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The Influence of Background Knowledge on Forensic Toxicology Decision-Making

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Introduction

In forensic toxicology, biological fluids are tested for drugs, alcohol, or poisons to determine their role in human performance (such as driving while intoxicated or a workplace accident), sudden deaths (such as a coroner's inquest), and criminal cases (such as drug-facilitated crime). Although forensic toxicology casework is frequently regarded as "objective," many aspects involve interpretation and subjective decision-making that are left to the discretion of the forensic examiner. Understanding the job of mental human variables in forming choices in this discipline is thusly significant. Cognitive bias is a systematically distorted pattern in human judgment, and it can affect our perceptions and decisions in many different ways. These have now been shown to have a significant impact on forensic science, and the effects are not limited to fields that compare patterns or images; inclination may likewise affect disciplines in light of scientific science, like measurable toxicology [1].

Numerous fields, including DNA and fingerprints, have demonstrated the impact of cognitive bias on forensic science decisions; however, more objective fields, such as forensic toxicology, have not been empirically examined. When analyzing data from an immunoassay test for opiate-type drugs, participants (n = 58) were affected by irrelevant case information in the first experiment. Participants (n = 53) in the second experiment chose tests with bias; for instance, the deceased's age affected testing strategy: Medicinal drugs were typically chosen by older individuals, whereas drugs of abuse were chosen by younger individuals. We propose that examiners analyzing presumptive test data are blind to irrelevant contextual information because of the findings that examiners analyzing case data may have biases if they have access to the context of the case. Also, those forensic toxicology labs follow a consistent method for choosing tests and that any deviations are documented and explained [2].

Cognitive bias can have an impact on three important aspects of a toxicology case: the selection of tests or a case strategy, the finding of a drug during drug screening, and the way test results are interpreted. While these cycles can be affected by mental predispositions, a few explicit models are examined here. Expected frequency bias, for instance, can have an impact on the selection of tests. The treatment of this case is biased if the toxicologist makes incorrect decisions based on previous experiences and assumptions about the people involved. For instance, during drug screening, comparisons are made between the case sample and drug reference standards. This (often visual) comparison can be influenced by the target reference or by contextual information provided to the analyst about the case. In forensic toxicology, interpretation is frequently subjective; for instance, it is based on the particular toxicologist performing the work, as well as their own personal knowledge and experience, which can result in expectations that can cause confirmation bias or tunnel vision [2].

Description

Immunoassay is utilized in criminological toxicology to quickly evaluate natural examples for the presence of gatherings or 'groups' of medications e.g., benzodiazepines. Immunoassay results are hypothetical, and that implies that they don't give unequivocal proof of the presence of a medication and any sure discoveries ought to be affirmed by another more modern procedure, for example, gas chromatography-mass spectrometry (GC-MS) or fluid chromatography-mass spectrometry (LC-MS). Because immunoassays are known to produce false-positive results, the secondary technique is used first to confirm the immunoassay's positive result and, if the result is a true positive, to identify the drug family members that are present. Immunoassay screening, like many other tests in forensic toxicology, is done in batches. For instance, multiple cases are analyzed together, with positive and negative control samples and sometimes duplicate samples from each case. It is additionally normal for the investigator doing the immunoassay to be different to the toxicologist detailing and deciphering the case [3].

Immunoassays are basic variety change tests, and in the penultimate step of the test the power of the variety delivered by the example is noticed and switched over completely to a mathematical worth known as the absorbance (Abs) or optical thickness (OD). The analyst looks over the data in the final step and uses a straightforward mathematical rule to figure out which samples need to be confirmed and which are negative. The "cut-off" value, which is the Abs value from a biological sample spiked with a drug reference standard, is compared to the Abs value from each case. Participants in this study looked at data from a competitive enzyme-linked immunosorbent assay (ELISA). If the case Abs number was lower than the cut-off number, it was assumed to be positive, and if it was higher than the cut-off, it was assumed to be negative [1].

The customer, such as a police officer or pathologist, may send precise instructions outlining which tests are required, or the decision may be made entirely by the toxicologist or in conjunction with them, depending on the jurisdiction. At the time of receipt in some laboratories, cases are assigned to named toxicologists, and the scientist who will ultimately report the case makes the decision. In different labs, a couple of toxicologists are liable for "booking-in" or "getting" the examples and picking the tests. The selection of tests may be restricted in some cases, such as workplace drug testing or driving under the influence or by contracts that have been agreed upon in advance with the customer. As a result, the focus of this experiment was on post-mortem cases, where these external factors typically limit the range of tests [4].

This study's participants were students studying toxicology, and subsequent research should investigate decisions made by practicing toxicologists. Cognitive bias may have an impact on other aspects of forensic toxicology casework. For instance, in order to attempt to identify a drug, forensic toxicologists frequently use "matching" software in mass spectrometry, similar to Automated Fingerprint Identification Systems (AFIS) and e-Gate technology. A drug's pure reference sample is used to create the library spectra, which are then compared to a response from a biological sample to rank potential matches. Especially in low quality examples, experts are then expected to

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embrace an emotional matching cycle, sifting through signals from commotion for examination, an interaction that might be impacted by task-superfluous data. Because interpretation is frequently subjective and based on the individual experience and expertise of the toxicologist, rather than on accepted or standard rules, the question of how interpretation in forensic toxicology is affected by cognitive bias is a more difficult one to investigate [5].

Conclusion

In this study, we looked at how two common decisions in forensic toxicology labs were affected by irrelevant contextual information. The first was the selection of tests for five post-mortem cases and the second was the analysis of data from an opiates immunoassay screening. The participants' experiences shaped both of their choices. Even when the context supported the correct mathematical decision, the presence of the case circumstances decreased the accuracy of decisions in the immunoassay data analysis. We propose that analysts making this kind of decision in forensic toxicology laboratories are not given access to irrelevant contextual information due to our findings that examiners analyzing case data may have biases if they are given access to case context. In the case strategy experiment, the selection of tests for cases with similar circumstances was influenced by demographic information like age and ethnicity. As a result, we propose that forensic toxicology laboratories adhere to a consistent framework when selecting tests and that case-by-case variations or decisions be documented and supported in casefiles.

Acknowledgement

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Conflict of Interest

None.

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