



Differential reporting of mixed DNA profiles and its impact on jurists' evaluation of evidence. An international analysis



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ABSTRACT

While DNA analysis is considered by many the gold standard in forensic science, there is ample room for variation in interpretation and reporting. This seems especially the case when working with (complex) mixed DNA profiles. Two consecutive studies on differential DNA reporting were conducted. In Study 1, we first examined type and magnitude of differences when forensic DNA experts across institutes and jurisdictions are handed an identical forensic case with mixed profiles. In Study 2, we explore the impact of the observed differential reporting on jurists' evaluation of the DNA evidence.

19 DNA expert reports from forensic institutes across Western jurisdictions were obtained. Differences between the reports were many and include extensiveness of the reports, explanations of technical issues, use of explanatory appendices, level of reporting, use of context information, and, most markedly, type and substantive content of the conclusions. In Study 2, a group of criminal law students judged a selection of these reports in a quasi experimental study design. Findings show that these differing reports have quite different evidentiary value for jurists, depending on which expert authored the report. It is argued that the impact of differential reporting on jurists' evaluation was so fundamental and substantive that it is seems reasonable to claim that in an actual court case it could make the difference between acquittal and conviction.

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1. Introduction

DNA evidence is often considered the gold standard of forensic science [29]. To illustrate, in 2009, a highly critical National Academy of Science report was published about the state of affairs in US forensic science [21]. The underlying study and subsequent report were commissioned to focus on non-DNA forensic evidence. To many, apparently also to US Congress, which ordered the report, DNA evidence has a unique standing and esteem. This DNA exceptionalism [20] is unjustified as expert DNA evidence is not insusceptible to error, subjectivity, bias, and controversy. It is true that DNA profiling and the actual techniques used have been validated and evolved to high and reliable technical standards as compared to many other areas of forensic science. However, it is

often overlooked that the interpretation and comparison of partial and mixed DNA profiles in particular is far from straightforward and may give cause for concern (cf. [3,8,30]). Moreover, the production of the written DNA expert report and its subsequent interpretation and comprehension by the jurist consumer of it, have been shown to be prone to many problems and miscomprehension (cf. [2,5,10,13,17–19,26,27]).

Bias and subjectivity are explicit matters of concern in the forensic community (cf. [21]). Dror and Hampikian demonstrated bias in forensic DNA mixture interpretation as a result of the absence or presence of context information about the criminal case [8]. Apart from the effect of context information, their study further showed that within one group of 17 DNA experts working at the same North American laboratory, there was substantive variation in the interpretation of a mixed profile.

From an international perspective, matters become even more complicated since the form and content of expert DNA reports seem to vary substantially between jurisdictions and between forensic institutes. In an unpublished explorative study on DNA-reporting [7], 55 DNA-reports from accredited laboratories in the

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United States, Ireland, Germany, the Netherlands and Belgium were compared. The reports differed on several dimensions, but it was impossible to draw any generalizing conclusions, because of the purely exploratory design, yielding reports that were based on different types of crimes, varying from simple robbery to homicide. Nevertheless, it was this initial international exploration of DNA reports that motivated us to undertake a more structured and systematic study of variation in DNA reporting and its consequences, which is the focus of the present study.

While DNA analysis is considered by many to be technically void of any substantive degrees of freedom, the present study aims to further examine what substantive differences exist in interpretation and subsequent reporting. To that end we presented forensic experts with one and the same forensic case including exactly the same context, formal request and DNA profiles. We will examine differences between the reports on several dimensions including volume, explanation of technical issues, structure of the report, format and type of conclusions, and, last but not least, the actual content and meaning of the conclusions.

Whatever the source, it is plausible to expect that variation in DNA reporting affects the impact and use of the reports by the (judicial) consumer in court. We therefore used a selection of the expert reports obtained in this study for a subsequent quasi experimental examination. This subsequent study focuses on the differential impact of varying reports on jurists' interpretation of the evidentiary value of DNA findings.

In summary, in the two consecutive studies reported below, we will answer the following questions. What type and magnitude of differences do we find when forensic DNA experts across institutes and across jurisdictions are handed an identical forensic case to report on? If differences are substantive, what does this mean for the interpretation and value of the evidence by jurists?

2. Study 1: expert DNA reporting on an identical forensic case with mixed profiles

2.1. Purpose and focus

Study 1 has a dual purpose. Its first purpose is an international comparison of DNA reports written on the basis of identical electropherograms representing mixed profiles relating to a fictional forensic case. Its second purpose is geared towards Study 2, i.e. to provide a pool of DNA expert reports from which to select a limited number to include in a quasi-experimental study with jurists interpreting these reports.

For practical purposes, we limited our scope to countries where the official language was English, German or Dutch. We thus narrowed our focus on obtaining participation from DNA experts at accredited laboratories in the Netherlands, Belgium, Germany, Austria, Switzerland, The United Kingdom, Ireland, the United States, and Australia. The analyses were concentrated on differences between the reports in terms of structure and content, use of context information, and form and content of the conclusions. These are aspects that have been documented to affect the comprehension and interpretation of forensic expert reports by jurists. For instance, the inclusion in the expert reports of technical details such as the explanation of techniques used, statistics and error rates are considered to be important (e.g. [14,26]). Furthermore, if the request for DNA analysis is not specific, the choice of the expert to report at source level only, rather than to draw conclusions also on activity level, may have a profound impact on the meaning and use of the report in court (cf. [4]). Finally, the specific format in which quantitative or statistical evidence is presented may significantly affect its comprehension by the readers of reports (cf. [15,16,26,28]).

Table 1
Response at country level.

	Institutes	Reports
The Netherlands	2	2
Belgium	1	1
Germany	4	7 ^a
United Kingdom	2	5 ^a
Australia	2	2
United States	1	1
Ireland	1	1
Total	13	19

^a More than one report was submitted by one of the participating institutes in this country.

2.2. Participants and procedure

In 2013 we approached 30 accredited forensic institutes in Europe (the Netherlands, Belgium, Germany, The United Kingdom, Ireland, Austria and Switzerland), the United States and Australia. The European institutes were contacted using the contact information on the website of the European network of forensic science institutes (ENFSI). In addition to these institutes, Dutch and Belgian non-ENFSI institutes and other institutes in Australia were contacted via personal connections. The contacted institutes from the United States had earlier participated in the explorative study mentioned above and were approached using those contacts. Institutes were first emailed to ask for the contact information of the head of the DNA department. One week later a letter of announcement was sent to all institutes, if possible directed to the head of the DNA department. This letter asked for the participation of the institute by writing a DNA report on the basis of a mock case, referred to the earlier explorative study and explained the procedure of the present research. To prevent biased reports, no detailed information was revealed about the findings of the earlier study. Our letter underscored that the reports should be written by a qualified and experienced DNA expert in the same manner as these persons are accustomed to doing in their daily routine. As a further incentive, participants were told that all anonymized reports would be published on a password-protected website that was only accessible to the participants in the study. One month later, the forensic mock case including the request to report, the electropherograms, photos of evidence and a brief questionnaire for the expert who was writing the report, were sent to the forensic institutes. The accompanying letter once again underscored that an experienced DNA expert should write the report in accordance with the usual format, and that they should treat it as if it were a regular request from the public prosecutor. Institutes were requested to return the report within three weeks. After this deadline a reminder was sent that extended the deadline by one month.

Thirteen institutes participated and returned reports within a month after the request, yielding an overall response of 43.3%. Institutes that stated that they could not participate mostly indicated that they were too busy. As the remaining institutes never replied to any correspondence, it is unknown why they did not participate. Table 1 shows the response at country level. As some institutes participated with more than one qualified expert, the number of expert reports is greater than the number of participating institutes (19 and 13 respectively). Of the 19 reports, 13 came from institutes affiliated with ENFSI. Table 2 provides some further background statistics of the participating experts. The Table shows that we succeeded in reaching experienced DNA experts for our study.

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