and motor skills compared to their well-nourished (WN) peers. Do UN children (age 3-12) have a distinct physical fitness and motor skill profile compared to their WN peers? **Methods**: Three databases (PubMed, Web of Science and Scopus,) were systematically searched (last update: December 2,2022). Methodological quality of the included case-control studies was rated with the Scottish Intercollegiate Guideline Network (SIGN) checklist. The pooled standardized mean difference (SMD) and the standard error (SE) were calculated using random-effects meta-analyses. Heterogeneity among studies was estimated with I2. The level of evidence was estimated with the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) method. **Results**: Nineteen studies were included in the meta-analyses, 14 of which assessed physical fitness and five motor skills. UW children had a significantly lower performance on physical fitness (SMD: -0.849, SE: 0.24, $p < 0.001$, I2: 100%) and motor skills (SMD: -0.134, SE: 0.02, $p < 0.001$, I2: 53%). For physical fitness, UN children have less grip strength (SMD: -2.41, SE: 0.62, $p < 0.001$, I2: 100%), less jump power (SMD: -1.39, SE: 0.35, $p < 0.001$, I2: 99.9%), less anaerobic capacity (SMD: -0.114, SE: 0.03, $p < 0.001$, I2: 62%), similar aerobic capacity (SMD: 0.604, SE: 0.48, $p = 0.208$, I2: 100%) and less flexibility (SMD: -0.166, SE: 0.03, $p < 0.001$, I2: 52.6%). In terms of motor skills, UN children have poorer balance skills (SMD: -0.13, SE: 0.03, $p < 0.001$, I2: 35.6%) and ball skills (SMD: -0.16; SE: 0.04, $p < 0.001$, I2: 8%). **Conclusion**: UN children are less fit and have weaker motor skills than WN peers, evidenced by small-sized differences. Especially strength and power seem to be affected. The heterogeneity across the studies, potentially caused by the included study groups (e.g. type and degree of malnourishment) and the applied outcome measures and variables, may have masked the true differences. More homogeneous studies on the physical fitness and more research into motor skills in these children is needed to help us understand their profiles better.

Relevance

UN children tend to be less fit and have weaker motor skills than WN peers. Especially their strength and power seem to be affected (physical fitness). The differences in motor skills are very small-sized, which may suggest that this is not a core difficulty for them (yet). However, only five studies explored this aspect in varying groups by assessing different types of motor skills.

278 - Persistence of motor-cognitive inhibition deficits in children with developmental coordination disorder with age: a longitudinal perspective

Reza Abdollahipour, Ludvík Valtr, Kamila Banátová, Lucia Bizovská, Tomáš Klein, Zdeněk Svoboda, Palacky University Olomouc; Bert Steenbergen, Radboud University; Peter Wilson, Australian Catholic University, Palacky University Olomouc

Research has shown deficits in motor-cognitive coupling in children with developmental coordination disorder (DCD). However, it remains unclear whether such deficits persist with increasing age over childhood. Using a longitudinal design, the aim of this study was to examine performance changes in cognitive-motor coupling under different levels of inhibitory control in children with DCD compared with typically developing children (TDC). 47 primary-school children aged 6–12 years with DCD (M_{age} = 8.89 ± 1.62 years), and 150 TDC (M_{age} = 9.19 ± 1.51 years) were tested, each divided into 3 age bands (younger: 6-8 years; mid-aged: 9-10 years; older: 11+). Groups were compared after one year on two versions of double jump reaching task: standard (DJRT) and anti-jump (AJRT). Stimuli were presented on a large 42-inch touchscreen, the display consisting of a circular home-base, centered at the bottom, and three target locations at radials of −20°, 0°, and 20°, 40 cm above the home-base circle. For the DJRT, children moved their index finger from a circular home-base to touch the target stimulus as fast as possible; 20% were jump trials where the target shifted left or right at lift-off. For the AJRT, 20% of the trials required an anti-jump movement, touching the contralateral target location. Movement time difference scores (MTdiff) were recorded as the time difference between jump/anti-jump and no-jump trials. Results for the DJRT showed that faster online adjustments to jump targets (i.e., reduced MTdiff) with age was evident only for the TDC group, who were also faster overall. For AJRT, the performance of the DCD cohort was generally slower than TDC, regardless of age cohort. However, there were no interaction effects: for both DCD and TDC groups, each age cohort improved their performance significantly over the 1-year period. The findings show that cognitive-motor coupling does improve in DCD with age, but deficits persist relative to TDC.

Relevance

The findings of the current longitudinal study suggest that cognitive-motor coupling improves with age in children with DCD, but deficits persist compared to TDC. These ongoing performance difficulties during childhood should be considered when designing motor training programs aimed at addressing poor inhibitory control in children with DCD.

References

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279 - Diagnostic validity of the short version of the German Bruininks-Oseretsky Test of Motor Proficiency for developmental coordination disorder

Iva Šeflová, Technical University of Liberec

The Bruininks-Oseretzky Test of Motor Proficiency-Second Edition (BOT 2), a complete form, is considered a clinical objective tool for assessing motor proficiency with a focus on the search for motor difficulties of various etiologies. The short form of the BOT 2 is a derivative screening tool, which in the German version contains 19 selected items out of 53 test items. The aim of the study was to determine the diagnostic validity for DCD of the German BOT 2 short form. Thus, what is the ability of the BOT 2 short form to differentiate persons with and without DCD? The dataset comprised 637 neurotypical Czech children (297 girls, 46.6%) aged 6.00-11.00 years. Motor proficiency was measured using the complete form of the BOT 2, German version (Blank et al., 2014). Motor proficiency of Czech children is average (Total motor composite M = 46.37, SD = 10.50). 6.75 % of children have well-below average values and high risk of DCD prevalence. When assessing differences in means, BOT 2 short form provides statistically lower values for the Total motor composite than BOT 2 complete form ($t_{(636)} = 8.84$, $p < .001$). It places significantly more children in the well-below average category. This is subsequently reflected in the low 49% predictive value of a positive test, which reflects the probability that a child has DCD when tested positively. Diagnostic validity, as expressed by the sensitivity of the BOT 2 short form, is moderate at 77 %. Specificity is high at 94 %, and accuracy is at 93 %. The BOT 2 short form is useful for detecting children with a high risk of DCD and motor difficulties. Its use in practice depends on the diagnostic strategy chosen. The proposed selection of BOT 2 short form test items as a screening tool represents a future challenge for revising the selection of test items. The revision may still modify the overall diagnostic validity.

Relevance

The study evaluates the diagnostic validity of the screening test Bruininks-Oseretsky Test of Motor Proficiency-Second Edition, short form. It evaluates the feasibility of initial detection of DCD in the school setting with possible subsequent refinement of the etiology of difficulties in the clinical setting. This provides a basis for targeted intervention that respects individual educational needs.

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280 - Exploring the intricate relationships between preschool children's gross motor skills and body composition

Sharnay Botha, Stellenbosch University, Coventry University

The developmental trajectory of preschool children is significantly influenced by their body composition and gross motor skills (GMS) and is pivotal in shaping their overall well-being and future health (Orsso et al., 2019). While numerous studies have explored the link between body composition and GMS, limited research has delved into the specific associations between distinct components of each (Sánchez-SanSegundo et al., 2021). This study included 83 children from Coventry between the ages of 5-6 years. GMS were assessed using the Motorisk Utveckling som Grund for Inlarning (MUGI) assessment and body composition was assessed through bioelectrical impedance analysis utilizing the InBody 120 assessment. Pearson correlation revealed a significant relationship between GMS and overall body composition ($r = 0.18$,$p = 0.046$), as well as a relationship between overall GMS and Skeletal Muscle Mass (SMM, $r = 0.278$). Noteworthy findings revealed associations between Object Control and SMM ($r = 0.267$, $p < 0.1$) and Locomotion and SMM ($r = 0.251$, $p < 0.01$). Balance was negatively associated with Body Fat Percentage (BFP, $r = -0.182$, $p < 0.05$) and positively associated with Body Mass Index (BMI, $r = 0.240$, $p < 0.05$) and SMM ($r = 0.2$, $p < 0.05$). Body composition was also correlated with Bilateral Coordination ($r = 0.235$, $p < 0.05$). Positive relationships between Object Control and SMM and Locomotion and SMM indicate that certain motor skills align with skeletal muscle development. Furthermore, the association between BFP and balance suggests that aspects of BFP may influence balance. The positive relationship between overall body composition and bilateral coordination implies that this specific motor skill has a notable impact on the child's overall body composition. This study contributes to existing research by identifying specific links between GMS and body composition components, paving the way for further research and comprehensive strategies to promote holistic development of preschool-aged children.

Relevance

As global childhood obesity rates rise, understanding links between GMS and body composition is crucial. Targeted interventions addressing specific GMS and body composition elements can effectively promote the overall health of preschool-aged children. Insights gained can guide educators in developing holistic interventions considering the connection between GMS and body composition.

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281 - Fundamental movement skills in grassroots soccer: Voices of 9 European countries on knowledge, resources, and barriers to implementation in practice

Ricardo Martins, Matteo Crotti, Coventry University; Christian Bjørndal, James Rudd, Siv Gjesdal, Norwegian School of Sports Sciences; Matthieu Lenoir, Laurens Gilson, Maxime Beuckels, Ghent University; Morten Randers, University of Southern Denmark; André Seabra, Portuguese Football Federation; Mikko Julin, Laurea University of Applied Sciences; Jakub Kokstejn, Martin Musalek, Charles University; Stephan Behan, Aine Macnamara, Dublin City University; Liam Sweeney, Maynooth University; Nicola Lovecchio, University of Bergamo; Farid Bardid, Strathclyde University; Anthony Weldon, Birmingham City University; Michael Duncan, Coventry University

Background: Fundamental movement skills (FMS) are crucial for healthy development and underpin long-term athlete development in sports like soccer. While coaches across Europe receive training in FMS through educational programs, rarely have we heard the coaches' voices in studies related to FMS development through soccer. Coaches' perceptions and delivery practices are unknown and barriers to implementing FMS within grassroots soccer have not been qualitatively explored. Understanding the perspective of those coaches delivering grassroots soccer is vital to promote evidence-based practice. This study investigated coaches' perceptions of FMS across 9 European countries. **Methods**: 1060 grassroots soccer coaches (87.5% male) participated in an online survey (adapted from Duncan et al, 2022). Respondents were asked to define what they thought FMS were. This was then followed by providing them with the definition and exploring their perceptions as well as exploring barriers and types of resources used concerning FMS. The respondents represented a broad age range (18-64+yrs), coaching experience (0 to > 10yrs), age groups coached (U7-U17), and qualifications. Responses to open-ended were examined using content analysis. **Results**: Coach knowledge of FMS varied across countries. Finnish coaches had the highest awareness of the term 'FMS' (87.2%,n=95), while Danish coaches had the least (20.3%,n=12). While most countries' explanations of FMS included terms like "basic motor skills", specific responses rarely listed more than three skills (e.g., run, throw, jump), indicating relative lack of depth on what FMS constitutes. Resources used to develop FMS varied, social media was popular in England and Scotland, websites in Czech Republic and Ireland, and books in Italy and Portugal. The most cited barriers to incorporating FMS were lack of training and time constraints. Inadequate facilities were an additional concern for coaches in Czechia, Italy, England, and Portugal. **Conclusions:** Differences in knowledge, barriers and resources used exist between countries in relation to the use of FMS in grassroots soccer. Understanding such differences can be used to inform future coach development efforts to ensure the optimal use of FMS for the benefit of young soccer players.

Relevance

Exploring coaches' perspectives on FMS and barriers to their use provides rich data to improve coach education programs, ultimately benefiting children's motor development through sports participation.

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285 - Which test is best? Gross motor function of preterm-born children according to gestational age and assessment age: a scoping review

Ankita Surpal, Leanne Johnston, The University of Queensland; Laura Brown, The Macquarie University; Elizabeth Hurrion, The Mater Hospital

Background: Preterm-born children are at higher risk of gross motor difficulties. Regular follow-up assessment is recommended to guide intervention. Many assessment tools are available, but optimal tool selection for each age is unknown. The aim of this study was to profile gross motor function of preterm-born children using standardised motor assessments, with results plotted by gestational age at birth and assessment age from 0-18 years. **Methods**: This scoping review followed PRISMA guidelines and the Arksey and O'Malley methodological framework. Four databases were searched from inception to August 2022 (PubMed, CINAHL, EMBASE, Web of Science). Eligible studies included: (i) original follow-up gross motor data between 1-month-18 years; (ii) for children born extremely, very, or moderate-late preterm; (iii) published in English between 1990-2024. Studies included prospective and retrospective cohorts, clinical trials and cross-sectional studies. Methodological quality was assessed using the Newcastle-Ottawa Scale for Cohort/Case Controlled studies and the Pedro Scale for randomised controlled trials. **Results**: Searches yielded 4,147 papers, with 60 papers included. The four most common gross motor tools were: Alberta Infant Motor Scale (AIMS), Bayley Scale III (Bayley-III), Movement Assessment Battery for Children-2 (MABC-2) and Peabody Developmental Motor Scale-2 (PDMS-2). As gestational age at birth increased, gross motor impairment tended to decrease for children assessed on the AIMS, Bayley-III, PDMS-2 and MABC-2 (aiming and catching subscale). As assessment age increased, gross motor impairment tended to increase for the AIMS, PDMS-2 and MABC-2 (aiming & catching subscale), but scores for the Bayley-III and MABC-2 (balance subscale) remained consistent. Additionally, differences were evident across versions of the same assessment tool, e.g., same children when assessed using Canadian versus Dutch AIMS norms. **Conclusion**: Standardised gross motor assessment scores for preterm-born children vary depending on gestational age at birth, assessment age and assessment tool used. Synthesized data tables were produced to enable interpretation of scores for children at key ages, e.g., birthday milestones and school entry.

Relevance

We mapped follow-up outcomes of preterm-born children according to gestational age, age of assessment and standardised motor assessment tool. This clinical reference will help clinicians, educators, parents and researchers to interpret assessment results and plan intervention for preterm children.

286 - Exploring the impact of obstacle courses on motor competence and autonomous motivation in physical education classes: an intervention study

Elly van Hyfte, Eline Coppens, Ghent University; Delphine Sasanguie, HOGENT University of Applied Sciences and Arts; Kristine De Martelaer, Vrije Universiteit Brussel; Leen Haerens, Matthieu Lenoir, Ghent University

Background: Elementary school physical education (PE) classes offer opportunities for children to enhance their motor development and motivation. Both motor competence (MC) and motivation are crucial factors contributing to sustained engagement in physical activities, particularly in light of the global decline in children's MC. Hence, our study examines how an obstacle course intervention impacts MC and autonomous motivation for physical activity (AMPA) in 6 to 12-year-old children. **Methods and Results**: MC and AMPA were assessed using the Körperkoordinationtest für Kinder (KTK3+) and the Behavioral Regulations in Exercise Questionnaire (BREQ-2) among 1805 Flemish primary school children, covering first, third, and fifth graders. Participants (52.69% boys; 47.31% girls) with a mean age of 8.66 ± 1.63 years (age range 6 - 12 years), were divided into a control group (n = 850) and an intervention group (n = 955), across 121 classes and 39 schools. Assessments were conducted pre-intervention, post-intervention, and five months after the intervention (follow-up). Multilevel regression analyses in MLwiN 3.02 examined intervention effects, taking into account the hierarchical structure of the data. No intervention effects were observed for MC and AMPA. However, a significant time effect ($p = .001$) was found for both MC and AMPA, indicating increasing scores in both groups. The variability observed was primarily at the individual level ($p = .001$), emphasizing the influential role of individual factors. **Conclusions**: While direct intervention effects were not evident, our study highlights the dynamic nature of experiences within PE classes. The positive trend in both MC and AMPA across all groups emphasizes the crucial role of well-designed PE programs as contributor to promoting healthier and more active lifestyles among children. The study underscores the essential role of PE programs in enhancing MC and motivation in children.

Relevance

This study's findings underscore the importance of holistic PE interventions in addressing level disparities in MC and AMPA. PE teachers can tailor programs to meet diverse needs, promoting healthier and more active lifestyles. Schools and policymakers can use this insight to enhance PE curricula, contributing to the overall well-being of children and combating the global decline in MC.

288 - The relationship between motor skills, occupational performance and mental health in Japanese children with neurodevelopmental disorders

Masanori Yasunaga, Osaka University; Nakai Akio, Mukogawa Women's University; Hideki Miyaguchi, Chinami Ishizuki, Hiroshima University; Yosuke Kita, Keio University

Background: Associations between motor skills and executive function have been reported in children with developmental coordination disorder (DCD), but many previous studies have not considered characteristics of other neurodevelopmental disorders such as ADHD and ASD. **Methods and Results**: The participants were 95 children aged 5 to 6 years (mean age 75.8 months ± 3.64 months, 42 boys, 53 girls) enrolled in certified children's centers in Japan and their parents. This study was approved by the Hiroshima University Epidemiology Research Ethics Review Committee (No. E-761) and was conducted with written consent from parents. Participants were divided into four groups: children with DCD traits (DCD-t), DCD-t + neurodevelopmental disorders trait, such as ADHD and ASD(NDD-t), NDD-t not DCD-t, and typically developing children (TD), and the association between motor skill assessment (DCDQ-J and M-ABC2) and executive function (S-AMPS) and mental health (SDQ) was evaluated. The results showed that only the NDD-t + DCD-t group had strong relationship between motor skills of S-AMPS and FM of the DCDQ-J (r=.88, p=.00). There was also a strong correlation between total score of the DCDQ-J and SDQ in TDS (r=-.94, p=.000). There were no correlations in other groups. **Conclusion**: Children in the DCD-t + NDD-t group were more likely to have executive functions and mental health problems than children in the DCD-t only group. The results suggest that it is important to test executive function using the S-AMPS, and to assess comorbidity of other neurodevelopmental disorders, such as DAMP syndrome.

Relevance

DCD trait in early childhood is more likely to be comorbid with other neurodevelopmental disorders and have a greater impact on executive function and mental health especially in DAMP syndrome. Thus, it is possible to propose that a multidimensional assessment and intervention is needed, not only for motor coordination.

289 - Making full use of what's inside the box to rethink outside the box: Using sensor data to establish single metrics for quality of children's movement

Gareth Stratton, Nils Swindell, Claire Barnes, Swansea University; Richard Tyler, Edgehill University; Paul Rees, Huw Summers, Swansea University

Background: Sensors have been used for decades to quantify children's levels of physical activity. A recent rapid assessment of published articles revealed that almost all focussed on quantifying movement. This approach only uses a small amount of the data available from onboard sensors included in most modern devices. More recently new data analytical approaches have provided greater opportunity to think outside the box and to make better use of the data captured by sensors inside the box. Exploring new approaches has also allowed us to develop metrics related to quality as well as quantity of movement. **Methods and Results**: To trial this approach we placed sensors on children completing the Dragon Challenge (DC) (Tyler et al. 2019) which is a dynamic continuous assessment of nine fundamental movement tasks validated for use with 8-14 y old children. Unsupervised machine learning was used to objectively rank movement patterns independent of a-priori scoring criteria. We used analysis by comparison which allowed wide range of movement patterns demonstrated in the nine tasks assessed. We then adjusted sensor output signals using dynamic time warping and cross-correlation to produce a similarity matrix and visualised this data using a 3D plot where the perfect dragon challenge score was centred in a sphere. To externally validate this approach, we compared device generated data with real time assessment of children's performance from 20 expert assessors of the DC and found significant associations. Our novel approach to thinking outside the box using sensors has enabled us to use automated the assessment of children's quality of movement supported by significant associations with expert assessor results. We were also able to visualise the data demonstrating the potential to track improvements in children's quality of movement using sensor derived information. **Conclusion**: Given that assessing movement quality requires significant time and expertise, this approach may minimise in-person assessment allowing sensors to automate the process. This allows more time for practitioners to develop children's movement skills, alongside a sensor system that would provide an immediate feedback loop to track changes in children's quality of movement.

Relevance

The us gif devices has been used to "quantify" children's physical activity for decades. We are seeking to develop insights and approaches to drive "quality" level metrics from such devices. Children wore these devices 24/7 and thus have a system that captures the "ecology" of their movement allowing novel approaches to data analysis and comparison of day to day movement.

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290 - The relationship between gross motor skills and self-perceived motor competence in children with DCD that attend special versus regular education

Sander Panneman, Avans+

Background: The Elaborated Environmental Stress Hypothesis (EESH) is developed to consider the impact of environmental stressors, the variety of circumstances and/or contexts that manifest in either interpersonal difficulty (e.g., peer problems) or intrapersonal difficulty (e.g., low perceived self-competence). It is known that children with neurodevelopmental disorders present with poor self-concept and perceive themselves more often as incompetent in motor skills. However, children with Developmental Coordination Disorder (DCD) attending special education may learn in a more understanding environment, which may impact their self-perception and quality of life (QoL). Hence, the relationship between gross motor impairment and perceived motor competence may be different depending on the type of school. The aim of this study is to investigate the relationship between the objectively measured gross motor skills and the self-perceived motor competence and quality of life. What is the relationship between motor performance and self-perceived motor competence (MCQ) and QoL (EQ-health and KIDSSCREEN) and are these aspects different between children with DCD that attend special education versus regular education? **Methods and Results**: Twenty-three children (6-12 years) with DCD participated in the study, with 11 children (mean age 8.3, SD 2.1) attending regular school and 12 children (mean age 8.9, SD 1.7) attending special education. A significant relation was found between the MABC2 total standard score and successively the MCQ (rp=.635), EQ-health (rp=.696) and the KIDScreen (rp=.617). A significant relation was also found between the MCQ and the KIDScreen (rp=.527) and the EQ-health and the KIDScreen (rp=.497). This indicates that poor motor performance coincides with lower perceived competence and QoL. No differences were found between the children with DCD attending special versus regular schools. **Conclusion**: Although numbers are small, the results point at a relationship between actual motor performance and self-perceived competence and the quality of life, even within the limited range of motor scores of the children with DCD. No differences in self-perceptions or quality of life were found between children with DCD from different school settings.

Relevance

It seems that the relationship between objectified motor performance and self-perceived motor competence and quality of life is apparent in children with DCD, but independent of type of school. This message is important for parents of children that need to consider the transfer towards special education.

291 - How accurate are parent perceptions of physical activity for children with and without autism?

Kerri Staples, Texas Woman's University; Jessica Doty, University of Michigan; Leah Ketcheson, Wayne State University

Background: In addition to providing a benchmark of 60 minutes to achieve health benefits, time spent engaged in moderate to vigorous intensity physical activity (MVPA) is a frequent outcome measure following motor skill intervention. However, the measurement of MVPA differs between studies and the results vary widely. The purpose of this study was to compare parent reports with objectively measured MVPA for children with and without autism. **Methods and Results**: Participants included 48 children with autism and 49 children without autism, ages 3 to 9 years. They were divided into two age groups: 3 to 5 and 6 to 9 years. Parents were asked, "On an average day, how much time does your child participate in activity that makes them sweat or breathe hard?" Responses were based on a Likert scale that increased in 30-minute increments, ranging from 1 (none) to 5 (> 90 minutes). ActiGraph GT3X accelerometers provided an objective measure of MVPA. Among parents of 3- to 5-year-old children with autism, 77% perceived their child to engage in less than 30 minutes and 77% of parents of 6- to 9-year-old children with autism perceived their child to engage in less 60 minutes. More than 86% of parents of children without autism perceived their child to participate in at least 30 minutes. Results of a Spearman's rank-order correlation show no relationship between parental perceptions and objectively measured MVPA for both groups of 3- to 5-year-old children ($p > .70$), with parents underestimating time spent. There were strong, positive correlations between parental perceptions and objectively measured MVPA for both groups of 6- to 9-year-old children ($p < .05$). **Conclusions**: Parents of 6- to 9-year-old children are more accurate in their perceptions of their child's MVPA. However, these better estimates may reflect the time their child spends participating in organized activities. In early childhood, there are fewer opportunities and perceptions may not include time spent participating in unstructured activities. Additionally, parents of children with autism may not perceive the time their child spends engaged in repetitive or stereotypical movements as part of their daily MVPA. To be able to compare results across studies, this measurement issue must be better understood.

Relevance

Physical activity (PA) measurement is fundamental to much of the motor development research that we do. However, measurement of PA differs between studies and results vary widely. For children with autism, there are additional challenges associated with measurement when it comes to the presence of repetitive and stereotypical movements.

292 - Is storytelling in motion a possible methodology for motor development?

Patrizia Tortella, Monia Trovato, University "Kore" of Enna

Background: Physical activity reduces the risk of noncommunicable diseases and can improve executive functions but it is unclear what methodology is most effective for children in elementary school time. There are some studies highlighting that storytelling in motion can be a useful methodology for developing motor skills and executive functions. **Methods and Results**: We conducted a study in Italy, in a 1 elementary classroom, using the methodology of "Storytelling in Motion," comparing it with the regular "school physical education lesson" for 10 weekly 1-hour sessions. A mixed method between-within subjects analysis of variance was conducted to assess the impact of two different interventions on participants' scores in balance tests, PP tests, mixed coordination tests. We only found that both groups show an increase in "standing long jump" test, across the two time periods. The main effect comparing the two types of intervention was significant, F (1, 30) = 9.05, P = .005, partial eta squared = .232. We also analyzed the situation of males and females and found a significant difference in the post long jump test of males (Md = 117, n = 15) and females (Md = 95, n = 17), U = 56, Z = -2.702, P = .006, R =0.48 (medium effect using Cohen criteria). Furthermore a Mann Whitney U Test revealed a significant difference also in the pre medicine ball test of males (Md = 287, n = 15) and females (Md = 245, n = 17), U = 62, Z = -2.474, P = .013, R = 0.44. This would be considered a medium effect. There was also a significant difference in the post medicine ball test of males (Md = 303, n = 15) and females (Md = 246, n = 17), U = 32, Z = -3.6, P < .001, R = 0.64. **Conclusions**: The results show that further studies are needed to understand what are the best methodologies to promote increases in physical fitness skills, motor skills and executive functions. The results also show that in the medicine ball throw and standing long jump tests, males perform better than females.

Relevance

School physical education is a critical point in children's motor development, and it is necessary to understand what conditions exist for it to enable the development of motor skills, physical fitness, and executive functions from a holistic developmental perspective. This study aims to provide a new methodology.

293 - Motor imagery in children with Unilateral Cerebral Palsy (UCP) and Developmental Coordination Disorder (DCD) using Hand Rotation Task: a pilot study

Giada Martini, Eleonora Bieber, IRCCS Fondazione Stella Maris; Elena Beani, IRCCS Fondazione Stella Maris, University of Pisa; Katrijn Klingels, Hilde Feys, KU Leuven; Giovanni Cioni, IRCCS Fondazione Stella Maris; Giuseppina Sgandurra, IRCCS Fondazione Stella Maris, University of Pisa

Background: Motor imagery (MI) is a mental process by which an individual rehearses a given action. This process can be impaired in children with unilateral Cerebral Palsy (UCP) and Developmental Coordination Disorder (DCD), leading to difficulties in motor learning abilities that affect their motor skills. One of the paradigms utilized to assess MI abilities is represented by hand rotation. The hand rotation task (HRT) is a task of hand laterality judgment carried out to study MI abilities in children. We aim to explore differences in MI abilities in children with DCD and UCP compared to typically developing (TD) children. **Methods and Results**: Eight children with UCP, four children with DCD and 10 age-matched TD children, aged from 6 to 10 years old, were included in the study. The HRT consists of 36 hand stimuli presented in different rotation angles and in random order. Children were asked to recognize the laterality of the stimuli. Response time, stimuli rotation angles and accuracy of the HRT were considered as outcome measures. Analyses of variance (ANOVA) with post-hoc tests, and correlations analyses were conducted. Significant interaction effects were found between accuracy, stimuli rotation angles and groups ($p=.04$). In particular, we found a significant difference between children with UCP and TD children ($p=.04$) and between children with DCD and TD children ($p=.01$) both for accuracy and stimuli rotation angles. In children with UCP we also found a significant correlation between reaction time and laterality of the stimuli ($p<.005$). **Conclusion**: These pilot results showed impaired MI abilities in children with UCP and children with DCD, confirming their difficulties in motor learning skills which may in turn affect their motor skills.

Relevance

This pilot study contributes to the study of motor learning skills in the paediatric population. These skills often underlie the motor skills and, in particular, the difficulties present in children with UCP and children with DCD. Expanding studies of motor learning abilities will also open up new rehabilitation perspectives for working on motor problems.

294 - Paediatric anterior cruciate ligament injuries - Exploring the potential role of movement skill proficiency as indicator for injury risk

Theresa Heering, Coventry University, Deakin University; Jason Tallis, Coventry University; Natalie Lander, Lisa Barnett, Institute for Physical Activity and Nutrition (IPAN), Deakin University; Michael Duncan, Coventry University

Background: Paediatric Anterior cruciate ligament (ACL) injuries have been increasing over the past decade and become a burden to health care systems (e.g., high treatment costs) and the individual (e.g., long term health consequences, limited future physical activity participation). Existing risk reduction approaches lack specificity to paediatric populations. We hypothesise that limited movement skill proficiency (e.g., run, throw, squat) considered fundamental for sport participation may increase the risk of paediatric ACL injuries. **Methods and Results**: Movement skill proficiency was assessed with the Test of Gross Motor Development (TGMD) and skills of the Resistance Training Skills Battery (RTSB) (e.g., bodyweight squat, forward lunge) in 28 participants (8 girls) aged 8-14 years recruited from local recreational football teams. ACL injury risk was examined during a linear, horizontal deceleration task and determined through the analysis of biomechanical variables previously linked to ACL injury using 3D motion capture (Vicon, UK) and force plates (AMTI, US). Firstly, spearman rho correlation analysis was conducted between TGMD, RTSB scores and biomechanical variables of the linear, horizontal deceleration task. Secondly, differences in biomechanical variables of the deceleration task were assessed according to skill mastery level (Near-/Mastery vs. Poor). There was strong evidence ($p < .01$) for only 4 out of 832 correlations (e.g., TGMD score and vertical ground reaction force impact ($r = .618$, $p < .01$)). Individuals with a poorer proficiency in nine movement skills (gallop, single-leg hop, horizontal jump, two-hand strike, one-hand strike, overhand throw, underhand throw, bodyweight squat, and forward lunge) displayed poorer management of the deceleration task which potentially leads to higher risk of ACL injury. **Conclusion**: The lack of association may be explained by the pre-planned, isolated movement skill assessment in a controlled environment which contrasts with the characteristics of the ACL injury mechanism. A more dynamic, game like movement skill assessment could provide further insights on the associations between children's movement skill proficiency and variables associated with ACL injury risk.

Relevance

Developing effective injury risk reduction approaches is of international significance with relevance for safe physical activity participation. The current research explores the potential of ACL injury risk identification through movement skill proficiency. Prioritising the development of movement skills in childhood could be an important strategy to reduce the risk of severe injuries in children.

295 - The Process of Clinical Practice Guideline for Developmental Coordination Disorder in Finland

Piritta Asunta, Jamk University of Applied Sciences; Aulikki Lano, University of Helsinki; Heli Sätilä, Päijät-Häme Central Hospital; Helena Viholainen, University of Jyväskylä; Kati Rantanen, University of Tampere, Tampere University Hospital, University of Helsinki; Helena Mäenpää, Helsinki University Hospital; Reetta Tuomisto, 4Fysio, Finnish Association of Paediatric Physiotherapy; Harri Arikka, University of Turku, Turku University Hospital; Sini Martikainen, Fysios Mehiläinen, Finnish Association of Paediatric Physiotherapy; Isa Teeriaho, Etelä-Savo well-being area; Helena Tigerstedt, Villa Vekara, Tallinn Health Care College; Krista Nuotio, University of Helsinki, Helsinki University Hospital, the Finnish Medical Society Duodecim; Jorma Komulainen, the Finnish Medical Society Duodecim

Background: Current Care Guidelines are evidence-based clinical practice guidelines covering important issues related to Finnish health, medical treatment, and prevention of diseases. They are intended as a basis for treatment decisions and can be used by physicians, healthcare professionals, and citizens. The Finnish Medical Society Duodecim develops the guidelines in association with medical specialist societies. The Finnish national guideline for Developmental Coordination Disorder (DCD) aims to improve the early identification of children with DCD, standardize diagnostics and rehabilitation, improve the functioning of children and adolescents, and prevent or reduce long-term psychosocial problems. **Methods**: The international clinical practice guideline for DCD (Blank et al. 2019) gave the initial impetus for starting the process in Finland. The Current Care Guideline for DCD is based on the ICD-10/11 criteria and the recent research on DCD and assessment and treatment practices found to be appropriate in Finland for children who have been diagnosed with motor difficulties. An expert committee of 12 specialists and the Current Care Guidelines editorial team produced the first national evidence-based DCD guideline, which is undergoing a public opinion round before publication in spring 2024. **Results**: The guideline includes 20 different recommendation statements ranging from standardized diagnostic procedures to multiprofessional collaboration and rehabilitation according to the International Classification of Functioning, Disability, and Health (ICF) framework. In Finland, the ICD-10 classification is used in healthcare. Accordingly, a diagnosis of DCD is now included in Code F82 Specific developmental disorder of motor function. In the updated ICD-11 classification, DCD will be diagnosed under the term Developmental Motor Coordination Disorder (6A04). **Conclusions**: The work will raise awareness of DCD in Finland and highlight the perspective of children and adolescents and their families.

Relevance

By improving early identification, standardizing diagnostics, and enhancing rehabilitation, this guideline aims to positively impact children and adolescents. It also seeks to prevent long-term psychosocial and health issues related to DCD. Ultimately, this work will raise awareness of DCD in Finland.

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296 - Intersegmental coordination in forward and backward walking in developmental coordination disorder: a case study

Raphael Mesquita, Arthur Dewolf, UCLouvain

Background: Adult locomotion in patients with developmental coordination disorder (DCD) is characterised by movement execution difficulties and increased variability (Du et al., 2015). The goal of this case study was to compare the intersegmental coordination of lower-limb segments during forward (FW) and backward (BW) walking in a DCD patient (Adult Developmental coordination disorder Checklist: A 34/40 B&C: 86/120) compared to a control group of 10 subjects (CG). We hypothesised that a modified coordination pattern in walking combined with greater variability would be present in the DCD patient, with the ability in adapting to walking conditions (FW vs BW, and with speed) to be lessened in DCD, as compared to CG. **Methods**: Participants walked FW and BW on a treadmill at different speeds for at least 8 strides. Bilateral, 3D kinematics were recorded. General gait parameters and the orientation of the best-fitting plane of the lower limb elevation angles planar covariance were compared between both groups. **Results**: In FW the subject had a larger step width and shorter step length as compared to the CG. BW results were similar between both groups. The coordination of the DCD subject is altered in FW and BW as the shank and foot motion were more in phase but varied little with speed. **Conclusions**: The latter is an important adaption observed in healthy walking, locking the ankle and bringing the foot forwards faster during the swing phase (Bianchi et al., 1998). The constant shank-foot phase could result from poor adaptation and a stiffer, less adaptive ankle, resembling observations in toddler locomotion (Dominici et al., 2007). Despite deviating from average CG results, the DCD subject showed variations that were within the standard deviation (Du et al., 2015), suggesting they lie on the edge of 'standard' locomotion with increased variability and limited adaptation to conditions.

Relevance

Adult DCD is characterised by difficulties in movement and increased variability in motor tasks. The coordination of the limb segments related to walking remains rather unexplored despite being a characterising factor. In this case study we have for the first time observed a modification in the limb coordination.

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297 - Relational systems and network modeling: theoretical and methodological perspective for examining active and healthy performance across the lifespan

Maria Teresa Cattuzzo, University of Pernambuco; Ariane B.D. Santos, Albert L.O. Tertuliano, Debora A.A. Oliveira, Nathalia N. Silva, Anderson H.P. Feitoza, University of Pernambuco

Background: A relational developmental perspective and network modeling together seem to allow appreciation of the hierarchical organization of the "active and healthy development" system during childhood. The objective is to investigate the network of relationships between motor competence (MC), executive functions (EF), physical activity (PA), and cardiorespiratory fitness (CRf) in healthy children, considering age and time as comparison factors. **Methods and Results**: In the cross-sectional study, children (n=213) were allocated in younger (7 to 10 years old) and older (11 to 14 years old) groups; in the longitudinal study, the subjects were children (n=30) tested in the years 2016 (m=8.26 years ± .87) and 2019 (m=11.8 years ± .88); the sub-systems examined were: MC (locomotion, object control and balance); FEs (working memory and inhibitory control); PA (Light PA and Moderate-to-Vigorous PAO) and CRf. Network modeling allowed knowing the topology of the network relationships intra and inter-subsystems and their centrality indices. In both the cross-sectional and longitudinal studies, all elements formed networks and intra-system relationships were stronger than those inter-systems. In the cross-sectional study, the MC was the subsystem with the greatest strength of relationships, proximity, and connectivity, both in the younger (S=1.680; P=1.021; C=1.177) and in the older groups (S=1.878, P= 1.850, C=1.440); PA had the highest values of expected influence in both groups. Longitudinally, the MC was the most central subsystem in 2016 (S= 1.561, P= 1.415, C= 2.458) and 2019 (S=1.918, P= 1.664, C= 1.677); in 2016 the FEs exhibited the greatest expected influence (EI=1.877), and, in 2019, the PA had the greatest (EI=1.045). **Conclusion**: In this sample, network modeling was able to show the relationships between all elements of the "active and healthy development" system. A hierarchical organization was apparent, with the MC being the most elemental subsystem, preceding and remaining the basis for other subsystems; because of its expected influence on the network, it is suggested that PA is a subsystem that can activate the changes in active and healthy developmental systems.

Relevance

An innovative approach for examining active and healthy development across the lifespan.

298 - The relationship between motor proficiency and emotional development in 8 to 9-year-old children: The PERF-Fit study

Wilmarié Du Plessis, North-West University / PHASREC; Clarize Mulder, Daniëlle Neethling Neethling, Elaine Van der Linde, Marincha Van der Merwe, North-West University

Background: Motor proficiency, including skills like coordination, balance, and visual-motor integration, influences not only physical abilities but also fine motor integration, math, reading, and emotional well-being. Therefore, developing motor proficiency can activate a series of changes in areas separate to motor behaviour. The study aimed to find the relationship between motor proficiency and emotional development in eight- to nine-year-old children. **Methods and Results**: A cross-sectional study design was used, with an availability test sample. This study will only use the data of eight- to nine-year-old children that was collected in 2019, 2022, and 2023. Ethics approval was received from HREC to conduct the study and participants consented to take part. The Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2) short-form was used to evaluate motor skills, and the KIDSCREEN for the emotional section. To process the data, JASP Computer Software (Version 0.17.3.0) was utilised. Descriptive statistics (mean, standard deviations, minimum, and maximum values) were generated to categorise participants by gender and age. A Pearson correlation established the relationship between motor proficiency and emotional development in eight- and nine--year-old children and the significance was set at a p-value of ≤ 0.05. A weak significant ($p \leq 0.05$), and sometimes inverse correlation ($r = -1 - 0$) was found between the KIDSCREEN questionnaire and the total BOT-2 short form. In general, the results indicate weak correlations ($r = 0 - 0.3$), suggesting that there is no strong or consistent relationship between KIDSCREEN scores and BOT assessments. An exception was ‘Transferring pennies’ and “Question 9: have you got well on at school?” that showed a statistically significant, moderate correlation ($r = 0.38$, $p < 0.001$). **Conclusions**: Although our study did not find strong significant correlations between the KIDSCREEN variables and the motor proficiency variables, some indications of inverse correlation between the variables was observed. The literature points to a link between these variables and the potential impact it can have on children and their development. Thus, we suggest further investigation into these variables with larger groups and varying socio-economic status and sexes.

Relevance

Teachers and other health care professionals to incorporate class room strategies in order to assist children to develop their emotional capabilities in order to better perform in their motor skills.

299 - The use of wearables to inform interventions to improve movement quality for children with poor movement skills or DCD - The Moves-UP Project

Claire Barnes, Richard Metcalfe, Emily F. Williams, Nils J. Swindell, Chelsea Starbuck, Hannah Barker, Huw D. Summers, Gareth Stratton, Swansea University

Background: Developmental coordination disorder (DCD) is a neurodevelopmental condition affecting fine and/or gross motor coordination. Adequate physical activity levels amongst children are key for the proper development of overall health, however, DCD can negatively impact this aspect of a child's life. Wearable technology have become gold standard to monitor physical activity levels and provided insights to inform intervention. It is thought that whilst prevalent, wearables are yet to be fully exploited and remain an untapped resource. Here we conducted a scoping review to assess the use of wearables to measure quality of physical activity in children with DCD. **Methods and Results**: The databases used were Scopus, Web of Science and SportDiscus. Thirty-one terms were used including motor co-ordination, stability and sensors to encompass the working definitions of quality of movement. Studies that used MEMs devices to measure quality of movement, including accelerometers and gyroscopes were included whereas lab-based motion capture papers were excluded. Three reviewers checked papers for accuracy and appropriateness yielding a total of 124 papers from 2015 – 2020. DCD was underrepresented in the research with just a small number of papers dedicated to this group (n=3). The highest number of papers assessed movement by feature extraction from time series captured by wearables (n = 107) with a small number of studies applying machine learning algorithms and modelling techniques to the data (n = 27 and n = 7 respectively). **Conclusions**: The review showed that a wealth of research has been conducted investigating the use of wearable technology for the purposes of understanding quality of activity amongst children. The review highlighted issues surrounding the consistent definition of quality of activity. Moreover, with low numbers of papers involving the use of machine learning and modelling to convert data from wearables into actionable knowledge, it seems that there is still work required to ensure that this technology is fully exploited particularly amongst children with poor movement skills or DCD who may be one of the groups able to derive the most benefit.

Relevance

Approximately 5 - 8% of children world-wide are affected by DCD. All children are entitled to a physically active childhood, however, DCD negatively impacts this aspect of a child's life. The use of wearables to assess the quality of physical activity has the potential to positively impact both those with the condition and professionals seeking to aid children's development.

300 - Compensatory motor behaviour in children with limb differences

Laura-Ashleigh Bird, Durham University; Raffaele Tucciarelli, Tamar R. Makin, Cambridge University; Dorothy Cowie, Durham University

Background: Every day we perform hundreds of bimanual motor actions – simply opening a water bottle requires one hand to hold the bottle and one hand to turn the lid. Each year, ~500 babies in the UK are born with an upper limb difference, ranging from fused digits to total absence of the hand and arm. These individuals develop unique motor strategies, performing bimanual motor actions without difficulty (Hahamy et al., 2015, Hahamy et al., 2017). Here we study which body parts children use in alternative motor strategies, exploring the flexibility of motor skills during development. **Methods**: Seventy one-handed children and 35 two-handed children (2-9 years) completed a series of everyday tasks including threading beads and separating Lego bricks. **Results**: Whilst two-handed children completed tasks bimanually, one-handed children used alternative effectors 91% of the time to substitute for their missing hand. These included residual limb, torso, mouth, legs, and feet. Compared to two-handers, one-handed children used their non-dominant limb significantly less ($p<.001$), instead using their torso, legs, and feet significantly more ($p<.05$ for all comparisons). With age, decreasing foot use in one-handers correlated with increasing use of the residual limb ($p<.001$). Furthermore, by 8 years one-handed children completed the series of tasks as quickly as two-handers ($p=.26$, $BF10=.83$). **Conclusions**: Our data provide evidence for the theory that motor development is highly flexible (Adolph et al., 2018). Specifically, functional end state development can be achieved despite divergence from the typical path of development. Here, skilled motor action is executed using alternative effectors, and its efficiency matches that of two-handed children by 8 years. However, whilst two-handed children settle on a dominant strategy, using their hands, around 4 years, one-handers maintain a wider solution space for an extended period of development, converging on a preferred strategy much later. Our ongoing analyses explore how converging motor strategies in one-handers are shaped by success and experience, and how effective they are compared to two-handers.

Relevance

Despite missing a hand, children with congenital upper limb differences develop impressive motor skills and functional capabilities. With no known cognitive impairments, these children offer a unique insight into the fundamental principles of motor development. Specifically, the role of exploration and accumulated experience, answering the question, how flexible is the path of motor development?

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302 - Home Sweet Competence: Home affordances and their association with toddler's motor skills and cognitive functioning

Lies Blontrock, Ghent University; Lisa Mertens, Vrije Universiteit Brussel, Ghent University; Matthieu Lenoir, Ghent University; Eva D'Hondt, Vrije Universiteit Brussel; Eline Coppens, Ghent University

Background: From birth on, motor competence (MC) is an important part of children's overall health, also being closely related to other domains of human development and functioning. However, a pilot study in Flemish toddlers (Coppens et al., 2021) revealed a decline in MC compared to 20 years ago. Therefore exploring the underlying factors impacting MC in early childhood is crucial to respond to this decline. One of the factors playing an important role in the development of a child is the physical environment at home and the opportunities it offers. This study assesses the home affordances in relation to the holistic development of young children, encompassing both MC and cognitive functioning (CF). **Methods and Results**: A total of 145 Flemish toddlers (18-30 months) were evaluated in this cross-sectional study. Their environment at home was assessed using the Affordances in the Home Environment for Motor Development Self-Report questionnaire (AHEMD-SR) completed by the parent/guardian of the child. This questionnaire consists of 5 subtests: inside space, outside space, variety of stimuli, gross motor tools and fine motor tools. Toddlers' status of MC was mapped with the Peabody Development Motor Scales, second edition (PDMS-2), and CF was assessed with the Bayley Scales of Infant and Toddler Development, fourth edition (Bayley-4). Correlations were used to examine interrelationships between home affordances and both MC and CF. No significant associations were found between the standard scores of the AHEMD-SR subtests and the gross, fine and total motor quotient of the PDMS-2. However, two significant relationships were found between the AHEMD-SR and the Bayley-4. The standard score on CF of the Bayley-4 correlated positively with the total standard score of the AHEMD-SR ($r = .196$; $p = .032$) and with the score of subitems 'variety in stimulation' ($r = .291$;$p = .001$) and 'fine motor tools' ($r = .286$;$p = .001$). **Conclusion**: These results indicate a positive association between toddlers' CF and the availability of fine motor tools as well as the amount of variety in stimulation. However this study suggests that the different home affordances do not have a direct association with the status of MC.

Relevance

The decline of MC in young children is alarming. Therefore, there is need to map the influencing factors on the early years of child development. More knowledge regarding the physical environmental affordances at home is necessary to develop initiatives, guidelines and awareness for parents and professional caregivers on how to boost their environment and improve toddlers' general development.

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305 - 24-hour movement behaviours in children with and without suspected DCD and associations with fundamental movement skills: the Moves-UP project

Nils Swindell, Chelsea Starbuck, Siqi Jin, Harriet Barker, Swansea University; Gemma Thomas, Jimena Rueda-Hernandez, Catherine Crosby, Singleton Hospital, Swansea Bay University Health Board; Claire Barnes, Department of Biomedical Engineering, Huw Summers, Gareth Stratton, Swansea University

Background: Sufficient physical activity (PA) and sleep, combined with limited sedentary behaviour (SB) is essential for children's physical, cognitive and social-emotional development. PA is important for the development of motor-coordination and future PA participation. However, in children with suspected Developmental Coordination Disorder (sDCD), PA has not yet been examined in relation to the remaining movement behaviours (MB) that make up a 24-hour day. Therefore, the aims of this study were to: (1) investigate whether differences exist in 24-h MB compositions (sleep, SB, light physical activity [LPA] and moderate-to-vigorous physical activity [MVPA]) between children with sDCD and their typically developing (TD) peers; and (2) examine associations between MB compositions and fundamental movement skills (FMS). **Methods**: Eighty-four children (39% female, aged 9.4 +/- 1.0 years) wore a wrist mounted accelerometer (Axivity AX3) for seven consecutive days. Raw accelerometer data were processed in R-package GGIR and cut-point data extracted to estimate daily average sleep, SB, LPA and MVPA. Children were screened for sDCD using the Developmental Coordination Disorder Questionnaire. The Short Form Dragon Challenge (SFDC) was used to objectively measure FMS. Compositional data analysis approaches were applied to compare the relative behavioural profiles of TD and sDCD children. Linear regression models and isotemporal substitution was used to estimate the association of reallocating time between behaviours and SFDC scores adjusting for age and sex. **Results**: Children with sDCD spent 30% and 43% less time in MVPA and sleep respectively and 31% more time in SB than the geometric mean of the whole sample. The 24-h MB composition was associated with stability (r2.20), locomotion (r2.19), object control (r2.21) and SFDC total (r2.19). (all P<.05). The greatest positive changes FMS scores were observed when time was reallocated from LPA to MVPA. Positive changes were also observed when LPA was reallocated to SED. **Conclusions**: The 24-h MB profiles of children with sDCD may predispose them to health and wellbeing outcomes that are inferior to their TD peers. The role of SB and LPA should be reconsidered in the context of FMS.

Relevance

This study shows that children with sDCD have different MB profiles than their typically developing peers which may have implications for their health and wellbeing. This study also reports the relationships between the 24-h MB composition and FMS. Taken together, these findings will inform interventions that enhance movement proficiency, combined with overall health and wellbeing.

306 - Investigating brain-muscle communication in children with Developmental Coordination Disorder (DCD)

Maaike Esselaar, Johnny Parr, Emma Hodson-Tole, Greg Wood, Manchester Metropolitan University

Background: It has been proposed that DCD is a “dysconnection syndrome”, where difficulties faced by people living with DCD may be due to impaired connectivity between brain regions. Our previous work indicated that this dysconnection may impair the efficiency in which cortical signals are propagated to the periphery. Specifically, preliminary evidence implied that impaired isometric force control in DCD might be driven by reduced strength of corticomuscular coherence (CMC) between the cortex and contracting muscles. The results however come from a single case study in adults, and it is not known if this evidence can be extrapolated to children. Therefore, the aim of our study is to investigate whether children with DCD have reduced CMC compared to their typically developing peers. **Methods and Results**: A total of 39 children participated, 23 diagnosed with DCD and 16 typically developing (TD) counterparts. The isometric handgrip contraction was set at 10% of Maximum Voluntary Contraction (MVC) using a handheld dynamometer with their dominant hand. This task simulates the force control that a child would need to successfully squeeze toothpaste onto a toothbrush or manipulate a drinking glass. Children completed 10 sets of 6 (10 seconds) contractions while forearm muscle activity was measured using bi-polar EMG and brain activity measured using 32-electrode electroencephalogram (EEG) cap. **Conclusions**: As the data analysis is pending, the abstract currently refrains from drawing final conclusions. If it holds true, that DCD is a disconnection syndrome and based on a previous case study done in adults, we expect to find lower and less localised CMC in the DCD group compared to the TD group.

Relevance

This study could lend support to the proposal that DCD is characterised by impaired brain-muscle communication. This could lead towards new and innovative diagnosis technologies. The CMC technique can further be tailored to support therapeutic strategies that focus on enhancing corticomuscular communication.

307 - Obstacle crossing during various dual task conditions in children with Developmental Coordination Disorder and typically developing children

Ludvík Valtr, Zdeněk Svoboda, Lucia Bizovská, Tomáš Klein, Kamila Banátová, Reza Abdollahipour, Palacky University Olomouc; Peter Wilson, Palacky University Olomouc, Australian Catholic University

Background: Cognitive-motor dual-tasks are complex goal-directed actions that depend on the underlying capacity for motor-cognitive integration, which is impaired in children with developmental coordination disorder (DCD). The aim of our study was to assess the nature of these difficulties on a locomotor-cognitive dual-task that involves obstacle crossing and landing. **Methods**: Thirty-seven children with DCD and 75 typically developing (TD) in three age groups (7-8, 9-10, 11-12 years) participated. Children walked a 10m walkway with a central obstacle (standardized to 30 % leg length) under single and dual-task conditions. A secondary visual discrimination task (VDT) was presented randomly via a data projector on the walkway, behind the obstacle: children were asked to verbalise the side of presentation (left or right) as quickly as possible (simple condition) or the opposite side (inhibit condition). Performance was measured by foot clearance height, step length and step width using kinematic tracking. Kinetic measures were derived from a force plate and included landing and propulsion immediately after obstacle crossing, both ground reaction force (GRF) and centre of pressure (COP) path. **Results**: Results showed no group or condition effects on kinematic measures. On kinetic measures, however, children with DCD had less braking peak of GRF), less propulsion (smaller 2nd vertical GRF peak) and worse medial-lateral stability (greater standard deviation of COP in medial-lateral direction), indicating a less fluid and adaptive landing, regardless of task condition. For both groups, age was significant on almost all variables. Older children had smaller maximal clearance height of the foot and shorter step during crossing, showing that their landing was more controlled, softer and smoother than younger, and the propulsion more dynamic. Complexity of the VDT did not interact with group or age. **Conclusions**: Children with DCD can perform obstacle crossing with clearance similar to TD peers, but landing and subsequent propulsion after the obstacle is not fluent and requires redundant braking.

Relevance

Our study showed that although there are no differences in manner and success of performance, children with DCD show subtle difficulties in the control of force during landing/braking and propulsion. These difficulties need to be considered when devising motor training programs that aim to improve movement efficiency and reduce the potential for injury.

308 – Characterization of the motor competence of university young adults

José Oliveira-Santos, University of Maia, University of Porto; Sara Ribeiro, University of Maia; Ana Nogueira, University of Maia; Maria João Lagoa, University of Maia

Background: Motor competence (MC) is related to the development and performance of human movement and is defined in the literature as the proficiency presented by an individual in a wide range of locomotor, stability, and gross manipulation skills. Despite growing evidence of the importance of MC for the development of a healthy lifestyle, data regarding certain age groups are still scarce. Thus, with this study we intend to characterize the MC of the student population of the graduation in Physical Education and Sport at the University of Maia, having as reference the Portuguese normative values related to age and sex for the six Motor Competence Assessment (MCA) tests (Rodrigues et al., 2019). **Methods and Results**: The sample consisted of 254 students, with an average age of 18,8 years. To assess the MC of university students, the MCA was used, subdivided into three MC components: locomotor, stability, and manipulative, each of them evaluated by two different objectively measured tests. A descriptive statistical analysis was carried out, considering the gender and age of the participants, and then the mean values obtained in each test were compared with the normative and percentile values proposed for the Portuguese population. Considering the normative values for age, female students are in the 50th percentile in one of the MCA tests (shifting-platforms), and above the 50th percentile in the remaining 5 tests of the MCA, while male students showed greater gaps in MC, presenting results below the 50th percentile in the shuttle run test and shifting-platforms test. **Conclusions**: Students present distinct MC profiles according to sex. Given the normative values for age, male students demonstrated higher gaps in the MC, being below 50th percentile in 2 of the 6 MCA tests. These data are representative of the MC of the university population registered in the Degree in Physical Education and Sport of the University of Maia and will be relevant for future comparisons in the upcoming years, providing a deeper diagnosis and analysis of the MC of this specific population.

Relevance

This study adds data on the motor competence of young university students, and given the relationship between motor competence and the various dimensions of health (physical, mental, emotional), it can provide long term insights on the associations and impact on academic performance, personal and social development, promoting healthy interventions and habits throughout life.

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309 - Postural control while stooping down to pick up an object in unilateral stance in children with Developmental Coordination Disorder

Ludvík Valtr, Lucia Bizovská, Reza Abdollahipour, Palacky University Olomouc; Dorothee Jelsma, University of Groningen; Bouwien Smits-Engelsman, University of Cape Town

Background: The motor organization of anticipatory postural adjustments (APA) and reactive responses is dysfunctional in children diagnosed with Developmental Coordination Disorder (DCD). Although there is ample evidence of DCD-related deficits in balance tasks, less is known about the impact of self-induced movements that require APA for the expected center of pressure (CoP) shifts. The study seeks to address whether children with DCD have developed the ability to make anticipatory adjustments during a stooping movement, compared to typically developed children (TDC). **Methods**: Fifty-nine children (M_{age}: 9.9 ± 1.2 years), including 28 with DCD and 31 TDC, participated in the study. Children performed a modified PERF-FIT Can transition task, which involved a sequence of movements, starting with a quiet one-leg stance, stooping down to pick up and move the can (either 35 cm away or 35 cm toward the foot of the stance leg), and returning to the initial one-leg standing position. Children who were able to complete three successful repetitions for both legs, totaling 12 trials, were included for further data analysis. Each trial was divided into five phases: 1) Initial quiet stance, 2) stooping down, 3) a can being moved, 4) straightening back up, and 5) final quiet stance. Two force platforms were used to record the ground reaction force (GRF) and CoP movement. **Results**: Although children with DCD required more additional trials to complete the task, it did not take them longer to perform the successful trials. Children with DCD had increased sway than TDC, overall. The group-by-phase interaction revealed that children with DCD made larger movements than TDC when straightening back up to an upright one-leg stance. The GRF results revealed that the DCD children leaned more (4.34 N) on the can during descent and ascent compared to the TDC (2.48 N). **Conclusions**: The findings highlight unique patterns of dynamic balance in children with DCD, including difficulties in controlling forward movements, not slowing down adequately in the downward movement and exerting almost twice the force on the can when landing. They also showed increased sway when pushing off during the upward phase.

Relevance

This study emphasizes the importance of studying tasks beyond just standing on one leg to capture nuanced balance challenges in DCD. Motor control impairments associated with DCD during self-induced movements should be potentially targeted during interventions and tailored to support this population. Anticipating the downward force, generating, and fine tuning of the upward force seem to be the major deficits.

310 - Physical activity, fundamental movement skills and lifestyles in children with poor movement proficiency: the Moves-UP Project

Siqi Jin, Gareth Stratton, Nils Swindell, Harriet Barker,Claire Barnes, Chelsea Starbuck, Huw Summers, Gemma Thomas, Swansea University

Background: Being physically literate is vital for the cognitive, social, and emotional development of children laying the foundation for a well-rounded and healthy life. However, some groups of neurodiverse children and those with poor movement proficiency encounter challenges in executing fundamental motor skills, impacting their overall physical activity engagement and movement quality. Existing research underscores reduced participation in physical activity among these children, potentially predisposing them to a sedentary lifestyle and associated health risks. This study aims to study the relationship between variations in children's movement proficiency and their engagement in physical activities, exploring the impact of these differences on overall development. By intricately analyzing how disparities in movement skills influence children's participation in daily physical activities, we hope to identify motor skill and movement behaviour deficits. **Methods**: We have recruited 102 children, aged 8-12, from 4 primary schools. The inclusion criteria consisted of children with typically developing (TD), poor motor proficiency (PMP) and suspected DCD (sDCD). Children have completed a health and activity survey, completed continuous 24/7 monitoring using accelerometers to track their movement trajectories and a measurement of motor competency. A subset of participants have also received a kinematic analysis of select fundamental movements. **Results**: Out of 60 valid responses to the DCDQ+, 33 had sDCD (boys 48%, girls 46%, undisclosed 6%). Physical activity levels, lifestyle behaviours and fundamental movement skills were all lower in the sDCD compared to the typically developing children. These data will be used to develop targeted intervention strategies, fostering the establishment of positive exercise habits in early childhood and enhancing comprehensive health and development in children with PMP. **Conclusions**: By integrating methodologies previously unused in this area we have identified differences in active lifestyle behaviours and FMS between sDCD, PMP and TD groups. Addressing these differences early in childhood is essential for promoting a physically active lifestyle and fostering healthy development and will help inform effective intervention strategies.

Relevance

This is a multidisciplinary study integrating objective measures of fundamental movement skills, lifestyle survey and device measured physical activity in children with suspected DCD, poor motor performance and those who are typically developing. The paper will describe differences in performance measures between these groups of children.

312 - DTW analysis in the examination of the characteristics of the DCD poor handwriting: comparison with Typically Developing (TD) primary school children

Elisa De Francesco, Barbara Caravale, Ludovica Risoldi, Chiara Tracina, Carlo Di Brina, Sapienza University

Background: Poor handwriting is a common feature in the general school population and very frequent among children with developmental coordination disorder (DCD). Its prevalence varies from 10 to 30%, depending on sample characteristics and the methodology used (Karlsdottir et al., 2002). An accurate assessment of handwriting combines paper-and-pencil tests with a computer-based examination. A digitized tablet together with the CSWin-DTW Plugin Software (Di Brina et al., 2008) provides an objective evaluation of the variability of letters' shapes (DTW coherence) and high (DTW LH) (Marquardt et al.,2021) during handwriting and drawing tasks. The aim of this work is to compare children with DCD with typically developing (TD) children through a comprehensive handwriting assessment. **Methods:** We compared 86 TD (mean age 152 months, SD 6.21) and 19 DCD (mean age 130 months, SD 7.67) children in 3°-4°grades using the following protocol: 1) the Concise Assessment Method for Children's Handwriting (BHK) for the evaluation of legibility and speed; 2) computer-based letters handwriting tasks (normal, fast, accurate) and drawing (wheels and eggs) for the evaluation of DTW coherence and LH, surface pressure and kinematics such as frequency and writing time (WT). **Results:** Children with DCD reached significantly lower scores in legibility ($p<0.001$), had longer WT ($p<0.003$), lower DTW coherence ($p<0.009$) and made higher letters ($p = 0.003$) than TD counterparts. In both groups legibility and DTW coherence are influenced by gender (girls achieved higher scores). Legibility of BHK significantly correlates with speed, DTW LH in letter repetition, and DTW coherence in drawing tasks ($p<0.01$). **Conclusions:** DCD children show worse results in some product-based tasks and computer-based measures compared to TD. We confirm that the DTW analysis is a valid technique in the handwriting evaluation of the DCD.

Relevance: DTW analysis is an objective measure of the handwriting output and gives an insight of the letter automation. It correlates with some product-based handwriting tasks in the TD and DCD population. We suggest its use in the evaluation of children with poor handwriting.

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313 – Exploring the role of motor competence on executive function in the first childhood

Ana Nogueira, Maia University; Michael Duncan, Coventry University; Sara Ribeiro, Maia University; Sara Santos, University of Trás-os-Montes and Alto Douro; Maria João Lagoa, Maia University

Background: The study of the relationship between motor development and human cognitive development presupposes that perception and action are closely interconnected. Movement can be seen as a form of primary biological knowledge that can influence learning, for example, mathematics, which is considered a form of biologically secondary knowledge. The main goal of the present study was to relate Motor Competence (MC), which can be defined as proficiency in some motor skills with Executive Function (EF), including Inhibitory Control (IC), Working Memory (WM), and Cognitive Flexibility (CF) on preschool children. **Methods:** The sample consisted of 125 children (aged between 3 and 5 years) from the Gym4PETIZ program, 65 girls and 60 boys. MC was measured by the third edition of the Gross Motor Development test (TGMD-3), which has locomotion and object manipulation subscales, and EF was evaluated through the Early Years ToolBox test. **Results:** The main results, when analyzed by simple linear regression, show that Locomotive skills of TGMD-3 test ((WM- β=0.507; $p<0.001$; $R2$=0.257; ((CF- β=0.337; p=0.001; $R2$=0.114)) and Object skills of TGMD-3 (WM-β=0,324; p=0.001; $R2$=0.105) have a significant effect on 2 of the 3 EF domains, and no significant results were found with the IC domain of EF. **Conclusions:** Contrary to what was expected according to the literature, in addition to no significant results, there is an inverse relationship between IC and MC. There was an increase in literature that proves the relationship between motor and cognitive development and understanding how this happens can be an advantage to focus on this theme and stimulate our children to be more proficient at FMS level. Further studies with higher sample densities are needed to understand and solidify the found results.

Relevance

Considering that children spend more time in the classroom and that there is less opportunity to stimulate fundamental motor skills, understanding that motor competence can have a positive influence on cognitive development highlights the importance of greater focus on this.

314 – Association between physical activity, motor skills, executive function, and behavioral self-regulation in Brazilian median-low-income preschoolers

Natália Lemos, Federal University of Vale do São Francisco; Valerie Carson, University of Alberta; Jessica Mota, University of Pernambuco; Pablo Silva, Andressa Bispo, Lívia Gois, Karoline Araújo, Glacithane Cunha, Morgana Alves, Federal university of Vale do São Francisco; Paulo Bandeira, Regional University of Cariri; Fernando Lemos, Federal University of Vale do São Francisco; Clarice Martins, Federal University of Paraiba,University of Porto

Background: Behavioral Self-Regulation (BSR) in preschoolers is an essential ability for positive social skills development, resulting in the effective application of executive function (EF), such as impulsive control and decision-making skills in daily contexts. Recent studies have investigated whether physical activity (PA) and Fundamental Movement Skills (FMS) can influence EF. However, few studies have examined these associations, considering BSR in preschoolers. This study aimed to examine the associations between PA, FMS, EF, and BSR in preschoolers. **Methods and Results:** Participants included 182 four and five-year-old preschoolers (M= 56.6 ± 3.86 months; 92 male) enrolled in six public early childhood educational centers located in low-income neighborhoods in Petrolina, Brazil. Time spent in Light (LPA), Moderate (MPA), and Vigorous (VPA) PA was measured using hip-worn accelerometers (Actigraph wGT3X-BT). Locomotor (LOC) and Ball skills (BS) were measured through the Test of Gross Motor Development – 3rd edition. EF tasks were performed to assess inhibitory control (IC), visual-spatial working memory (WM), and cognitive flexibility using the Early Years Toolbox. BSR was measured using the Head Toes Knees Shoulder revised protocol. Path analyses were conducted to examine direct and indirect associations between the constructs, with additional adjustments for age, sex, and body mass index. The model explained 21% of the variance in children´s BSR. Inhibitory control, Working memory and Cognitive flexibility were directly and positively associated with BSR (β = 0.29, 95% CI [17.70, 49.66]; β = 0.21, 95% CI [2.36, 11.49]; β = 0.17, 95% CI [0.15, 1.82], respectively). MPA was indirectly and positively associated with BSR through BS (β = 0.07; 95% CI [0.11, 0.56]). BS was indirectly and positively associated with BSR through Inhibitory control (β = 0.06; 95% CI [0.03, 0.33]). **Conclusions:** Our findings suggested that through an indirect path, supporting MPA by Ball skills, besides Inhibitory control, might be a strategy to promote preschoolers´ BSR.

Relevance

BSR is a crucial skill that should be stimulated during early childhood due to its influence on future outcomes. In this regard, improving MPA through FMS might be a pathway to enhance EF skills and BSR. Future longitudinal and intervention approaches are needed to investigate the causal relationship between PA, FMS, EF, and BSR in preschoolers.

316 – Physical exercise intervention with parents versus parents on motor competence in early childhood: Gym4PETIZ program

Maria João Lagoa, Ana Nogueira, Sara Ribeiro, Maia University; José Oliveira-Santos, University of Maia, University of Porto; Sara Santos, University of Trás-os-Montes and Alto Douro

Background: Intervention programs intended to promote Fundamental Motor Skills (FMS), like a Gym4PETIZ-Physical Exercise for Toddlers and Infants in Family program, are essential for child development. Additionally, the literature has shown little evidence of the active participation of parents during physical exercise interventions. In this regard, this study aimed to verify the effect of the active participation of parents during the Gym4PETIZ, a physical exercise intervention, on motor competence (MC). **Methods and Results:** The sample comprised 27 infants (< 3 years) and 78 preschoolers (>= 3 years) (41.24±15.04 months), of which 47.8% were girls and 52.2% were boys. We had an Intervention Group With Parents (IGWP; n=27) and an Intervention Group Without Parents (IGOP; n=78). The intervention exercise was implemented once a week for 12 weeks. MC was assessed through the Peabody Developmental Motor Scales (PDMS-2) for infants and the third edition of the Test of Gross Motor Development (TGMD-3) for preschoolers. For the descriptive analysis, the percentages of relative changes (%Δ) were calculated as a function of the baseline (TP0) and the second assessment (TP1): [(TP1-TP0)/TP0]*100. Analysis was carried out to compare means using the t-test for paired variables. A GLM-Repeated Measures ANCOVA was applied to analyse the longitudinal effects. There were significant improvements at the end of the intervention in both treatment groups for Fine Motor Quotient in < 3 years (FMQ); for Gross Motor Quotient in < 3 years (GMQ); for Locomotion in >= 3 years (LO), but not for Ball Skills in >=3years (BS). The %Δ mean were higher in the IGWP (FMQ: %Δ 22.63±20.65; GMQ: %Δ 14.19±16.74; LO: %Δ 42.30±52.81; BS: %Δ 9.40±21.41) in comparison to IGOP (FMQ: %Δ 09.12±12.48;GMQ: %Δ 11.45±12.35; LO: %Δ 38.77±115.84; BS: %Δ 2.58±29.05), however the differences were significant only for BS (F= 4.52; p<0.05). **Conclusions:** In conclusion, Gym4PETIZ interventions tended to have a positive outcome in infants and pre-schooler's MC, specifically with the inclusion of parents in the intervention. In this way, interventions with parents can be considered for future implementations to promote MC and parents' involvement, as a key relevant indicator for interventions that extending to the family.

Relevance

Gym4PETIZ can be a future strategy for the development of FMS in a family context. This study will provide new evidence for the long-term effects of an active lifestyle to promote a pleasant motor development for children. The active participation of parents in intervention classes can improve parental education on the importance and development of MC and an active lifestyle in early childhood.

317 - French adaptation and validation of the Adult Dyspraxia/Developmental Coordination Disorder Checklist

Sarah Seiwert, Joseph Tisseyre, Jessica Tallet, Université de Toulouse

Background: Motor disorders due to DCD persist into adulthood in 30 to 87% of cases (Kirby et al., 2010). However, there are no specific criteria for DCD diagnosis in adulthood and international recommendations propose using the same criteria as for children with some adaptations (Blank et al., 2019). Two of these criteria can be assessed by the Adult Dyspraxia/Developmental Coordination Disorder Checklist (ADC) (Kirby et al., 2010), one of the few standardized tools designed for adults. It aims to evaluate motor difficulties and their impact on daily life during childhood and adulthood. This self-report questionnaire was created and validated in English and Hebrew and then adapted in several other languages but there is currently no equivalent in French. The present study aims to validate a French version of the ADC to contribute to the standardization of adult DCD assessment.
Methods and Results: To validate this French version, we plan to include 150 to 200 adults between 18 and 60 years, counting 25 with a diagnosis of DCD. Participants will complete the ADC and a test measuring the quality and speed of handwriting. Some participants will also complete a test assessing their level of motor skills, a test measuring motor learning, and the ADC a second time 15 days later. Statistics analyses will be computed to verify the psychometric qualities of the questionnaire: structural validity, internal consistency, test-retest reliability, concurrent validity, and hypotheses testing. The method was approved by a French Ethics Committee. Results will be presented in the poster.

Relevance

European and French recommendations support the development of studies focused on assessment tools for DCD in adults. The adaptation and validation of existing questionnaires in different countries is important to identify the difficulties of adults with DCD, leading to better guidance for adults. This validation will also unify the tools used to assess DCD in adults at an international level.

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319 - The mediating role of motivation in the relationship between motor competence and life skills

Nuria Ortega-Benavent, University of Valencia, Florida Universitaria; Cristina Menescardi, Sergio Montalt-García, Jorge Romero-Martínez, Xavier García-Massó, Isaac Estevan, University of Valencia

Background: Life skills are the behavioral and cognitive competencies necessary to achieve a good quality of life. Some of these skills are teamwork, goal setting, time management, emotional skills, interpersonal communication, social skills, leadership, problem solving, and decision making and are largely developed through sport. Considering the current challenges of sedentary lifestyle and physical inactivity in society, it is necessary to understand the different factors that influence physical activity (PA) participation. Further correlates of PA are motor competence (MC) and autonomous motivation that play an important role not only in promoting physical well-being, but also in the overall development of individuals, strengthen their life skills. For this reason, the main objective of this study was to analyze the relationship between MC and life skills during adolescence and how motivation influences this relationship. **Methods and Results:** A sample of 162 (76 girls, 46.9%) students aged 12-15 years from four different Secondary schools participated in this study voluntarily. They completed two questionnaires on motivation (PLOC) and life skills (LSSS), followed by a MC test (CAMSA). Bivariate correlations controlled for gender and age were performed. The analyses revealed an association between MC, motivation, and life skills. The causal relationship model, conducted with the SPSS Process macro, showed a significant relationship between MC and life skills both directly and mediated through motivation. **Conclusions:** MC and the more self-determined motivation seem to have a role in fostering life skills. Secondary school physical education teachers' interventions should not only be focused in enhancing actual MC but authentic motivational climates that satisfies basic psychological needs through PA environments. It might benefit life skills which in turn help students to achieve benefits for their adult life.

Relevance

It is increasingly difficult for children and adolescents to understand the complex world around them. Therefore, it's interesting to learn about the different factors that influence the promotion of life skills that help them to cope and benefit them throughout their adult life.

320 - Are there differences in rhythmic sensorimotor synchronization deficits between Developmental Coordination Disorder and/or dyslexia?

Anaïs Desbernats, Université de Toulouse; Mélody Blais, Université de Montpellier; Margaux Lê, Aix-Marseille-Université; Mélanie Jucla, Université Toulouse II, Toulouse, France; Jessica Tallet, Université de Toulouse

Introduction: Sensorimotor synchronization (SMS) is a human rhythmic skill that involves the coordination of motor behavior with an external rhythm (Repp et al., 2013). Some neurodevelopmental disorders, such as developmental coordination disorder (DCD) or developmental dyslexia (DD), have deficits in SMS (Lense et al., 2021), but it remains unclear whether certain task parameters, such as response and sensory stimuli modalities, differentially affect these two disorders and DCD+DD comorbidity. **Methods:** 55 children (120 ± 14 months), divided into four groups according to their disorder (DCD, DD, DCD+DD, and controls CTRL), performed SMS tasks in which they had to synchronize either their tapping or verbal responses in synchrony with either visual or auditory isochronous rhythmic stimuli. Measures of SMS stability and accuracy were computed using circular analyses (Berens et al., 2009). Mixed models controlling for participant and trial were computed to test the effects of Stimuli Modality, Response Modality, and Group. **Results:** As main results, Group effects revealed that DCD children produced less stable responses than CTRL, and that DD and DCD+DD produced less accurate responses than CTRL. Significant Stimuli Modality x Response Modality interactions revealed that tapping with VIS stimuli led to the least stability and that verbal responses with AUD stimuli led to the least accuracy. **Conclusion:** In general, verbal responses were more stable than tapping, but the sensory modality of rhythmic stimuli modulates this. Our results confirm that DCD and/or DD lead to deficits in SMS, but the deficit is expressed either in stability synchronization (DCD) or in accuracy (DD and DCD+DD). These results provide new perspectives for rehabilitation with SMS in children with neurodevelopmental disorders.

Relevance:

Our study contributes to a better knowledge of the specific rhythmic deficits in neurodevelopmental disorders (DCD, DD and DCD+DD) and the parameters that influence rhythmic SMS. Our results may help to adapt rehabilitation programs based on rhythmic skills according to each neurodevelopmental disorder.

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321 – The effect of a core-stabilization functional training program on physical fitness and health-related quality of life in adolescents

Sofia Monastiride, Ermioni Katarzi, Maria Kontou, Ioannis Pappas, Aristotle University of Thessalonik

Background: It is well documented that core stability is a key factor that improves functional ability, performance in daily activities and health multi-dimensionally. A core stabilization exercise program can contribute to the physical fitness (PF), health and psychosocial development of adolescents. The study aimed to investigate the effectiveness of a core stabilization functional exercise program on health-related PF and health-related quality of life in adolescents. **Methods and Results:** 68 adolescents were assigned to two groups; an experimental (n=29; mean age 12.4 ±0.54) which participated in a 12-week (three 50-min sessions per week) intervention and a control group (n=39; mean age 12.8 ±0.67). A "Sit-up test" and "Sit and Reach test" were performed both pre- and post-intervention and after a 3-week follow-up period. The TACQOL-CF questionnaire was used pre- and post-intervention. ANOVA was used to test the main and interaction effects for all variables. Bonferronis post-hoc tests were used to examine the difference of the variables pre, post, and follow-up. The results showed that the intervention improved the abdominal muscle strength significantly ($p<0.05$) and these improvements were maintained at follow-up. General physical functioning/complaints, motor functioning/performance, cognitive functioning, school performance and positive moods were improved post-intervention showing enhancement in health-related quality of life. **Conclusions:** The present study showed evidence that a core stabilization functional exercise program can positively affect adolescents' health-related PF and health status. It is suggested that such an intervention approach is applicable within the physical education curriculum at school or during extra-curricular and out-of-school physical activities for adolescents.

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322 - Effectiveness of CO-OP in preterm born children with developmental coordination disorder: A diffusion tensor imaging study

Olivia Tsihlias, University of British Columbia; Margot Mackay, BC Women's Hospital, University of British Columbia; Anne Synnes, BC Children's Hospital Research Institute, University of British Columbia, BC Women's Hospital; Ruth Grunau, BC Children's Hospital Research Institute, University of British Columbia; Steven Miller, Jill Zwicker, University of British Columbia, BC Children's Hospital Research Institute,

Background: Compared with children born at term, children born very preterm (VPT; ≤32 weeks gestational age) are 6-8 times more likely to have Developmental Coordination Disorder (DCD). The Cognitive Orientation to Occupational Performance (CO-OP) approach is a therapeutic intervention for children with DCD that uses cognitive strategies to achieve motor skill acquisition. Diffusion tensor imaging (DTI) allows for the analysis of how white matter microstructure can change with CO-OP by measuring the diffusion properties of water in the brain. The rationale of the study was to determine if CO-OP intervention improves white matter microstructure and motor outcomes of VPT children with DCD. **Methods and Results:** 15 VPT children [mean age (SD): 9.2 (1.6) years; mean gestational age (SD): 27.1 (2.2) weeks] were diagnosed with DCD. Children underwent three MRI scans: (1) a baseline scan three months before CO-OP; (2) at the start of CO-OP; and (3) after the intervention. Each child received CO-OP intervention once weekly for 10 weeks. The whole brain and regions of interest (e.g., cerebellum, corpus callosum, corticospinal tract) were captured and measured with Diffusion Tensor Imaging indices [fractional anisotropy (FA), mean diffusivity (MD), axial diffusivity (AD), and radial diffusivity (RD)]. Motor outcomes were measured with the Canadian Occupational Performance Measure (COPM) and the Performance Quality Rating Scale (PQRS). Children showed statistically significant and clinically meaningful improvements in self-identified motor goals after CO-OP [COPM-performance mean (SD) change: 4.03 (2.19), $p < 0.001$; COPM-satisfaction mean (SD) change: 4.22 (2.12), $p < 0.001$; PQRS mean (SD) change: 2.52 (1.48), $p < 0.001$]. Analysis of DTI data is currently ongoing. We expect to see white matter microstructural changes that reflect the improvements in motor functioning after CO-OP through increases in mean FA and AD and decreases in mean MD and RD, reflecting brain maturation**. Conclusion:** CO-OP is effective in improving the motor skills of VPT children with DCD. We expect to find positive neuroplastic changes in brain structural connectivity associated with CO-OP intervention, providing further evidence of the effectiveness of this treatment approach.

Relevance

Children born very preterm (VPT) are at higher risk of DCD compared to term-born children. Without therapeutic intervention, the motor deficits of DCD consequently impact academic performance, leisure pursuits, and mental health. This research demonstrates the effectiveness of CO-OP intervention, and is the first study to show the beneficial effect of this intervention for VPT children with DCD.

323 - The association of motor competence, health-related fitness, and perceived sport competence with dropout from organized sports during adolescence

Iiris Kolunsarka, University of Jyväskylä

Background: It is well established that motor competence and fitness are associated with physical activity in children. Motor competence can be viewed as a cornerstone for a physically active lifestyle. For children, a common way to engage in physical activity is through participation in organized sports. However, dropout rates from organized sports accelerate in adolescence, and there is limited evidence regarding the role of motor competence and health-related fitness. Therefore, this study aimed to examine how baseline health-related fitness, motor competence, and perceived sport competence at the age of 11 predict dropout from organized sports participation over the following four years. **Methods:** Out of 1162 participants, 672 children who were involved in organized sports at baseline were included in the analysis (Mean age = 11.37 ± 0.37). Motor competence, physical fitness, and BMI were assessed by trained researchers, while perceived sports competence and organized sports participation were evaluated through a questionnaire. All predictors were assessed at age 11, and a binary logistic regression model was employed to predict participation and dropout by age 15. **Results:** Motor competence (throw-catch combination, 5-leaps, and lateral jumps) and physical fitness (shuttle run, push-ups) at age 11 significantly predicted dropout from organized sports by age 15. BMI and perceived sports competence were not significant predictors. **Conclusions:** Enhanced motor skills and health-related fitness may encourage children's participation in organized sports throughout adolescence, which is a critical period for adopting lifelong physical activity behaviors. Early promotion of motor skills and health-related fitness could facilitate children's involvement in organized sports.

Relevance

Previous studies have shown that those children who participate in organized sports tend to be more physically active and have better fitness. This study offers evidence that better motor competence and health-related fitness at the age of 11 predict continued participation in organized sports at the age of 15, emphasizing the crucial role of motor skills and fitness development in early childhood.

324 – Neuromaturational factors, motor competence and numeracy in median-low-income Brazilian preschoolers

Natália Lima Quirino, Federal University of Paraíba; Natália Lemos, Federal University of Vale do são Francisco; Rafael Miranda Tassitano, Federal University of Paraiba, University of Illinois; Clarice Martins, Federal University of Paraíba

Background: Numeracy is a relevant learning skill to be developed in the preschool years, and refers to the ability to process, communicate, and interpret numerical information. Studies have investigated how the performance in cognitive tasks might influence numeracy and showed a positive relation between cognitive flexibility (CF) and early numeracy. Although an existing association between CF and motor competence, few studies have explored the potential of motor competence to promote preschoolers´ numeracy, and the results are conflicting. Thus, this study aimed to analyze the association between neuromaturational factors and motor competence with preschoolers´ numeracy. **Methods and Results**: 69 children (56.9±4.36 months of age; 40 girls) enrolled in 6 municipal early childhood education centers in Brazil participated in the study. Neuromaturation factors were described as age and Cognitive Flexibility (CF) performance, assessed using the Early Years Toolbox. Locomotor and object control skills were measured using the Test of Gross Motor Development 3 (TGMD-3) to determine children´s motor competence and fine motor skills of the right and left hands were assessed using the 9-hole pegboard test. Numeracy was assessed using the Early Numeracy test. To identify a possible association between the independent variables, on the dependent variable numeracy, a Generalized Linear Model (GZLM) was performed, with additional adjustments for sex, age, and body mass index. The significance level was set at $p < 0.05$. Results highlighted that CF ($\beta = 0.91$, $p = 0.02$) and right-hand fine motor performance ($\beta = -0.93$, $p = 0.03$) were significant predictors of numeracy. **Conclusions:** CF and right-hand fine motor skills significantly predicted numeracy in preschoolers.

Relevance

Our findings identified the association of Cognitive Flexibility (CF) and Fine Motor Skills of the right hand on the development of numeracy in preschoolers from low socio-economic backgrounds. Future longitudinal and intervention studies on CF and fine motor competence could be applied to determine their long-term effects in children´s numeracy.

325 - Enhancing early motor competence and family physical activity: the impact of the ‘Footie Families’ programme in Wales

Anna Stevenson, Nalda Wainwright, Andy Williams, University of Wales Trinity Saint David

Background: ‘Footie Families’ is a community-based motor skill program in Wales designed to enhance preschool children's motor competence and promote family physical activity, utilising the popularity of football. Recognising the importance of early motor skill development and the risks associated with physical inactivity, ‘Footie Families’ integrates principles from Successful Kinaesthetic Instructions for pre-schoolers (SKIP) and engages parents in joint physical activities with their children. **Methods and Results:** This study evaluated the impact of ‘Footie Families’ on children's motor competence and family physical activity through a mixed methods pre-post design involving thirty-two families. Motor competence was assessed using the second edition Peabody Developmental Motor Scales (PDMS-2) and the Athletic Skills Track (AST-1), while family co-participation in physical activity was measured through a questionnaire (O’Connor et al., 2014). A process evaluation considered the implementation and mechanisms of impact. Results indicated significant improvements in children's motor competence across various skill domains after participation in ‘Footie Families’, highlighting the effectiveness of the program. Additionally, there was a positive change in parent engagement in physical activity, emphasising the importance of parental involvement in promoting children's physical development. The process evaluation indicated how the provision of equipment and program experiences influenced a change like physical activity supporting greater engagement in object control skills. **Conclusions:** This study underscores the value of community-based programs like ‘Footie Families’ in fostering early motor skill development and family physical activity, offering insights for future interventions in promoting holistic physical literacy among preschool-aged children.

Relevance

The ‘Footie Families’ program in Wales promotes early childhood development and family engagement in physical activity. By targeting motor skill development in pre-schoolers and involving parents in joint activities, it contributes to community health and well-being, offering insights for policy initiatives.

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326 - A pilot study to assess the impact of professional development training for preschool staff incorporating SKIP-Cymru on children's motor competence.

Nalda Wainwright, Anna Stevenson, Amanda John, Kirsty Thomas, University of Wales Trinity Saint David

Background: In Wales, sedentary behaviour levels of young people are some of the poorest globally (1). Developmental models recognise early years as key for developing foundational skills that will drive later physical activity (2). Lack of training in physical development contributes to teachers' knowledge gaps in supporting young children's motor skills. A program of professional development incorporated principles of SKIP (Successful Kinaesthetic Instruction for Pre-Schoolers) (3) into the play-based approach of pre-schools in Wales SKIPCymru. The program, accredited at level 3 for preschool staff, involves online learning and face-to-face practical workshops. **Methods and Results:** Settings in Wales (n=4) took part in the pilot. Staff completed the accredited training. A pre-post design was used to assess the impact of the staff's training on the skills of children aged 36-43 months over a 14-week period. Fidelity of implementation was assessed with activity tracking sheets and two observation visits. Motor competence was assessed using the gross motor portion of the Peabody Developmental Motor Scales – 2nd Edition (PDMS-2) to assess children's motor competence. Analysis revealed a statistically significant increase in gross motor standard scores between pre and post data ($n = 21$, $Z = -3.925$, $p < 0.05$). Gross motor quotients showed notable improvements from pre-test to post-test. At pre-test, 87% of the sample were identified as below average or poor in their motor competence highlighting concerning levels of delay. At post-test, the sample of children had a shift in their motor competence status, with only 33% below average and none in the poor category. **Conclusion:** These results indicate the potential of accredited practitioner training in facilitating positive outcomes for children, particularly those at risk of motor competence delays, and emphasise the importance of investing in training for staff to ensure physical development in early childhood.

Relevance

Children in Wales have low levels of physical activity and some of the highest levels of overweight and obesity in Europe. Training adults who work with young children to support motor development is needed if we are to address the chronic delays, we are seeing in pre-school children's physical competence. A training programme that is effective in empowering pre-school staff to change children's outcomes is significant.

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327 - Effects of a Game-Based Movement Education Program (GMEP) on the actual and perceived motor competence and physical activity levels in preschool children

Neslisah Yaren Kirci, Suheda Dilay Kizilca, Emine Caglar, Menekse Boz, Erdem Karabulut, Ayda Karaca, Giyasettin Demirhan, Hacettepe University

Recognizing the significance of Fundamental Motor Skills (FMS) during early childhood as well as enhancing motor skill competency through interventions such as game-based movement, are essential for establishing active lifestyles. To date, limited studies have investigated the impact of an intervention program incorporating precise motor skill instructions, as assessed for reliability by experts, on both actual and perceived motor competence, as well as physical activity levels. This study aimed to investigate the impacts of an 8-week Game-Based Movement Education Program (GMEP) on actual and perceived motor competence, along with physical activity levels. Fifty-five preschool children, aged 5-6 years, were randomly assigned to experimental (n=29) or control (n=26) groups. The experimental group participated in an 8-week GMEP (30 min·day-1, three days·wk-1) that was specifically designed with the aim of improving FMS. The control group was instructed to maintain their standard curriculum. Physical activity levels, actual and perceived motor competence of both groups were measured at baseline, post-intervention, and one-month follow-up. Physical activity levels were also measured with accelerometer. A significant increase was observed in actual locomotor (partial eta squared ($\eta p2$)=0.705) and object control skills ($\eta p2$=0.577) in the experimental group after the intervention ($p<0.001$). The intervention program significantly improved perceived locomotor ($\eta p2$=0.168) and object control skills ($\eta p2$=0.253) ($p<0.05$). These improvements remained evident in the follow-up measurements for actual and perceived locomotor and object control skills in the experimental group, compared to the baseline scores ($p<0.05$). A slight improvement in actual locomotor skills was also noted in the control group ($p<0.05$), with no significant change in actual object control skills and perceived motor competence ($p>0.05$). A significant change was observed over time in the mean scores for moderate to vigorous intensity physical activity for both groups ($p<0.05$), with no difference between groups ($p>0.05$). To conclude, an 8-week GMEP improves young children's actual and perceived motor competence, with modest effects on physical activity levels.

Relevance

Demonstrating how the game-based intervention program will affect the physical activity (PA) level by improving perceived and actual motor competence will provide data for education and public health authorities to create evidence-based school and community programs to increase PA levels in children.

328 - The neural basis of motor sequence control in individuals with Dyspraxia/Developmental Coordination Disorder

Helena Wright, University of Birmingham; Rhys Yewbrey, Bangor University; Kate Wilmut, Oxford Brookes University; Katja Kornysheva, University of Birmingham

Behavioural research suggests that motor deficits in Dyspraxia/Developmental Coordination Disorder (DCD) are related to alterations in the planning of movement sequences, but it is unclear which neuro-functional mechanisms of motor sequence control are affected. Motor sequence planning and execution are associated with movement-related desynchronisation in the beta band (MRBD), a marker of excitation of the motor system, followed by a beta rebound (PMBR) immediately after the movement ceases. Further, neurophysiological and behavioural findings in controls show that movements in a sequence are internally pre-ordered in parallel during the planning and predict the quality of subsequent performance. We set out to study whether DCD individuals show reduced excitatory and inhibitory neural modulation and sequence pre-ordering during the peri-movement phase. Participants took part in a sequence learning study where they performed two 4-element finger sequences from memory after a 1s delay (delayed sequence production task) over four sessions and scanned in the Magnetoencephalography (MEG) scanner after a refresher of the delayed sequence production task. During training, DCD was affected in the sequence accuracy rate ($p<.001$), as well as initiation speed ($p=.004$) and movement duration ($p=.003$) in trials with correct sequence production. In addition, they showed behavioural markers of reduced preordering of movement in the upcoming sequence ($p=.026$, $p=.014$) for reaction time and error probe trials respectively. Our preliminary MEG findings (N=10 out of target 16 age-matched controls and N=4 out of target 16 participants with clinically diagnosed DCD) suggest that DCD individuals tend to have a less pronounced MRBD and PMBR during planning and after execution, respectively, relative to a rest baseline, and engage a broader set of neural resources outside the contralateral primary motor network. Multivariate pattern decoding will be used to examine the neural preordering of movements during planning and its relationship to the oscillatory markers in the peri-movement phase. These findings will advance our understanding of the neural and informational control of motor sequences in DCD and may provide entry points for future interventions.

Relevance

Individuals with DCD can struggle with acquiring and controlling sequences of movement for fine motor control i.e. typing. This research examines the differences in neural function and organisation of movements just before, during and after a movement sequence is produced from memory

329 - The relationship between physical activity and motor competence of Foundation Phase children in Wales during the school day

Amanda John, Nalda Wainwright, University of Wales Trinity Saint David; Jackie Goodway, The Ohio State University; Andy Williams, University of Wales Trinity Saint David

Introduction: Early childhood is a crucial time for children to develop their motor competence serving as a foundation for engagement in lifelong physical activity (Robinson et al., 2015), and the foundations for physical literacy (Whitehead, 2010). With increasing concerns over the declining levels of physical activity and motor competence, this study aimed to examine the physical activity levels of children during the school day and look at the relationship with motor competence. **Methods and Results:** Children (N=85) in five classes from four different settings with a mean age of 68.96 months wore ActiGraph GT3X-BT accelerometers (ActiGraph Corp., Pensacola, FL) for a whole week during the school day. Motor competence was measured using the Test of Gross Motor Development Second Edition (TGMD-2) and Movement Assessment Battery Second Edition (MABC-2) and a standing jump standardised by height. Results suggest that the children spent an average of 48.7% of the school day in sedentary behaviour and 9.1% in moderate to vigorous physical activity (MVPA). Children did not achieve 60 minutes of MVPA during the school day. A two multiple regression model found that object control skills (TGMD), standing long jump, and age significantly predicted the percentage of time spent in sedentary behaviour ($F(10,73) = 3.026$, $p = .003$, .29 (adj .20)) and time spent in MVPA ($F(10,73) = 3.597$, $p < .001$, .33 (adj .24)). Results also showed a significant multivariate main effect for gender ($F(2,78) = 4.69$, $p = .012$, = .11). Girls spent more time than boys in sedentary behaviour and boys spent more time than girls in MVPA. **Conclusions:** This study reveals that the school day alone is insufficient for children in a play-based curriculum to meet the recommended 60 minutes of physical activity set by UK Chief Medical Officers and the pivotal role teachers and parents play in providing opportunities for children to be PA. Children who could jump further and had better OC skills spent more time in MVPA. This reinforces the crucial role of developing motor competence, particularly OC skills, and the need for investing in comprehensive programs and initiatives that prioritise development during early childhood.

Relevance:

The study highlights the need for interventions to improve motor skills in early childhood as those children with better object control skills were more physically active. It also demonstrates that time needs to be created for physical activity opportunities outside of school to ensure children meet daily recommendations for physical activity.

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330 - Which social and physical environmental factors at home are associated with motor competence in typically developing toddlers? – A systematic review

Lore Daelman, Vrije Universiteit Brussel, Ghent University; Eline Coppens, Lynn Bar-On, Ghent University; Eva D'Hondt, Vrije Universiteit Brussel

Background: Motor competence (MC) plays a key role in a toddler's holistic development and is fundamental for cultivating an active and healthy lifestyle. However, recent evidence indicated that MC development is already delayed in 1- to 3-years-olds. Furthermore, the World Health Organization identified motor development in toddlers as a research gap. The etiology of a child's MC can be attributed to cumulative interactions and exposures with the environment, both stimulating and hindering. Since the home environment is very influential during early childhood, this systematic review aims to identify the social and physical environmental factors at home associated with toddlers' MC. **Methods and Results:** This registered review (CRD42024501137) follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Five electronic databases were searched: PubMed, Embase, Web of Science, Education Resources Information Center and Cumulative Index to Nursing and Allied Health Literature. The search strategy included terms describing 1- to 3-year old typically developing children, MC, as well as social and physical factors in the home setting. After conducting the systematic search, 4890 articles were found and 3945 remained after duplicate removal. Peer-reviewed English-written observational research articles published from the year 2000 onwards are included. The methodological quality will be determined using the Risk Of Bias In Non-randomized Studies - of Exposures tool. Upon submission of this abstract, the screening process has started. Results will be presented at the conference. **Conclusions:** It is hypothesized that this systematic review will identify important stimulating and hindering factors, both inherent but also modifiable, at home associated with MC. These findings will be useful in identifying toddler subgroups at risk for lower MC levels and/or delays in MC development and will help determine intervention components. Toddlers are a very important group to target since the developing brain is most sensitive to experiences and the environment in the first 3 years of life. As such, this systematic review will inform future interventions to counteract the decline in MC levels among toddlers.

Relevance

This systematic review addresses the current concern of delayed MC in typically developing toddlers, an underrepresented population in literature. By examining social and physical factors in the home setting, the aim is to identify both promoting and hindering determinants of MC. The findings will inform interventions for primary caregivers and will contribute to reversing the MC level decline.

331 – Fundamental motor skills of urban and rural Brazilian preschoolers

Lais Barros, Universidade Federal da Paraíba

Background: Fundamental Motor Skills (FMS) are the common movements that serve as the basis for performing advanced and specific motor skills. This study was carried out to compare FMS results between rural and urban preschoolers. **Methods and Results:** 399 preschoolers (56.9±4.36 months; 47% girls) enrolled in six municipal early childhood education centers in Petrolina, Brazil, participated in the study. Locomotion and object control skills were assessed using the Test of Gross Motor Development-3 (TGMD-3) test. ANOVA adjusted for sex and age was used to compare children from the two settings. The effect size adopted was the npartial². The statistics were carried out using JASP (0.17.0.0 version). Results highlighted showed that there was a significant difference between the rural and urban groups in object control scores ($p<0.001$, np^2 0.098), in favor of concluding that rural preschoolers with lower-middle incomes have a higher object control score than urban preschoolers.

Relevance

The results of this study were relevant because they identified a significant difference between the groups, resulting in a higher object control (OC) score for rural preschoolers. However, it is suggested that future research on FMS and the relationship with OC scores can be applied in longitudinal and intervention studies so that causes and effects can be understood and worked on.

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332 - Physical Activity and Sport Participation among Mexican American Girls: Is Menarcheal Timing Important?

Jennifer Gay, University of Georgia; Eva Monsma, University of South Carolina; Jasmine Udeshi, University of Georgia

Mother's age at menarche is a known correlate of daughter's age at menarche. Earlier age at menarche is associated with changes in perceptions of body image and subsequent declines in physical activity participation. However, research examining the role of menarche in physical activity participation among Hispanic youth is limited. The aim of the study was to determine if participation in physical activity or sport varied by age at menarche for girls and their mothers in a sample of Mexican-American girls. Data were obtained from a cross-sectional survey of a school district along the south Texas/Mexico border. The sample was composed of 329 girls from a larger sample of Mexican-American students in grades 4-12 (Mage=12.09 ±1.95). Mothers of participating girls self-reported age at menarche. Participants self-reported attainment of and age at menarche, social physique anxiety (SPA), physical activity, and sport participation. General linear modeling was used to test correlations between mother's and daughter's age at menarche with physical activity and sport participation. Daughter and mother ages at menarche were moderately and positively associated ($r=0.45$, $P<0.0001$) and there was 44.8% positive agreement in menarcheal timing. There were no associations between age at menarche or mother's age at menarche with physical activity or social physique anxiety. However, like other studies, age was negatively associated with physical activity ($B=-0.15$, $p=0.0002$) and SPA approached statistical significance ($B=-0.13$, $p=0.064$). More than half of the sample participated in sports (60.8%), yet there were no associations between mother or daughter menarcheal timing with sport participation or sport type. These results contribute to the growing evidence examining physiological determinants of physical activity and sport participation in women, particularly among Hispanics who are historically understudied. Subsequent research examining socialization into and out of sport, controlling for competitive level and maturational timing is warranted. Future longitudinal studies would be useful in more fully understanding the role of menarcheal timing for body image and physical activity participation.

Relevance

Trends for lower SPA among older participants suggest acculturation to physical changes of puberty. Like in elite athlete populations, mother-daughter correlations support familial resemblance in maturational timing and likely the associated physical characteristics known to vary systematically by timing (e.g., muscularity and lower relative leg length to torso among early maturers) and sport type (e.g., later maturation among aesthetic sport athletes). Encouragingly, most of the sample participated in sport, but the lack of familial resemblance by sport type is unusual. In aesthetic sports there likely would be later ages at menarche in mothers and daughters.

333 - Toward population-based screening of Developmental Coordination Disorder in West Africa: preliminary evidence from Ghana

Rosemary Xorlanyo Doe-Asinyo, Brunel University; Emmanuel Bonney, University of Minnesota

Background: Developmental Coordination Disorder (DCD) is a neurodevelopmental disorder affecting about 6-10% of school-age children worldwide. While validated screening and assessment tools exist in several high-income countries, very little has been done in many low-income countries, such as Ghana to facilitate identification or intervention for children with DCD. In recognition of this challenge, we pilot-tested a school-based DCD screening initiative in two regions of Ghana. The objective of this effort was to determine the proportion of children with an elevated risk of DCD among a sample of Ghanaian children. **Methods and Results:** We conducted a population-representative screening of DCD among school-aged children who lived in four different (two urban and two rural) communities in Ghana. Participants were recruited from public and private elementary schools in the target communities. Adults who identified as being a parent, guardian, or caregiver of a child aged 5-12 years completed the Developmental Coordination Questionnaire 2007 (DCDQ'07). Descriptive statistics were used to determine the base rate of children with an elevated likelihood of having DCD. From May 2019 to December 2020, we enrolled 619 (293 boys, 326 girls) Ghanaian children with an average age of (8.69 ± 1.84 years). Out of the 619 children who were screened, 40.2 % (n=249, mean age 9.36 ± 1.69) had an elevated likelihood of DCD. Of this, 55.0% (n=137, mean age 9.29 ± 1.71) were girls. In addition, we observed that 49.8% (n=124, mean age 10.78 ± 0.75) of the children identified as having an elevated likelihood of DCD were aged between 10-12 years. **Conclusions:** Findings indicate that a greater proportion of Ghanaian children may be at increased risk of DCD. Girls were more likely to be at risk of DCD than boys, as were older children compared to their young peers. Sustainable screening and surveillance programs need to be developed within the Ghanaian elementary school context to facilitate early detection, subtyping, and intervention.

Relevance: This preliminary work indicates children may be more prone to developing DCD in low-income countries such as Ghana. More effort is needed to generate locally relevant data that is robust and meaningful to inform contextually relevant assessments, tailored interventions, and responsive policies to advance motor development and learning across diverse populations in Africa.

334 - A network between physical activity, fundamental motor skills, fitness and body mass index after an intervention program with preschoolers

Natália Lima Quirino, Federal University of Paraiba; Taís Feitosa da Silva, State University of Paraiba, Federal University of Paraiba; Clarice Maria Martins, Federal University of Paraiba

Background: Physical activity (PA) during early childhood is related to several health benefits, including the development of fundamental motor skills (FMS). Studies have shown that involvement in PA opportunities is associated with a high performance in FMS. Additionally, body composition, physical fitness (PF), age, sex, and participation in structured PA programs, are important factors for children´s motor proficiency. PA interventions in FMS are complex and non-linear and have associated factors such as PF and body mass index (BMI). This study aimed to identify the most influential variables in the network of associations between PA, FMS, PF, and BMI, before and after an exercise intervention program for early childhood**. Methods and Results:** A total of 72 preschoolers (4.19±0.94 years; n=42 in the control group) participated in a PA intervention program for 12 weeks, with activities that improve FMS: 1. warming-up; 2. main part, consisting of six exercises, carried out in different planes and directions; 3. cooling down, consisting of activities set to music. PA was assessed using accelerometers, FMS using the Test of Gross Motor Development (TGMD-2), PF was measured using the Shuttle-run test, and BMI was calculated. The relationships between groups, MVPA, FMS, age, sex, and BMI at baseline and post-intervention were calculated using a Machine Learning technique entitled Network Analysis. Furthermore, the “Fruchterman-Reingold” algorithm, the pairwise Markov random field model, and the EBIC parameter were adjusted to 0.5 to create networks. The centrality indexes, closeness, strength, and expected influence were calculated using JASP version 0.9.2. The main results showed that the Intervention Group increased its expected influence (from -0.762 to 1.084), while the BMI reduced it (from 1.887 to 0.655) after the intervention. Furthermore, moderate to vigorous PA and PF presented higher strength values within the network (0.215 to 0.500 and -1.233 to 0.630), when compared to the baseline value. **Conclusions:** This study brought an innovative analysis perspective to intervention studies since being part of the intervention group was the most influential variable in the network of associations between PA, FMS, PF, and BMI. It also showed a non-linear relationship between the variables assessed.

Relevance

This study has shown that participation in an exercise intervention program has an important relationship with physical activity, fundamental motor skills, physical fitness, and body mass index, and a closer understanding of the complex non-linear relationship between these variables, with significant implications for the promotion of preschoolers' health and future interventions.

335 - Assessing the impact of occupational therapy intervention on brain-muscle communication in children with Developmental Coordination Disorder

Greg Wood, Maaike Esselaar, Emma Hodson-Tole, Johnny Parr, Manchester Metropolitan University

Background: Our pilot study showed a potential link between impaired isometric force control in individuals with DCD and diminished corticomuscular coherence (CMC) strength, signifying the poor communication between the cortex and contracting muscles. This study seeks to provide the first examination of the impact of a conventional Occupational Therapy intervention on brain-muscle communication in children with DCD. **Methods and Results:** A cohort of twenty-two children with DCD participated in an isometric hand grip contraction task during their initial laboratory session. The isometric hand grip contraction was standardized at 10% of Maximum Voluntary Contraction (MVC) using a handheld dynamometer, employing the dominant hand. Participants completed ten sets of six contractions (each lasting 10 seconds), with forearm muscle activity monitored through bi-polar electromyography (EMG), and brain activity recorded using a 32-electrode electroencephalogram (EEG). Following the initial task, participants were randomly assigned to either a typical Occupational Therapy intervention group or a control group. The intervention group engaged in six weeks of therapy, during which each child selected three hand manipulation activities (e.g., tying shoelaces, throwing and catching a ball, making a paper airplane, practicing lettering, etc.). Demonstrations and instructions were provided, and participants practiced these tasks in the laboratory under guidance. Subsequently, they were tasked with practicing these activities at home three times a week for six weeks. Weekly progress checks were conducted via email, with an additional midpoint assessment (3 weeks) through phone or video conference. If mastery was achieved at the 3-week mark, tasks were progressed in difficulty or altered. After the 6-week intervention period, all participants returned to the laboratory to repeat the isometric hand grip task for comparative analysis. **Conclusions:** As the data analysis is pending, the abstract currently refrains from drawing final conclusions.

Relevance

This study will advance our understanding of potential impairments to brain-muscle communication as a contributing factor for the movement difficulties in DCD. Ultimately, findings could inform evidence-based approaches for enhancing motor coordination in individuals with DCD, influencing neurorehabilitation practices and developmental neuroscience

336 - Prediction of Developmental Coordination Disorder in extremely and very preterm Brazilian children

Nadia C Valentini, Universidade Federal do Rio Grande do Sul; Carolina Panceri, Renato Procianoy, Rita C Silveira, Universidade Federal do Rio Grande do Sul e Hospital de Clinicas de Porto Alegre

Background: Preterm children are at higher risk for Development Coordination Disorder (DCD) than full-term children. There is a lack of evidence about this subject in preterm from low- and middle-income countries (LMIC). Few studies used extremely and very preterm groups to compare DCD to each other. This study compared the prevalence of DCD in extremely and very preterm Brazilian children and investigated if motor development in the first year of life predicts DCD at preschool age. **Methods:** 75 preterm children (17 extremely preterm, 58 very preterm) enrolled in a follow-up clinic for high-risk infants participated in the study. The Bayley Scales of Infant and Toddler Development (BSITD-III) was used to assess motor development at 4, 8, and 12 months. The MABC-2 was used to assess motor performance at preschool age, and information about neurological conditions and children's difficulties at home or schools was collected; all this information was used as criteria to diagnose DCD according to the DSM-5. Analysis with T-student test, Chi-square test, logistic regression, and receiver-operating characteristics (ROC) curves were used. **Results:** The prevalence of DCD was 48% (N=36) for the total sample. The extremely preterm group had a higher prevalence of DCD, 70.6%, compared to the very preterm, 41.4% (p=0.034). Extremely preterm children had lower scores in all MABC-2 subscales: Manual Dexterity (p=0.034), Aim and Catch (p=0.002), Balance (p=0.033), and Total percentile (p=0.019). Motor performance at 12 months was a significant predictor for DCD at preschool age. The chance of DCD at preschool age increases by 7.1% (95% CI: 1.8 - 13.9, p = .006) for each point that the motor composite score decreases. Further, analyses of the ROC curve demonstrated that the area under the curve for motor assessments at 12 months was 0.68 (95% CI 0.54 – 0.83; p = .026), and the best cut-off point of the BSITD-III composite score was 98.5 with 52% sensibility and 78% specificity. At 4 and 8 months, no significant associations were found. **Conclusion:** This information is precious to LMIC since fewer resources are available for children with subtle impairments or with less known disorders, such as DCD; often, those children are underdiagnosed.

Relevance

The identification of DCD and the mechanism behind the disorder are still under-investigated in LMIC. Understanding how children from the majority of the world develop, the prevalence of disorders, and the associated risks are crucial to providing better care. This study contributes to society's awareness of the disorder and the need to refer children to intervention.

337 - Persisting primitive reflexes: an overlooked factor for motor and cognitive difficulties

Adam Provazník, Tomáš Větrovský, Martin Musálek, Chipo Malambo, Charles University; Luis Paulo Rodriguez, Ana Filipa Silva, Instituto Politécnico de Viana do Castelo

Background: In the early stages of infancy, primitive reflexes play a crucial role in facilitating basic survival instincts and early motor functions. Once vital for the infants interactions with the environment, these reflexes are expected to integrate as the child matures. However, the reflexes are not fully integrated every time, falling into persisting primitive reflexes (PPRs). Emerging research suggests that PPRs might disrupt children´s development. Unveiling the relationships between PPRs and motor and cognitive development may be another important factor for better understanding motor difficulties and cognitive delays. **Methods and Results:** We are conducting a systematic review, following the PRISMA guidelines, to search the relationships between PPRs and motor and cognitive development. Found studies varied highly in variables analyzed and in methodological quality. Noteworthy findings include a sig. moderate positive correlation between ADHD and asymmetrical tonic neck reflex (ATNR). Several studies revealed a strong predictive power of ATNR persistence on reading, spelling, and verbal IQ. Many other studies revealed weak to moderate negative correlations between motor or cognitive skills and PPRs in neurotypical children. Higher correlations were observed in socially disadvantaged children and also males showed stronger correlations than females. In some cases, females did not show any significant correlations. In the majority of included studies, predictive power is not reported. However, interventions based on integrating PPRs may potentially support developmental problems in some children. Integration of PPRs led to better results in reading, spelling, math, and visual-motor integration. The effect sizes of these interventions varied from small to large, depending on the variables. **Conclusion:** The relationships between PPRs and motor and cognitive development seem to be complicated. PPRs are associated with lower reading and math skills and also balance and manipulation. However, differences appear between children´s sex, social disadvantage, and developmental disorders. PPRs integrating interventions help with developmental deficits, with effects depending on the area of development. Summing up, PPRs seem to be one of the factors worth considering while regarding overall support of children´s development.

Relevance

PPRs may be the overlooked link, connected to motor and cognitive difficulties in children. A general approach may miss the spot regarding specific conditions, but focused intervention may be more effective. From this point of view, understanding the potential effect of PPRs and having a tool to support this condition seems like an effective strategy for further education and development.

338 - Motor competence and physical activity of children and adolescents with a congenital heart disease – action please!

Kristof Vandekerckhove, Katya De Groote, Ghent University Hospital; Frederik Deconinck, Ghent University

Background: Physical activity (PA) and fitness are important predictors of health in later life. To achieve a satisfactory level of activity and fitness, an adequate level of motor competence (MC) is needed. Development of MC requires dedicated practice and active exploration, preferably in organized sports (or PE) settings. Given their medical history and possible risk of overprotection by the environment, individuals with a congenital heart disease are at risk of reduced MC. The current study set out to examine MC, PA and level of intrinsic motivation towards sports in a Flemish mixed sample of children and adolescents with a univentricular heart and tetralogy of Fallot. **Methods:** Thirty participants with a congenital heart disease (CHD; mean age: 10.9±3.3; range: 4-17), monitored by the Pediatric Cardiology unit of the Ghent University Hospital, were assessed with the Movement Assessment Battery for Children 2 (MABC2) and surveyed with the Flemish Physical Activity Questionnaire (FPAQ). The results of the MABC2 were compared against the published reference values, those of the FPAQ with an age-matched control sample of 104 children from our own database. **Results:** The average MABC2 percentile of the participants with CHD was 14.8±18.6 (range: 0.1-75). In 21 of the sample (70%), motor competence was categorised “at risk of a motor problem”, with 14 (47%) having a clear motor impairment. Furthermore, the degree of PA (42 minutes/day, range: 5-103) was lower than in the control group (63 minutes/day, range: 11-195; $F(1,128)=8.327$, $p=0.005$). Only 7 participants with CHD (23%) met the WHO guideline of 60 minutes PA per day compared with 50% of the control group. **Conclusions:** Consistent with other research, the level of motor competence and the degree physical activity of this Flemish sample of children with CHD are low. While disease-related factors (impaired neurodevelopment and reduced cardiorespiratory fitness) may explain these findings, the figures are nevertheless concerning, and highlight the need for additional care and support for this vulnerable population.

Relevance

In children with a congenital heart disease, the primary emphasis rightfully centers on disease treatment and monitoring. Nonetheless, the latest study underscores the significance of fostering motor competence, especially given its pivotal role in promoting an active and healthy lifestyle.

339 – Brazilian health and education professionals' knowledge of developmental coordination disorder

Clarice Ribeiro Soares Araujo, McGill University; Lilian Viviane Barbosa, Lívia de Castro Magalhães, Universidade Federal de Minas Gerais

Background: Developmental Coordination Disorder (DCD) stands as a prevalent health condition in childhood, with an estimated global prevalence of 5% among school-age children. In Brazil, the prevalence rates vary significantly, spanning from 4.3% to 47.2%. Despite its widespread occurrence, there is compelling evidence suggesting that DCD remains relatively unfamiliar to health and education professionals. This lack of awareness contributes to delayed diagnoses and limited access to treatment. The knowledge of Brazilian professionals about DCD has not been investigated. Our objective was to evaluate the knowledge about DCD of Brazilian health and education professionals who work with children and adolescents. **Method and Results:** A descriptive, cross-sectional survey was conducted using an online questionnaire, garnering responses from 803 Brazilian professionals. Participants were 547 teachers, 146 occupational therapists, 57 physiotherapists, and 53 pediatricians. The findings indicate that DCD is one of the lesser-known health conditions affecting children and adolescents with 57% of participants having some degree of familiarity with the condition. Notably, the motor characteristics are better understood compared to its non-motor aspects across all professional groups. Unlike previous studies, the term "dyspraxia" is infrequently utilized in Brazil. Health professionals have a higher level of familiarity with DCD (72.6%) compared to their education counterparts (49.1%). Amongst the health professionals, occupational therapists exhibited the greatest awareness (82.2%) of DCD, followed by 73.7% of physiotherapists and 45.3% of pediatricians. A limited number of health professionals have ever considered the possibility of a child having DCD, and few pediatricians have ever diagnosed a child with the disorder. **Conclusion:** There is an urgent need to increase awareness of DCD among key health and education professionals in Brazil, as only 57% of participants had heard of the condition. Knowledge translation strategies can be effective in providing professionals with a comprehensive understanding of the condition, enabling them to recognize early signs, provide timely interventions and create a supportive environment.

Relevance

This study highlights the current level of awareness of DCD among professionals in Brazil. These findings can lead to proposals aimed at improving awareness, education, collaboration, and policy support to bring about meaningful changes in the way DCD is understood and addressed in the health and education sectors in Brazil. International knowledge translation collaboration would be welcome.

340 - The vestibular system in children with neurodevelopmental disorders: a neglected sense?

Ruth Van Hecke, Emmely Van Acker, Frederik J.A. Deconinck, Maya Danneels, Ghent University; Ingeborg Dhooge, Ghent University Hospital; Hilde Van Waelvelde, Ghent University; Jan R. Wiersema, Department of Experimental and Clinical Health Psychology; Leen Maes, Ghent University

Background: The vestibular system contributes to a wide range of functions, ranging from reflexes to the involvement in the highest levels of perception and voluntary behavior. Despite similarities in symptoms found in children with neurodevelopmental disorders (NDDs, i.e. developmental coordination disorder, DCD, autism spectrum disorder, ASD, and attention deficit hyperactivity disorder, ADHD) and those with vestibular impairments, a thorough investigation of the vestibular system in children with an NDD is lacking. Therefore, the aim of the current study was to explore the integrity of the peripheral vestibular organ in this population using state of the art methodology (i.e. measurement of ocular vestibular evoked potentials, oVEMP, cervical vestibular evoked potentials, cVEMP, and a video head impulse test, vHIT). **Methods and Results:** Twenty-eight participants with a neurodevelopmental disorder (NDD) (6 girls, 22 boys; 6-13 years; 9.3±2.4 y) were enrolled in this pilot study. Sixteen participants were diagnosed with a single NDD (ASD: n=7, DCD: n=3; ADHD: n=6), while comorbidity of at least one other NDD was present the remaining 12 (ASD+DCD: n=2; ADHD+DCD: n=1; ADHD+ASD: n=5; ASD+DCD+ADHD: n=4). Compared with an age and sex-matched control group of 28 typically developing children, the NDD group had on average significantly higher interpeak amplitudes on c/oVEMP and longer N1 and P1 oVEMP latencies. No group differences were found on the vHIT, however, pathological correction saccades were noted for the right horizontal semicircular canal in one child of the NDD-group. Overall, an abnormal otolith function in eleven children with NDDs (39%). In three participants (11%) results were indicative of a peripheral vestibular dysfunction. A moderate positive correlation (r=0.40, p=0.004) was found between the cVEMP amplitude and the score on the Movement Assessment Battery for Children, 2nd version. **Conclusion:** Although the relatively small sample warrants caution with interpreting the results, these findings seem to suggest the vestibular system may be involved in the phenotype of ate least a proportion of children with DCD, ASD, and/or ADHD.

Relevance

The current study encourages practitioners to be aware of potential vestibular deficits in children with an NDD. Given the relatively high prevalence of these deficits, evaluation of the vestibular system is recommended as part of the standard neuro-clinical examination in view of optimal and tailored treatment of the individual child.

341 - Exploring predictive variables to better occupational performance of children with developmental coordination disorder after the CO-OP approach

Clarice Ribeiro Soares Araujo, McGill University; Lívia de Castro Magalhães, Ana Amélia Cardoso, Universidade Federal de Minas Gerais; Helene Polatajko, University of Toronto

Background: The Cognitive Orientation to daily Occupational Performance Approach (CO-OP) is effective in promoting functional gains in children with Developmental Coordination Disorder (DCD). Knowledge about individual characteristics that might influence progress contributes to clinical decision-making. This study intended to explore what factors might influence change on occupational performance perceived by children and their families after occupational therapy using CO-OP. **Method and Results:** This is an exploratory study, analyzing data from a randomized clinical trial with 22 Brazilian children with DCD, 7-12 years of age, allocated to the experimental group (CO-OP + parent coaching sessions) or active control group (CO-OP only). Group, parenting style, signs of attention deficit, age, child`s perceived self-efficacy, cognitive capacity, motor performance, inhibitory control and cognitive flexibility, measured at baseline were considered in the regression models using the stepwise method. Parenting style ($p < .000$), cognitive capacity ($p < .008$) and motor performance ($p < .000$) predicted better outcomes on occupational performance perceived by children and their parents. **Conclusions:** Optimal parenting style contributed to better occupational performance of children after occupational therapy. This suggests that parents that have “at risk” or “regular” parenting styles may require more support from therapists to improve their parental practices, thus impacting their children`s functional outcomes. This adds evidence that involvement of parents during CO-OP is an active ingredient that might be further explored. This study found that children with better scores on motor and cognitive tests tend to have better occupational performance outcomes. Further in-depth analysis is required to explore mechanisms of change.

Relevance

Parenting style influences children's improvement, adding evidence to family-centered practices. Parenting style is an attribute of parents and refers to the way parents interact with their children, i.e. the "emotional and relational climate" they create. Pediatric rehabilitation interventions have to provide better support for families on improving their parental practices.

343 – Screen time, sleep, and motor skills in socially economically disadvantaged Brazilian toddlers: a network perspective

Jessica Mota, Universitiy of Pernambuco; Érika dos Santos, University of São Francisco Valley; Alesandra de Souza, Federal University of Tocantins; Natália Goulart, Paulo Bandeira, University of São Francisco Valley; Rafael Tassitano, University of Pernambuco; Clarice Martins, University of Porto

Background: Early childhood represents a window of opportunities for cognitive, emotional, physical, and motor development. The first three years of life constitute a period marked by the transition from a phase where the child coordinates sensations experienced with simple motor behaviors to experiences of rudimentary and fundamental motor skills (from the age of 2, they serve as a foundation for the acquisition of more complex movements). The aim of this study was to examine the network structure of screen time, sleep duration, and motor skills in brazilian toddlers. **Methods:** A cross-sectional study with 57 children (35 girls) enrolled in daycare centers in Petrolina, Pernambuco. Parental questionnaires were used to assess screen time (ST) and sleep duration (SD), while gross and fine motor skills were evaluated using the Peabody Developmental Motor Scales, Second Edition (PDMS-2). Network analysis was conducted using Jasp software, with the expected influence index used to analyze the most influential variables in the network. **Results:** For boys, the strongest and positive relationship was observed between meeting sleep time and the grasping subtest (0.669), as well as a strong relationship between locomotor and postural subtests (1.859). For girls, the strongest relationship was observed between sleep duration and postural skills (1.508), as well as between grasping and visuomotor subtests (1.304). **Conclusions:** Indications suggest that boys who meet sleep recommendations are associated with grasping skills, while in girls, sleep duration is associated with postural skills.

Relevance

The study examines how factors such as screen time and sleep can affect motor skills, providing valuable information for parents, educators, and healthcare professionals. By focusing on socially and economically disadvantaged children, the research highlights the disparities existing in society. The study results can help guide interventions and programs aimed at improving child development.

344 - Effects of class-wide peer tutoring on motor performance of typically developing students and students with Down syndrome in physical education

An Van de Putte, Matthieu Lenoir, Hilde Van Keer, Ghent University

Background: Reviews show that children with Down syndrome (DS) are weaker in their overall development than typically developing children (Kersteins & Green, 2015). PE should be viewed as an important part of the curriculum of students with DS. This implies that PE teachers should adopt educational strategies. Therefore, the current study aims to compare motor learning in typically developing children and children with DS in a class-wide tutoring system (CWTS) compared to a teacher-led whole-class (TC). **Methods:** A quasi-experimental, pretest posttest retention test design was used. All participating students (N =146) and the students with DS (N = 8) were enrolled in eight intact classes from eight different regular schools throughout Flanders. Product and process scores on a juggling task were analysed. **Results:** The results showed that there was no main effect of group ($F(1,144) < .001$, NS), nor an interaction effect on the product scores of the juggling task. Analysis of the process scores indicated a main effect of group, with better scores for the PT group ($F(1,144) = 30.142$, $p < 0.001$) and a main effect of time ($F(2,288) = 236.442$, $p < 0.001$). Post hoc LSD indicated an increase in process score from pre-test to post-test ($p = 0.000$), an improvement that was retained at the retention test ($p < 0.001$). However, and more pertinent to the aims of this study, a significant group x time interaction ($F(2, 288) = 80.934$, $p < 0.001$) revealed that the CWPT group improved more over time compared to the TC group. To test the product score of motor skills of students with DS, the non-parametric Mann-Whitney U-test was used because of the small number of students with DS. Students with DS in the experimental group achieved a significant difference than the students with DS in the teacher-led whole group when looking at the post and retention test. ($U = 0.000$, $p = 0.017$, sig ≤ .05, 2-tailed). **Conclusion:** The present findings show that the CWPT intervention program during physical education classes was effective in improving process scores of TD students and the product scores of the students with DS.

Relevance

The results of this study demonstrate that class-wide peer tutoring intervention positively impacts the development of motor skill of typically developing students as students with DS. This outcome is a meaningful contribution for physical education teachers in that students with Down syndrome can practice the motor task in the same physical education classes as typically developing students.

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345 - Terminology used in research reports of developmental coordination disorder: updated review from 2006-2023

Lívia C Magalhães, Barbara Moraes, Larissa Godinho, Lilian Barbosa, Lorena Sales, Rejane Palhares, Iasmin Maia, Universidade Federal de Minas Gerais; Clarice Araújo, McGill University; Alessandra Cavalcantti, Maira Amaral, Universidade Federal do Triangulo Mineiro

Background: Motor coordination issues in children, historically described under various names, saw a pivotal moment at the 1994 London consensus meeting where the term Developmental Coordination Disorder (DCD) was recommended. Two subsequent reviews revealed a substantial increase in the use of the term from 1995 to 2005, reaching 52%. Initially concentrated on children, the field has evolved to encompass adolescents and adults. This study aims to systematically review the terminology used for motor coordination problems, mapping terms, age ranges, author disciplines, geographic origins, and publication types. **Methods and Results:** A systematic search covered major databases—Medline, Scopus, Web of Science, Embase, and BVS—for peer-reviewed articles in English from January 2006 to December 2023 focusing on individuals with DCD. Search terms included Motor Skills Disorders, Developmental Coordination Disorder, DCD, Developmental Motor Difficulties, Dysgraphia, Dyspraxia, Motor Coordination Difficulties, Sensorimotor Difficulties, Sensory Processing Disorders, Clumsy, Clumsiness, Physically Awkward, Motor Skills, Psychomotor Performance. The search yielded 1458 articles, narrowed to 516 after eliminating duplicates and irrelevant ones. Verification of abstracts and methods resulted in 397 articles for analysis. Preliminary findings show that the term DCD was utilized in 70% of the articles, while terms like clumsy, motor difficulties, and dyspraxia persisted, especially in articles that involve co-occurring conditions, such as autism spectrum disorder, dysgraphia and also preterm-born children. The majority of articles are empirical, with an expanded age range and increased international contributions to the field. Further results from manual searches and specific journals will be presented subsequently. **Conclusion:** Since the last review, there has been a continuous increase in the number of articles, accompanied by a growing proportion focused on adolescents and adults. While the term DCD is now prevalent on research articles, relying solely on it as a search term still results in the omission of several relevant articles. The issue of co-occurrence needs further research and better definition.

Relevance

Ensuring the consistent application of diagnostic terms is crucial for comparing findings, identifying studies for reviews guiding field development, and fostering effective communication among researchers, clinicians, families, policymakers, and the public. Despite the prevalent use of the term DCD, clarification in areas of overlap is needed, as this has implications for intervention.

346 - Interlimb coordination in human newborn

Arthur Dewolf, Université catholique de Louvain

Background: Accurate left-right coordination is essential for the regulation of locomotion. Studies from diverse species showed that the spinal cord contains networks of neurons that can produce a variety of rhythmic outputs (Whelan et al., 2000), responsible for the different interlimb coupling (Danner et al., 2016). Human gait usually consists of anti-phase left-right rhythmic limb movement. However, a certain level of independence of each hemi-spinal cord is reflected in the coordination of limb movements, for example on a split-belt. However, the intrinsic nature of the mature interlimb coupling is still an area of uncertainty. **Methods and Results:** To investigate interlimb coordination at birth, we registered 46 neonates performing bilateral and unilateral stepping with one leg manually blocked. The muscle activities of both limbs were recorded, and we characterized the left-right phase shift to define the type of coordination: alternating or synchronous. Cross-correlations were also used to compare kinematics and muscle activity between bilateral and unilateral stepping. **Conclusions:** Unilateral stepping and bilateral stepping were similar, suggesting relative independence between the two sides of the body. In addition, the left-right muscle activity was alternated in ~45% of steps and synchronous in ~55% during unilateral stepping, whereas a great majority of alternated activation was observed during bilateral stepping. The variable interlimb coordination supports the presence of an independent rhythm generator for each leg at birth but with limited interlimb interactions between them. With age, a progressive emergence of elements of coordinative neuromuscular behaviour should emerge. Nevertheless, longitudinal studies on interlimb coordination during the first year of life are lacking and may provide additional information about the maturation of the neuromuscular functional network.

Relevance

Understanding the development of interlimb coordination in newborns can inform rehabilitation strategies for motor impairments and contribute to early intervention programs for developmental disorders. This research offers insights into the maturation of neural circuits and could improve treatment outcomes for individuals with locomotor disabilities.

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347 - Adapted physical activity in children with DCD: Constrains, assessment, problem-solving, adaptation, modification and evaluation

Ivana Djordjević, independent researcher

The main barriers to including students who cannot equally participate in PE, recreation and organised sports as their peers are teacher attitudes, lack of knowledge, and perceived barriers to instruction, such as equipment, curriculum, and time constraints. Belonging, acceptance, and support are essential for creating an inclusive environment. The purpose of this study is to utilize a theoretical framework to determine important considerations for physical educators and coaches when making short- and long-term developmental plans for children with DCD. This context-specific approach emphasizes the interplay between various categories of factors that can indirectly or directly affect each other and ultimately impact the developmental processes of children with DCD. Finally, the implications are addressed for parents, educators, physical education teachers, coaches, and policymakers, and structured physical activity experiences that promote motor competence in children with DCD are recommended.

Relevance

Coaches and PE teachers can use the proposed framework as a guide to key factors to consider unique factors associated with DCD children and their environment.

349 - Using a transdiagnostic approach to understand motor behavior: Preliminary results of the COMBINE (Consortium for Motor Behavior in Neurodivergence)

Priscila Tamplain, University of Texas at Arlington; Nicholas Fears, Louisiana State University; Haylie Miller, University of Michigan

Background: Data sharing is a way to improve the generalizability and replicability of research findings and can help us derive conclusions about motor skill development in neurodivergent individuals. The COMBINE (Consortium for Motor Behavior in Neurodivergence) is a dataset aimed at understanding the development of neurodivergent motor behavior in children. Here, we aim to present the preliminary results of combining 2 datasets with at least 5 different diagnoses in childhood. **Methods and Results:** Using the COMBINE dataset, we examined Movement Assessment Battery for Children, 2nd Edition Movement Total Scores (MABC-2 scores) for 200 children (M=165, F=35) between 37-193 months of age (M=98.38, SD=34.18, Median=93). The current sample included only children with neurodevelopmental diagnoses including autism (n=55), developmental coordination disorder (n=63), attention-deficit hyperactivity disorder(n=65), and childhood apraxia of speech (CAS; n=58). Most children had multiple diagnoses. Overall, the MABC-2 scores were low across the sample (M=3.71, SD=2.50, median=3, range=1-12). We regressed MABC-2 scores on age, birth sex, and each of the listed diagnoses using a generalized linear model. We found a significant effect of autism diagnosis (b=-0.532, p=.009), indicating a diagnosis of autism predicted lower Movement Total Scores compared to other diagnoses. **Conclusions:** The dataset supports the notion that motor skill problems are prevalent across several neurodevelopmental diagnoses. Amongst children with developmental conditions, having an autism diagnosis is related to significantly lower total scores on the MABC-2 compared to the other groups.

Relevance

A data sharing consortium is a way to combine datasets and to deepen our understanding of motor skills in neurodevelopmental conditions. Contributing to creating a large database is a great way to honor the time and effort participants contribute to advance understanding. The COMBINE dataset showed that an autism diagnosis predicted lower scores for motor skills than any other diagnosis.

350 - Awareness and support for developmental coordination disorder in nursery school

Ryoichiro Iwanaga, Nagasaki University; Takuya Higashionna, Tokyo Kasei University; Akiko Tokunaga, Akira Imamura, Nagasaki University

Background: In Japan, compared with ASD and ADHD, there is a lack of knowledge of DCD among educators and childcare workers, but the actual situation has not been clarified. Therefore, in this study, we investigated Japanese childcare workers' awareness of DCD, their understanding of the actual situation, and the current state of support. **Methods:** We randomly selected 2,000 nursery schools and conducted a written survey. The survey investigated nursery schoolteachers' awareness of ASD, ADHD, and DCD, intellectual developmental disorders among 5- to 6-year-old children at nursery schools, the proportion of children diagnosed with or clearly having ADHD, ASD, and DCD, and the presence of children with or suspected of having DCD. **Results:** We received responses from 580 nursery schools: "all of nursery teachers" or "most of nursery teachers" said they knew about ASD-89%, "all of nursery teachers" or "most of nursery teachers" said they knew about ADHD-91%. Only 23% were familiar with DCD. Regarding the percentage of children with intellectual disorder, ADHD, ASD, and DCD among 5- to 6-year-old children in nursery schools: intellectual disorder was 5.4%, ADHD -7.5%, ASD-5.6%, and DCD was 0.2%. However, 4.8% of the children were judged by nursery teachers to have clumsiness in coordination. **Conclusion:** In this study, DCD is not well known among Japanese nursery schoolteachers was suggested. In Japan, it has been suggested that the number of children diagnosed with DCD in early childhood may be small, but nursery schoolteachers recognize that 4.8% of children have clumsiness. This recognition suggests that there is a larger population of undiagnosed children with DCD. In the future, it is necessary to raise awareness of DCD among nursery school teachers to better identify these children and provide early effective interventions and supports.

351 - The interaction of dyadic positioning, orientation, and locomotion during play between an infant and their parent

Emily Marcinowski, Marziyeh Shabani, Julie Schneider, Louisiana State University

Background: Movement and positioning, particularly sitting, changes how capable infants are of interacting with their world. Sitting frees their hands for play and broadens their visual field, which introduces new opportunities for interaction with toys and partners. Not surprisingly, position changes how infants play with toys manually, engage in social play, and communicate. Nevertheless, the complex consequences of positioning, orientation, and locomotion on dyadic play are not well understood following the onset of independent sitting. The purpose of this project is to investigate how an infant's positioning, orientation to the parent, and locomotion changes during dyadic play 12 months following the onset of independent sitting. **Methods and Results:** Thirty-six infants were recruited at independent sitting emergence, and 3 longitudinal visits following (3, 6, & 12 months later). Parents participated in a play period with their infants using a building set. Reliable behavioral coders scored infants' physical positioning (e.g., sitting), orientation to the parent (away, towards, or perpendicular/parallel), and locomotion (stationary/locomoting) during dyadic play. Preliminary results (n=14) indicate that infants sat for a larger percentage of time in parallel or perpendicular to the parent at the 12 month visit (91.9s), as compared to facing towards (61.2s) or away (36.9s) from the parent; however, infants primarily sat facing away from the parent (96.2s) at the baseline visit (toward: 5.7s; parallel/perpendicular: 55.8s). Additional positions, locomotion, more visits, and more infants will be added to the project's final analysis of dyadic play. **Conclusions:** These findings suggest that infants initially start this period playing away from the parent while sitting, but later play in parallel/perpendicular to the parent. As infants are more capable of supporting themselves in sitting, they play more in parallel/perpendicular orientation to the parent. Parallel/perpendicular orientations may allow for easier demonstration of play and proximity.

Relevance

Understanding how physical orientations, play and movement interact can shed light on how infants can be supported at a crucial time in their lives, which can in turn improve their long-term functioning and health.

352 - Checks and balances: a meta-analysis on the known-groups validity of functional postural control tests in children

Jorn Ockerman, Ghent University; Silke Velghe, Hasselt University; Anke Van Bladel, Ghent University; Edouard Auvinet, Centre de Recherche et de Développement ECAM; Jelle Saldien, Ghent University; Katrijn Klingels, Hasselt University; Lynn Bar-On, Ghent University; Evi Verbecque, Hasselt University

Background: Pediatric physical therapists often evaluate postural control deficits in children with various disorders through functional postural control tests. Despite a plethora of available tests, evidence supporting their validity remains limited. This review aims to evaluate the known-group validity of functional postural control tests to distinguish pediatric pathological groups from typically developing (TD) peers. **Methods and Results:** A systematic search of Pubmed, Web of Science, and Scopus yielded 40 case-control studies (pathological children (n=1331), TD peers (n=1889)). Random-effect meta-analyses were performed to estimate pooled standardised mean differences (SMD) for the various test types and subclassified based on pathology and/or age.
Results indicated significant differences in performance between pathological children and TD peers across multiple functional postural control tests. Specifically, test batteries (SMD=-2.21), the Timed Up and Go Test and variants (SMD=2.30), and the One Leg Stance test and variants (SMD=-2.14) exhibited substantial differences, while the Reach tests demonstrated a smaller effect (SMD=-1.19). Subclassification within the meta-analyses showed that pathology was an influencing factor for the test batteries and the one leg stance test and variants, while age was an influencing factor for the reach tests. However, all tests showed low levels of evidence for known-group validity. **Conclusions:** Functional postural control tests assessing multiple aspects of postural control, demonstrate higher known-group validity compared to single-task tests. Pathology seems to exert a greater impact on test validity than age. However, the overall low level of evidence underscores the need for further research with more homogeneous groups and norm reference data.

Relevance

Improving balance deficits is a common goal in pediatric rehabilitation. Yet, no consensus exists on the appropriate tools to identify these deficits. This study hopes to help guide professionals in their selection of functional postural control tests to evaluate their patients. By considering the impact of age and pathology, clinicians will be better equipped to select the most suitable test for their assessment.

353 - Development and interrater reliability of an extended and age-specific Balance Evaluation Systems Test for children (Kids-BESTest-2) age 5-12

Evi Verbecque, Hasselt University; Charlotte Johnson, University of Antwerp; Mieke Goetschalckx, Pieter Meyns, Katrijn Klingels, Hasselt University; Ann Hallemans, University of Antwerp

Background: The Balance Evaluation Systems Test for children (Kids-BESTest) was transformed from the adult to a reliable pediatric version (age 8-14). Instructions were tailored for children, but minor changes were made to the scoring criteria. Hence, a maximal item score reflects an adultlike performance. Yet, postural control problems usually appear earlier. This study's aim was therefore to report the developmental process of an extended and age-specific version of the Kids-BESTest (Kids-BESTest-2) for children aged 5 to 12. **Methods and Results:** We followed an iterative process to establish the Kids-BESTest-2. In step 1: The domain and total scores (original Kids-BESTest) were compared between children with Developmental Coordination Disorder (DCD; n=7), Cerebral Palsy (CP; n=7) and typical development (TD; n=33) to establish known-groups validity and we observed the performances (movement quality and quantity) in TD children. In step 2: The results obtained in step 1 were combined to develop an age-specific test version, the Kids-BESTest-2 comprising 5 age bands: age 5, age 6, age 7, age 8-10 and age 11-14. In step 3: Known-groups validity (49 children: 8 DCD, 8 CP, 33 TD) and interrater reliability (39 children: 6 DCD, 6 CP, 27 TD) of the Kids-BESTest-2 were assessed. The original Kids-BESTest total and domain scores distinguished children with CP from TD peers, but not DCD. Item observations in TD children revealed frequently occurring signs of instability in nine items, tending to decrease with increasing age. The Kids-BESTest-2 total and domain scores distinguished performances in children with CP and DCD from TD peers showing excellent interrater reliability (ICC: 0.946) with a Minimally Detectable Change of 6.5% and a measurement error range of 13% for the total score. **Conclusion:** The Kids-BESTest-2 reliably distinguishes children aged 5-12 with CP and DCD from their TD peers. To generalize its use in pediatric rehabilitation, further psychometric investigations are needed in other patient groups with postural control deficits.

Relevance

Currently no consensus exists on the appropriate tools for identifying postural control deficits. The Kids-BESTest-2 may fill this gap in literature. The age-specific test version not only allows reliable assessment between raters, it also seems to increase sensitivity towards correct identification of postural control deficits in children with CP and DCD, facilitating tailored therapy plans.

354 - Known-groups validity, sensitivity and specificity of the extended and age-specific Balance Evaluation Systems Test for children, Kids-BESTest-2

Evi Verbecque, Hasselt University; Maja Van Grinderbeek, Vrije Universiteit Brussel; Katrijn Klingels, Pieter Meyns, Hasselt University; Charlotte Johnson, Ann Hallemans, University of Antwerp

Background: We developed an extended and age-specific version of the Balance Evaluation Systems test for children (Kids-BESTest-2; age 5-14), that allows for the identification of specific deficient postural control systems by assessing corresponding postural control test domains, i.e. limits of stability, anticipatory postural adjustments, reactive postural responses, sensory orientation and stability in gait. With this study we aimed to explore the known-groups validity, sensitivity and specificity of the Kids-BESTest-2 in children with Developmental Coordination Disorder (DCD). **Methods and Results:** 153 children age 5-12 (88 typically developing (TD) children, mean age: 8.6 ± 1.8 years; 65 children with DCD, mean age: 9.1 ± 2.0 years; $p>0.05$) performed the Kids-BESTest-2 and the Movement Assessment Battery for Children, 2nd edition (MABC-2). Known-groups validity was investigated by establishing differences between relevant groups (DCD versus TD; Mann-Whitney U test). The optimal combination of variables (highest sensitivity and specificity) predicting a poor performance (total score < 80%) on the Kids-BESTest-2 was identified with stepwise backward logistic regression analysis. The children with DCD performed poorer on all domains ($p<0.001$) and the total score ($p<0.001$) compared with the TD children. Logistic regression analysis identified the combination of age, the MABC-2 total percentile and the MABC-2 Balance percentile as indicators for poor performance on the Kids-BESTest with a sensitivity of 92.0% and a specificity of 92.9%. **Conclusions:** The Kids-BESTest-2 clearly distinguishes performances in children with DCD from their TD peers. Based on age, overall and balance subscale MABC-2 percentiles, therapists can decide whether or not a child with DCD would have a positive kids-BESTest allowing them to use the domain scores to gain more insights into what causes their postural control deficits and how to shape their training program.

Relevance

The Kids-BESTest-2 can aid therapists in identifying the specific deficient postural systems in children with DCD, thereby facilitating tailored therapy planning. To prevent unnecessary assessments in this specific area, therapists can easily decide whether or not to administer a Kids-BESTest-2 based on the patient's age and MABC-2 total and balance subscale percentiles.

355 - Is there a continuum of balance performance between developmental coordination disorder, cerebral palsy, and typical development?

Charlotte Johnson, Ann Hallemans, University of Antwerp; Pieter Meyns, Silke Velghe, Nina Jacobs, Evi Verbecque, Katrijn Klingels, Hasselt University

Background: Balance deficits are one of the most frequent requests for help in both developmental coordination disorder (DCD) and cerebral palsy (CP). Research suggests a continuum of balance performance between CP (severe balance deficits) and DCD concerning these balance deficits. Contrary, other DCD children may show similar performance to typical development (TD). Therefore, our study investigates the potential continuum of balance performance among these three groups. **Methods and Results:** We included 64 TD (5.0-10.6y), 39 DCD (5.4-10.9y) and 24 CP (5.1-10.4y, GMFCS I:13/II:7) children. The Kids-Balance Evaluation Systems Test - extended and age-specific version (Kids-BESTest-2), consisting of 36 tasks across six balance domains, evaluated their balance performance. Group-differences in domain and total scores (%) were assessed via ANCOVA (covariate: age), followed by Tukey HSD post-hoc analyses ($p<.01$). When accounting for age, DCD and CP performed significantly worse than TD across all Kids-BESTest scores with large effects (domains: $\eta 2=.25-.66$, total: $\eta 2=.71$). Children with DCD scored significantly better than those with CP on 4 of the 6 domains: Biomechanical Constraints, Anticipatory Postural Adjustments, Reactive Postural Responses and Sensory Orientation, while performing similarly on the domains of Stability Limits/Verticality ($p=.999$) and on Stability in Gait ($p=.012$). In both the DCD and CP group was heterogeneity was shown by individual overlapping values with the TD group and by varying deficient domains between and within individuals. **Conclusion:** There is a continuum of balance performance between children with TD, DCD and CP. Children with DCD and CP children can show difficulties in all different balance domains, which is suggestive for an internal modelling deficit in both groups. However, the TD like performances in both groups and varying performances across balance domains indicate the heterogeneity of their balance deficits. However, to fully understand this heterogeneity of these balance deficits, future research must focus on unravelling the control mechanisms.

Relevance

Improving balance deficits is a common clinical request in children with DCD and CP. However, first a better understanding of the balance deficits using a comprehensive approach is needed to understand all potential deficient underlying mechanisms. The heterogeneous balance performances in both children with DCD and CP underscore the importance of comprehensively evaluating balance deficits in both groups. This comprehensive assessment contributes to a better understanding of individual balance deficits, thereby facilitating more tailored treatment programs.

356 - Language skills of children with Developmental Coordination Disorder and motor skills of children with Developmental Language Disorder: a systematic review

Lynn van der Schaaf, Jelle Kisjes, Hanze University of Applied Sciences; Johannes Noordstar, Utrecht University; Remo Mombarg, Wilhelmina Children's Hospital; Ellen Gerrits, Frank Wijnen, Utrecht University; Margreet Luinge, Hanze University of Applied Sciences

Background: Children with Developmental Coordination Disorder (DCD) or Developmental Language Disorder (DLD) often show deficits in other developmental domains besides their primary impairment. For example, there are children with DCD who tell incoherent stories and children with DLD who are late in reaching motor milestones. However, the nature and prevalence of language difficulties in children with DCD, and conversely motor difficulties in children with DLD, is still unclear. The aim of this systematic review is to provide an overview of (1) the language skills of children with DCD, and (2) the motor skills of children with DLD, in comparison to the skills of typically developing children. **Methods:** A systematic review of the literature according to PRISMA guidelines was conducted. Four scientific databases were searched with two separate search strings related to the two objectives. A total of 876 articles related to language skills in DCD and another 447 articles related to motor skills in DLD were assessed. Finally, 16 articles about the language skills of children with DCD and 51 articles about the motor skills of children with DLD were included. Each article was independently assessed by two researchers for methodological quality. **Results:** Children with DCD scored lower on standardized language tests, specifically on receptive language outcomes. Deficits in phonological awareness and processing, narrative skills and communicative ability related to quality of life were also found. Further, children with DLD scored lower on standardized tests measuring manual dexterity and balance. Varying results were found for manual aiming and catching and other visuo-motor coordination tasks. Additionally, more problems are seen on tasks requiring complex motor skills and (complex) movement sequences, e.g. tying knots. Most of the observations were found for relatively older children (>6 y/o), but a few studies found similar results for younger children. **Conclusion:** In conclusion, the receptive language skills of children with DCD were found to be impaired, as well as the fine and gross motor skills of children with DLD, in comparison to these skills of typically developing children.

Relevance

The results point to an overlap in language and motor skill profiles between the DCD and DLD populations. These findings could benefit early screening and identification of children with DCD and/or DLD. Given the impact of language difficulties and motor difficulties on the daily lives of these children, it is important to provide the right care as early as possible.

NS1 Wees die held, durf over je eigen hek heen te kijken

Ilona v Wijngaarde, parent

Een oproep die ik zou willen doen aan alle experts: Durf over je eigen expertise heen te kijken en zie het kind. Het kind! Zie ouders als een expert en werk met ze samen. Hierdoor zullen kinderen sneller in beeld komen. En kunnen ze efficiënter worden geholpen. Ter illustratie, onze eigen ervaring.

Onze zoon, probleemloze zwangerschap. Al snel zien we een aparte ontwikkeling. Hij zoekt prikkels om in slaap te vallen.

Dan gaat hij niet kruipen. Hij rolt. Maak je niet druk.

Als hij anderhalf is komt hij met hevige benauwdheidsklachten in het ziekenhuis. Zo hevig benauwd hebben ze een kind op deze leeftijd nog niet gezien. Onze verhalen over zijn verkoudheden en hoe deze zich telkens openbaren worden neergelegd.

Het gaat goed met hem. Hij loopt wel laat. Valt veel.

Spraak komt niet op gang.

Zindelijk worden is lastig.

Alles wordt aangepakt. Maar afzonderlijk.

Bij spraak wordt er onderzoek gedaan. Geen taalontwikkelingsstoornis. Maar wel opvallendheden met motoriek en prikkelverwerking.

We komen bij een fysiotherapeut. Zij ziet de moeilijkheden bij prikkelverwerking.

Zindelijkheid wordt een ding. We komen bij de kinderarts. Als de verstopping is opgelost, kaarten we aan dat er wel veel is. Hier wordt geen gehoor aangegeven. ‘Daarvoor zitten we hier niet’.

Het kan niet dat er zoveel mis is in 1 kind en dat het kind niks overkoepelend heeft. Motoriek, spraak, zindelijkheid, verstopping, ademhaling, prikkelverwerking.. niemand die wil kijken naar ons hele verhaal. Alleen maar naar zijn/haar stukje.

Dan is daar die held. Degene die vraagt: wat zegt je moedergevoel?

Zij maakt zich hard voor een verwijzing.

Nu hebben we inmiddels een jongen van 6. Hij is nog niet zindelijk. Kan niet fietsen. Zijn neus niet kan snuiten. Prikkels zijn een hel, maar hij heeft ze ook nodig. School heeft geen idee.

Inmiddels heeft die jongen door dat hij anders is.

Zich druk makend over dat hij anders is en klasgenootjes hem uit zullen lachen.

Maar hoe anders was het geweest als er meteen serieus met onze signalen was in gegaan?

NS1 - Be the hero, dare to look over your own fence

Ilona v Wijngaarde, parent

I would like to make a call to all experts: Dare to look beyond your own expertise and see the child. The child! See parents as experts and collaborate with them. This will ensure faster focus on the child, such that they can be helped more efficiently. As an illustration, our own experience.

Our son, a problem-free pregnancy. Soon we see a peculiar development. He seeks stimuli to fall asleep.

Then he doesn't crawl. He rolls. Don't worry.

When he is one and a half years old, he comes to the hospital with severe respiratory complaints. They have never seen a child of this age so severely breathless. Our stories about his colds and how they manifest themselves each time are dismissed.

He's doing fine. He walks late. Falls a lot.

Speech doesn't start.

Becoming toilet trained is difficult.

Everything is addressed. But separately.

His speech is examined. No language development disorder. But peculiarities with motor skills and sensory processing.

We go to a physiotherapist. She sees the sensory processing difficulties.

Toilet training becomes a thing. We go to the pediatrician. When the constipation is resolved, we mention that there are many issues. This is not addressed. 'That's not why we're here.'

It can't be that so much is wrong with one child and that the child has no overarching issue. Motor skills, speech, toilet training, constipation, breathing, sensory processing... no one wants to look at our whole story. All experts focus at their own specific expertise.

Then there's that hero. The one who asks: what does your mother's instinct say?

She fights for a referral.

Now we have a 6-year-old boy. He is not yet toilet trained. Can't ride a bike. Can't blow his nose. Stimuli are hell, but he also needs them. School has no idea.

Meanwhile, that boy realizes he's different.

Worrying that he's different and classmates will laugh at him.

But how different would it have been if our signals would had been taken seriously right from the start?

NS2 - Empowerment through Fielgoed - Kampjes voor kinderen met DCD

Barbara De Mey, Kinepraktijk Heusden, België

Fielgoed-kampjes bieden een unieke en waardevolle ervaring voor kinderen met Developmental Coördination Disorder (DCD). Deze kampen zijn specifiek ontworpen om een veilige en ondersteunende omgeving te bieden waarin kinderen met DCD kunnen gedijen.

Kampjes voor kinderen met DCD bieden een scala aan voordelen. Allereerst creëren ze een gemeenschap waarin kinderen zich begrepen voelen. DCD kan leiden tot gevoelens van isolatie en frustratie, maar in een kampomgeving kunnen kinderen samen zijn met anderen die soortgelijke uitdagingen ervaren. Dit gevoel van verbondenheid kan een enorme boost zijn voor het zelfvertrouwen van deze kinderen.

Fielgood kampen zijn geen therapiekampen, met activiteiten die normale zomerkampen voor kinderen met een typische ontwikkeling wel omvatten. Echter, Fielgoed-kampen bieden aangepaste activiteiten en ondersteuning die zijn afgestemd op de behoeften van kinderen met DCD. Deze kampen fungeren als een veilige ruimte waarin kinderen kunnen experimenteren en groeien zonder angst voor veroordeling of mislukking.

Een belangrijke boodschap die deze kampen uitdragen, is dat kinderen met DCD niet alleen staan in hun uitdagingen. Door middel van ondersteuning, begrip en aanmoediging kunnen ze hun volledige potentieel bereiken. Deze kampen benadrukken het belang van inclusie en empowerment, waarbij elk kind wordt aangemoedigd om zijn of haar unieke talenten te omarmen.

Fielgoed-kampen bieden een veilige, ondersteunende en inclusieve omgeving waar kinderen met DCD kunnen groeien, bloeien en zichzelf kunnen zijn. Door middel van gespecialiseerde begeleiding en gemeenschapsopbouw dragen deze kampen bij aan het verbeteren van het welzijn en de levenskwaliteit van kinderen met DCD, terwijl ze tegelijkertijd bijdragen aan een meer inclusieve samenleving.

NS2 - Empowerment through Fielgoed - Camps for children with DCD

Barbara De Mey, Kinepraktijk Heusden, Belgium

Fielgoed camps offer a unique and valuable experience for children with Developmental Coordination Disorder (DCD). These camps are specifically designed to provide a safe and supportive environment in which children with DCD can thrive.

Camps for children with DCD offer a range of benefits. Firstly, they create a community where children feel understood. DCD can lead to feelings of isolation and frustration, but in a camp environment, children can be with others who experience similar challenges. This sense of connection can be a huge confidence boost for these children.

Fielgood camps are not therapy camps, including activities that summer camps for typically developing children would include. However, Fielgoed camps provide activities and support that are individually tailored to the needs of the children with DCD. These camps act as a safe space where children can experiment and grow without fear of judgment or failure.

An important message that these camps convey is that children with DCD are not alone in their challenges. Through support, understanding, and encouragement, they can reach their full potential. These camps emphasize the importance of inclusion and empowerment, encouraging each child to embrace their unique talents.

Field-based camps offer a safe, supportive, and inclusive environment where children with DCD can grow, thrive, and be themselves. Through specialized guidance and community building, these camps contribute to improving the well-being and quality of life of children with DCD, while also contributing to a more inclusive society.

NS3 - POTTS (Partnering Occupational Therapy Telehealth Services): An innovative approach to service provision for families and individuals with DCD.

Stephen Hodnett, Dyspraxia DCD, Ireland

Dyspraxia/DCD Ireland is a national disability organisation which provides services and support to individuals and organisations across the island of Ireland. In March 2020 Dyspraxia/DCD Ireland and the University of Limerick came together to develop an occupational therapy telehealth service. Known as POTTS (Partnering in Occupational Therapy Telehealth Services) the project allowed for services to be provided nationally to families with Dyspraxia/DCD as well as enabling final-year students to complete a placement to meet their required competencies. The selection of a telehealth model was a direct response to the COVID-19 Pandemic restrictions imposed in the Republic of Ireland during this time. In 2022 POTTS established a 3-year Strategic Plan which outlines the vision, mission and goals for the future. Below we have detailed our goals for the course of the strategic plan.

POTTS Strategic Plan Goals:

- Expand and enhance our online occupational therapy model of care
- Continuously improve our innovative student-led telehealth model of care
- Continue to sustainably grow our model of service provision
- Establish a robust governance model

Challenges:

- Suitability of services to telehealth
- Age group of service users
- Funding

Since the development of the POTTS programme, the service has provided:

- Placements for 37 occupational therapy students over 46 weeks of placements.
- These students have provided 624 one-to-one OT sessions, 30 group sessions, 24 webinars to over 100 families.

Current Service Provision:

- OT Assessment
- Handwriting assessment
- OT Sessions
- Webinars and education programmes
- Advocacy projects
- ADL clinic

Our future goals include:

- Increasing staffing and diversity of staff
- Expanding the volume of student placement opportunities
- Establish sustainable funding

Conclusions:

This project addressed two clear needs:

- Meeting the needs of individuals and families with DCD
- Providing students with placement experiences

NS4 - Application of CO-OP with a child with Fetal Alcohol Spectrum Disorder to address occupational performance goals: a case study

Catherine Hilly, Australian Catholic University, Australia

Children with fetal alcohol spectrum disorder (FASD) experience neurological impairments that impact participation in home, school and in the community. This can include motor coordination difficulties. Despite this, a recent systematic review of interventions for children with FASD found a paucity of motor interventions targeting participation outcomes.

Participation-focused interventions and outcomes for children with motor coordination difficulties, such as Developmental Coordination Disorder (DCD) and FASD, are critical to improve outcomes for children and their families and are a research priority in paediatric rehabilitation.

The Cognitive Orientation to daily Occupational Performance Approach (CO-OP) is one intervention found to be effective in addressing occupational performance goals and therefore promoting participation in children with DCD and other neurodevelopmental disorders affecting movement. It is yet to be evaluated for children with FASD and motor coordination difficulties.

In this presentation I will present a case study CO-OP with a 12-year-old diagnosed with FASD and motor coordination difficulties. Challenges were encountered in the application of this approach given the unique neuro-cognitive profile of this child. Encouraging the child's sense of autonomy and caregiver's active participation and creativity to support their child's participation and progress towards her goals was crucial. This child engaged in goal setting to identify and work towards their own occupational performance goals with additional support using CO-OP. The CO-OP approach was effective in achieving her goals although she did not generalise these to other contexts including school.

This case study highlights important interventions techniques for children with FASD. Further research is being undertaken to explore the feasibility and acceptability of CO-OP utility to attain occupational performance goals in FASD diagnosed children with motor coordination difficulties.

NS5 - Improving participation in sports and active play in children with DCD

Hilde Krajenbrink, Kenniscentrum Sport & Bewegen

Playing sports and being physically active are important for the health and development of children. However, participating in such activities is not evident for children with DCD. Children with DCD are often less physically active than their peers in all sorts of situations that involve motor activities. This is likely due to avoidance behavior that is caused by low self-esteem and lack of motivation due to repeating failure experiences. By avoiding these activities, children with DCD cannot practice and improve their motor skills, which means they are increasingly lagging behind their peers. It is therefore important to support these children so that they can increase their self-esteem and enjoy playing sports and being physically active together with their peers.

Currently, however, professionals in education and sports often do not have the necessary knowledge and tools to identify children with motor skill difficulties and to guide these children. In addition, therapists do not always work in a participation-oriented manner and communicate with these other professionals. In order to help children with DCD, a network of professionals is needed who work together and complement each other.

The Knowledge Centre for Sports & Physical Activity Netherlands makes knowledge from science, policy, and practice available and applicable to professionals. Last year, we worked on a whitepaper for professionals in education, sports, and health care, including knowledge and tools on how to identify, guide, and stimulate children with motor difficulties and how to build a network. In this session, the power of such a network and the role of individual professionals within this network will be illustrated with examples.

NS6 - A life with DCD: tumbling into DCD empowerment

Jason Spinks, person with DCD

The importance of embracing living with developmental coordination disorder needs to be underlined, both during childhood and during adulthood. To this end, I will tell the story about my own journey with DCD and my change in perspective, from not feeling like anything was amiss but my parents noticing some early signs (as a toddler) to not wanting to be seen as different (as a child and teenager) to a year in which I learned to find my place in a group of peers while being different (while studying creative writing in the UK), to learning more about DCD and changing my perspective, underlining that knowledge is power. In essence, I will try to sketch what forms DCD can take an how it can evolve through a lifetime.

Building on this, I will address the lack of awareness of DCD, taking examples from newspaper articles and radio shows where neurodiversity is discussed without a mention of DCD. I will discuss the fact that people can be more lenient with children than with adults with DCD, and will argue that the more people with DCD — whether children, teenagers or adults — come forward and talk about it, the more likely it is that developmental coordination disorder will become a widely known condition. The motivation behind this is to encourage people with DCD to embrace it, and the hope that more knowledge could help their immediate circles (family, teachers, employers) to better understand the situation they are facing and so react to it in ways that might be more beneficial to the person with DCD. In addition, it could help reduce the stigma surrounding the condition.

Take-home messages will be the need for self-acceptance on the one hand and for sensitization on the other.

NS7 - Are females paying the price for late or missed diagnosis of DCD? My perspective and journey from clinician to post graduate researcher

Clare Copley, University of Leeds

Background: As an occupational therapist within student support, in higher education, I have become aware of female students struggling with participation due to mental health. Often there appears to be no obvious underlying experience that would usually be associated with such presentations. There has been a focus upon societal changes, including social media usage, loneliness, and Covid-19. Yet 'thinking outside of the box', my own clinical judgement, has led to a realisation that a number of these young women, have difficulties associated with DCD. It appears that a lack of or late diagnosis and no access to appropriate support, has resulted in consequential difficulties transitioning into higher education.

Why this is important: There continues to be a distinct lack of understanding about DCD within the general population, health, and education - with women and girls appearing particularly disadvantaged. There is also limited understanding about the associated factors of DCD and experiences of young adults.

What are the challenges: In addition to my professional experience, I am the proud parent of a child with DCD. Like many mothers before me, this led to my own diagnosis of DCD in recent years. My clinical practice and personal experiences have undoubtedly driven me professionally and instilled a determination to step into the world of research. However, this is out of my comfort zone, and I am mindful of my personal bias relating to DCD.

What the future holds: I have begun to embark upon a PhD, focusing upon sex and gender differences within DCD, with specific consideration of mental health and factors influencing engagement with higher education. I hope to impact the experiences of young women with DCD, ensuring earlier identification and support. I am keen to promote opportunities for more inclusive and equitable academic outcomes, whilst mitigating risks due to sex and gender bias within neurodiversity.

NS8 - Multidisciplinary DCD diagnostic clinic – one stop shop is a success with families

Amanda Farrell, Guy's and St Thomas' NHS Foundation Trust, United Kingdom

This presentation explores benefits and value to families of a joint MDT (multidisciplinary team) DCD diagnostic clinic structure within a childrens community health team London.

There is a pathway for assessing coordination in children aged 5-18. Initial contact is within the Coordination Clinic run jointly by neurodevelopmental paediatrician + Senior paediatric OT. Appointment is in-depth assessment based on European Academy of Childhood Disability guidelines: parent/carer/young person interview, physical examination, parent/school questionnaire, standardised assessment of motor skills and functional assessment. Joint analysis is completed to reach consensus on diagnosis and shared with family. Follow-up intervention if indicated.

The clinic provides a one-off appointment resulting in diagnosis (or not) and/or highlighting other areas of need after this holistic neurodevelopmental assessment.

A recent survey highlighted that all families found the clinic helpful and would recommend the clinic to others. The survey also ascertained that families valued other aspects of the clinic format including pre-appointment information, summary sheet immediately after assessment; detailed report, opportunities to discuss any other concerns about their child's development. The survey raised challenges e.g., long waiting times for appointments, involving additional clinicians to join appointment, difficulties attending appointment.

The clinic is valued by the clinicians in the MDT, as there is sharing and enhancement of skills, opportunity to jointly assess and clinically reason, curtailing the need for making onward referrals and multiple appointments. This reduces the risk that diagnosis is delayed if the child is referred to either OT or paediatrics separately. The clinic is efficient, maximizing the impact of available resources within a clinical environment and is cost effective whilst maintaining high-quality patient care. This clinic presents as a learning opportunity for OTs and paediatricians in training.

NS9 - What a 13-year-old with DCD thinks teachers need to know

Joseph Copley, person with DCD

As a high school student, I've had my fair share of difficulties due to my diagnosis of DCD and these aren't always obviously related to my co-ordination issues. That said, changing for PE, using some equipment in Design and Technology and mastering arts and textiles skills does cause me some stress. But, the real difficulties are much less obvious. Some days by the time I make it to school, I already feel like I have run a marathon. Having DCD can be exhausting and really challenges me when I am expected to sit still for hour long lessons, engage socially with other humans and eat my lunch without appearing like Jabba the Hutt. Some days are easier than others, depending on how I have slept, what else is going on in my life, if I am having a growth spurt or if we are heading towards the end of the week or the end of term! I would love to enlighten teachers about the hidden bits of DCD that they might not know about.

I have also had some pretty awesome teachers help me so that I can be at my best. This experience has given me some great ideas about how teaching and school could unlock the potential of children with DCD and other conditions.

DCD does not stop me from succeeding at school, but teacher's lack of understanding has affected me in the past and my experiences at school have made me feel that I wasn't good enough. Now that I am 13, I am keen to use my experiences of school life to make a difference to the future education of other children with DCD. I would like teachers to know what is difficult and what is possible for children with DCD.

NS10 - The DCD voice through poetry: a dyspraxic performance

Jason Spinks, person with DCD

To tell the world about DCD is to deliver a complex message. Luckily, those who have to deal with the condition tend to have a propensity to think outside of the box and find creative ways to convey their message. No better than someone with lived experience to express life with DCD in a creative way.

Through poetry written by me, interspersed with explanations and illustrations of my own and others' lived experiences, this presentation will attempt to elucidate questions like:

How does it feel when you're struggling just to write your name in school, or when you have to do arts and crafts while you struggle to hold a pair of scissors?

What emotions do some children with DCD experience when they grow up? What's their inner dialogue?

How do people cope with the condition?

What is it like for an adult to live with DCD?

What is it like to have DCD in the workplace, and what questions do you ask yourself?

What does it feel like to tell someone you have DCD?

My poems will explore various aspects of living with DCD, from adaptations of daily life to hygiene and insecurity in friendship and other types of relationships. They will represent the patient voice in a day-to-day, rather than clinical, light.

Following this, I will give examples of other performances that have shed light on dyspraxia and give ideas on other creative ways of illustrating the condition. I will attempt to encourage other people with DCD to acknowledge their diagnosis and talk about it with their direct environment and with experts, to mobilize them to raise awareness.

NS11 - DCD and ASD. Implications of high co-occurance in our community children's service

Heather Turpin, Evelina London, Guy's and St Thomas' NHS Foundation Trust, United Kingdom

This poster raises a number of discussion points relating to high incidence of co-occurrence of DCD and ASD found within the patient population of a community paediatric DCD clinic. What started as a hunch on the part of the clinic clinicians was corroborated by a service evaluation which identified nearly 80% of children receiving a diagnosis of DCD were awaiting or had been referred for ASD assessment or already had a diagnosis.

Our DCD pathway is informed by the 2019 European Academy of Childhood Disability (EACD) guidelines, including recommendation 14 which states "dual or multiple diagnoses including DCD and any other disorder be given when appropriate." Following diagnosis intervention can include DCD education, task-specific training, COOP-based therapy, and parent coaching workshop.

Review of clinic attendees found not only high co-occurrence of DCD and ASD/ likely ASD, but also a nearly 20% increase between those seen in 2022 and in 2023.

Our reflections include:

- Should we have a joint assessment clinic for children referred to both ASD and DCD clinics?
- EACD guidelines suggest 79% of children with ASD may have "movement impairments consistent with DCD". Should this be flagged at ASD diagnosis and input provided, which may preclude need for subsequent DCD assessment?
- We offer separate DCD and ASD treatment pathways and it can be difficult to decide which would be most beneficial for children with dual diagnosis.
- Are we missing children who present with likely DCD but not ASD? EACD guidelines suggest less than 6% of children with DCD may have ASD comorbidity.
- What is the perspective of the children/young people and families on accessing diagnosis and intervention for more than one condition? Is there the perception that more diagnoses equate to more support?
- Are there implications for DCD research if it isn't explicit whether participants had a co-morbidity?

We are keen to stimulate discussion around co-occurrence of DCD with ASD, and to learn from other teams to support our ongoing service development.

NS13 - Raising awareness of motor impairment with fetal alcohol spectrum disorder (FASD) is imperative to support motor and participation outcomes

Catherine Hilly, Australian Catholic University, Australia

Fetal alcohol spectrum disorder (FASD) is an aetiological diagnosis for a spectrum of neurological disorders resulting from prenatal alcohol exposure (PAE). FASD is diagnosed with the presence of either PAE or three sentinel facial features, plus severe impairment on at least three neurodevelopmental domains including motor ability. The Australian FASD diagnostic guideline states that FASD may occur with other conditions such as ADHD and autism, but has not been resolved with respect to Developmental Coordination Disorder (DCD).

Motor impairments are widely reported in children with FASD. PAE may damage the cerebellum, corpus callosum and basal ganglia which are integral parts of the motor control network. A recent qualitative review of these guidelines indicates that clinicians query whether FASD diagnosis should align with those of DCD.

Like DCD diagnosis, motor assessment for children with PAE involves direct assessment of motor abilities using standardised assessment and caregiver questionnaires or interviews to determine the impact of motor abilities on daily performance. In children with FASD, the aetiology of motor impairment is well known, with impairments likely to impact on their participation in daily activities.

It is well established that DCD co-occurs with other neurological disorders including ADHD and learning disorder, however, its co-occurrence with FASD is not well conceptualised in diagnostic terms. It remains important to raise awareness of the motor impairments that do exist in this disorder to ensure valid diagnosis and provision of appropriate interventions to improve their motor skills and participation in everyday life.

I will discuss the diagnostic implications for children with FASD who also experience motor impairment. As few interventions studies exist for children with FASD, this talk is designed to raise awareness of the motor performance issues of these children and ways to support their motor development and participation.

NS14 - The use of non-traditional methods and teaching aids in the prevention of DCD in preschool children

Lenka Knopová, Technical University of Liberec, Czech Republic

Many current professional studies indicate that the level of motor competence of preschool children is declining. Below-average values that can be very well diagnosed by selected test batteries (e.g., Bruininks-Oseretzky Test of Motor Proficiency, Second Edition) may indicate the possibility of Developmental Coordination Disorder. Significant decreases in levels have been noted, particularly in the areas of fine motor control and body coordination. However, some research shows that these problematical areas can be well developed and systematic training can lead to improvements in the observed values. An appropriate training programme focusing exclusively on selected areas of motor competence could also act as a preventive measure for children showing average or above-average values. This specifically targeted intervention can be applied in different ways, using a variety of teaching aids. The aim of this paper is to present short practical exercises focused on the development of the above-mentioned problematical areas, using mainly non-traditional methods and procedures (cognitive games, coordination games etc.) and using non-traditional materials (pegs, lids, cups, newspapers, straws, inflatable balloons, foam earthworms, strings, paper trays etc.). These (unusual for normal movement activities) teaching aids are often used in psychomotor or experiential pedagogy. Particularly for pre-school age children, the use of these materials is particularly beneficial in terms of motivating children to engage in the activities in question. In the case of the development of individual areas, the variety and diversity of the offered activities is important. This kind of variety and diversity can be offered by the intervention programme. This series of practical exercises could be a suitable complement or an alternative to traditional exercises and could serve as an inspirational material not only for pre-school teachers but also for children in older age groups. Furthermore, this material could be used in research on the effectiveness of intervention programmes focused on developing motor competence.