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Short Communication

Cognitive challenges at the crime scene: The importance of social science research when introducing mobile technologies at the crime scene

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Forensic Science is highly focused on technological developments, especially with regard to crime scene investigations. Research in this field mainly focuses on technologies that support the visualization and analysis of (latent) traces. Examples of new technologies designed for rapid analysis of traces and for quickly obtaining identification information at the crime scene are so called rapid identification technologies. Recently developed mobile rapid analysis devices can generate identification information during an early stage of the investigation. Such developments create new opportunities for CSIs at the crime scene and for the investigation. It should, however, not be neglected that these technologies need to be handled by humans. Humans have to perceive and select traces before they can serve as input for these devices, and humans need to correctly interpret the output and the relevance of the evidence for the case. In other words, the human factor plays an important role even when complete trace analyses are conducted by machines. Rapid technologies for trace analysis do not change the fact that it is impossible to analyze every possible trace and sample that could be taken from the crime scene, and that CSIs constantly have to make choices. Their perceptions, observations, interpretations and decisions depend on scenarios they can imagine and on their routines, beliefs and experience [1]. The introduction of new identification technologies necessitates thinking about the influence of these technologies on perceptions, decisions and interpretations and on the way rapid analysis options change the dynamics of the criminal investigation process. If we do not understand the underlying decision making processes, we are faced with the risk that such promising new devices impede instead of aid the investigation as wrongful interpretations of traces and analysis results can bias other components of the investigation [2].

The introduction of new technologies at the crime scene is accompanied by (new) cognitive challenges. The availability of mobile rapid analysis devices influences CSIs decision making processes and their interpretation of the perceived information. Recent studies have demonstrated that social science research is crucial in understanding cognitive aspects of Forensic Science and should receive more attention. In this commentary, we will link this general requirement to the above mentioned rapid identification technologies.

1. Challenge 1: guiding goals and expectations influencing the perception of traces

Personal experiences, intentions and available information can give rise to expectancy effects. This so-called context information affects perception and decision making in all kinds of situations and circumstances, also at the crime scene (see Kassin et al. [3] for

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an overview of these context effects in the forensic field). Context effects occur because people are inclined to interpret events to fit their expectations, which are based on available information, their training, experiences and goals. CSIs cannot enter a crime scene completely blank; they always use their experience, their intentions and the available information as a reference to interpret their observations. This can be seen as top-down information processing. On the other hand, CSIs adapt their interpretations and their further search for information on what they observe, which can be seen as a bottom-up process. These top-down and bottom-up processes are intertwined.

Recent research has demonstrated that expectations, based on context information about a crime, influence the search, the interpretation and the selection of traces. Depending on the context information provided and the expectation of the observer, traces or clues are interpreted consistent with either one or the other scenario [4,5]. Furthermore, important traces appear to be frequently overlooked when they are left at unexpected places [6,7].

Expectations of CSIs cannot only be influenced by information provided at the crime scene, but also by new goals accompanied by technological innovations. New analysis devices may for instance shift the focus of CSIs from a broad observation of the crime scene, to a more targeted search for traces that can be analyzed with these devices. This entails the risk that important traces are overlooked. Although such an effect has not been demonstrated yet [8], more research into this aspect is desirable as the above-mentioned studies indicate an influence of expectations and experiential knowledge of CSIs on their observations and interpretations, regardless of technologies.

2. Challenge 2: decions concerning the use of the technology

Once traces are observed and perceived as relevant, the next cognitive challenge requires a good estimate of the relevance and the success-rate of a trace. Given the current developments, rapid DNA analyses conducted in a mobile device are less sensitive compared to traditional analyses in the laboratory. Furthermore, they lack the opportunity to save part of the sample. This means that use of the rapid DNA analysis device should be considered destructive. Therefore, knowledge about DNA success rates is essential to make informed and deliberate decisions regarding the use of a rapid DNA analysis device. The urge for more research into this topic is demonstrated in a recent study showing that CSIs do not always have a correct impression of the DNA success rate of different sorts of DNA traces. As a consequence, important traces with low success rates may get lost when they are analyzed with rapid DNA technology [9]. Obviously, support for more informed decision making is crucial. A first step is taken by Mapes et al. [10] who suggest a decision support system when using rapid identification technologies. The findings of these studies show the general urge for research into decision making processes and support systems when new mobile technologies are introduced at the crime scene.

3. Challenge 3: subjective interpretations of analysis results

The investigation at the crime scene is an ongoing process of observation, interpretation and adjusting hypotheses. When traces are eventually analyzed during the crime scene investigation, the final cognitive challenge concerns the interpretation of the results. Currently, the process of analyzing traces and interpreting trace results is separated to avoid bias. Expectations of CSIs, as argued, influence the interpretation of the scene and its traces, and consequently also the most plausible scenario. This scenario may influence the way new incoming information is interpreted, due to well-known cognitive processes such as confirmation bias and belief perseverance [11]. Recent research indicates that CSIs attach great importance to obtained database-matches [7]. The risk here lays in the fact that such results may become leading in the investigation when they are provided too soon, while alternative explanations for the findings should still be considered. After all, the presence of a person's DNA or fingerprint does not mean this person committed the crime as the scene can be full of traces left by persons legitimately connected to the scene (see also Gill [12]). In addition, this research shows that receiving analysis results in situ leads to fewer traces being collected thereafter [5]. This should not be problematic if the analyzed traces are indeed left by the perpetrator and thus provide investigative leads, but this approach counteracts when more trace information is required for other purposes such as reconstruction, discrimination between scenarios or for intelligence purposes [1,13].

4. Facing challenges: the way forward

Even in the domain of forensics, which is often regarded as objective, crime scene investigations, decisions regarding further analyses of traces, and the interpretation of the analyses results are accompanied by cognitive challenges. This should be understood properly when introducing new technologies at the scene.

The introduction of new technologies that enable trace analyses and trace comparisons at the crime scene have far-reaching consequences for the design of the criminal investigation process and for the professionals involved in it. Tasks and processes that have been increasingly separated since the middle of the last century will get more integrated. This enables an efficient use of the available information, but also involves risks as the above mentioned studies show. It is only when we understand these processes at the crime scene and, the role of the human factor in forensics and in the criminal justice system, that we will be able to use new technologies in its most effective way.

CRediT authorship contribution statement

Madeleine de Gruijter: Writing - original draft, Writing - review & editing. **Christianne J. de Poot:** Writing - original draft, Writing - review & editing.

References

[1] O. Delémont, S. Bitzer, M. Jendley, O. Ribaux, Intelligence-based crime scene examination, The Routledge International Handbook of Forensic Intelligence and Crimonology, Routledge, Abingdon, Oxon; New York, NY, 2018, pp. 86–101.
[2] I.E. Dror, Biases in forensic experts, Science 360 (6386) (2018) 243, doi:http://dx.doi.org/10.1126/science.aat8443.
[3] S. Kassin, I.E. Dror, J. Kukucka, The forensic confirmation bias: problems, perspectives and proposed solutions, J. App. Res. Mem. Cognit. 2 (1) (2013) 45–52, doi:http://dx.doi.org/10.1016/j.jarmac.2013.01.001.
[4] C. van den Eeden, C.J. de Poot, P. van Koppen, Forensic expectations: investigating a crime scene with prior information, Sci. Justice 56 (6) (2016) 475–481, doi:http://dx.doi.org/10.1016/j.scijus.2016.08.003.
[5] M. de Gruijter, C. Nee, C.J. de Poot, Rapid identification information and its influence on the perceived clues at a crime scene: an experimental study, Sci. Justice 57 (6) (2017) 421–430, doi:http://dx.doi.org/10.1016/j.scijus.2017.05.009.
[6] M. de Gruijter, C.J. de Poot, H. Elffers, Reconstructing with trace information. Does rapid identification information lead to better crime reconstructions? J. Invest. Psychol. Offender Profiling 13 (3) (2016) 1–16, doi:http://dx.doi.org/10.1002/jip.1471.
[7] M. de Gruijter, C.J. de Poot, The use of rapid identification information at the crime scene; similarities and differences between English and Dutch CSIs, Policing Soc. Int. J. Res. Policy (2018), doi:http://dx.doi.org/10.1080/10439463.2018.1434177.
[8] M. de Gruijter, C.J. de Poot, The influence of new technologies on the visual attention of CSIs performing a crime scene investigation, J. Forensic Sci. 61 (1) (2016) 43–51, doi:http://dx.doi.org/10.1111/1556-4029.12904.
[9] A. Mapes, C.J. de Poot, Rapid DNA anaysis at a mock crime scene: the impact on collecting and analyzing DNA traces, Rapid DNA Technologies at the Crime Scene. 'CSI' Fiction Matching Reality, Proefschriftmaken.nl, Amsterdam, 2017, pp. 80–109.

[10] A. Mapes, R. Stoel, P. Vergeer, C.J. de Poot, M. Huyck, Decision support for using mobile rapid DNA analysis at the crime scene, Sci. Justice 59 (2018) 29–45, doi:http://dx.doi.org/10.1016/j.scijus.2018.05.003.
[11] R. Nickerson, Confirmation bias: a ubiquitous phenomenon in many guises, Rev. Gen. Psychol. 2 (1998) 175–220, doi:http://dx.doi.org/10.1037/1089-2680.2.2.175.
[12] P. Gill, DNA evidence and miscarriages of justice, Forensic Sci. Int. 294 (2019) 1–3, doi:http://dx.doi.org/10.1016/j.forsciint.2018.12.003.
[13] Q. Rossy, D. Décary-Hétu, O. Delémont, M. Mulone, The Routledge International Handbook of Forensic Intelligence and Criminology, Routledge, Abingdon, Oxon; New York, NY, 2018.