



## **ASFDE Inc. Statement on Error Rates Associated with Handwriting and Signature Examinations dated May 2023**

Within the Australian and international forensic communities there is a growing push to establish and communicate the reliability of results associated with forensic examinations. The 2016 President's Council of Advisors on Science and Technology (PCAST) report recommends the 'foundational validity'<sup>1</sup> of forensic feature comparison methods be established through large scale empirical testing and for appropriate estimates of error rates to be made available [1]. In addition, the 2021 National Institute of Standards and Technology (NIST) publication recommends the inclusion of relevant rates of error in written reports [2]. The 2022 Sydney Declaration acknowledges that "forensic science deals with a continuum of uncertainties" and that "uncertainties can be identified and quantified through research and eventually managed in practice" [3]. One method for presenting the uncertainty attached to these examinations is through the provision of error rates. While the term 'error rate' suggests a problem, the measurement can also be used to demonstrate the relative lack of error.

The calculation and reporting of error rates is a complex endeavour. There are a great number of variables involved and many ways in which results can be interpreted. In *The Modular Forensic Handwriting Method*, Found and Bird (2016) caution readers that it is not appropriate "to derive a global error rate for forensic handwriting examination about all types of writing and all Forensic Document Examiners in general" [4]. Readers should also be cautioned against using an error rate as a measure of how likely the result provided in any one report is correct/incorrect, and that it is more appropriate to be used as a demonstration of the scientific validity and reliability of the forensic discipline [4]. While reporting of error rates is important to demonstrate 'foundational validity', 'validity as applied'<sup>2</sup> can be addressed by implementing measures to further reduce the potential for error, including a robust quality management system.

The validity and reliability of the field of handwriting and signature examination has been the target of a great deal of research. This is largely due to the pioneering work of Dr. Bryan Found and Dr. Doug Rogers who commenced this research in 1994. Found and Rogers' large-scale Australian empirical studies are considered amongst the best and most thorough in the world, and tested the skills of qualified Forensic Handwriting Examiners in both signature and handwriting examinations across a number of years. Participation across these trials ranged from 21 to 62 examiners [5, 6]. In each of the signature trials, examiners were asked to compare a number of questioned signatures with a set of specimen signatures. Responses regarding authorship were reported using a scale including five levels of opinion reflecting varying levels of confidence. A total of 29,811 responses were provided across the five signature trials and an overall error rate of 4.9% was reported [5]. In each of the handwriting trials, examiners were asked to compare a number of questioned

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<sup>1</sup> 'Foundational validity' is a term described in the PCAST report as "the scientific standard corresponding to the legal standard of evidence being based on 'reliable principles and methods'" [1].

<sup>2</sup> 'Validity as applied' is a term described in the PCAST report as "the scientific standard corresponding to the legal standard of an expert having 'reliably applied the principles and methods'" [1].

handwriting samples with a set of specimen handwriting samples; with a total of 30,100 responses provided across the five trials reported [6]. Responses regarding authorship were again reported using a scale including five levels of opinion. The error rates associated with these handwriting trials were divided into categories with respect to the author of the questioned sample (specimen writer or not the specimen writer) and the writing process (natural, disguised or simulated) with no overall error rate reported. The lowest error rate of 0.12% was reported for samples written naturally by the specimen writer. [6]. For samples written naturally by a writer that was not the specimen writer the error rate was reported as 0.96% [6]. The highest error rates were reported for samples written with disguise by the specimen writer (12.07%) and samples simulated by a writer that was not the specimen writer (16.7%)<sup>3</sup> [6].

Numerous other studies exist that report error rates associated with handwriting and signature examinations [5-26]. It is important to note that research results can be reported in many different ways, including variations in how an error rate is calculated and the terminology used. For example, error rates can be reported as overall or called error<sup>4</sup>, and can also be separated into false positive or false negative<sup>5</sup>. Research studies contain numerous other variables including the number of participants, demographics and qualifications of participants, the number of samples, response criteria and terminology, difficulty, and the type of writing included in the study. Across the signature studies, overall error rates have been reported as low as 0% by Found *et al.* (2001) [9], to 0.04% by Found and Rogers (2003) [12], and as high as 3.4% by Sita *et al.* (2002) [13]. Across handwriting studies, the reported error rates vary. Kam *et al.* (1997) [7] reported an overall error rate of 6.5%, while Durina and Caligiuri (2009) [8] reported an error rate of 2% and Found *et al.* (2001) [9] reported an error rate of just 0.3%. In a study which included handwriting samples from twins, Hicklin *et al.* (2022) [10] did not report an overall error rate however reported false positive and false negative error rates of 7.9% and 3.2%, respectively. Kam *et al.* (2015) [11] tested simulation detection and reported false positive and negative error rates of 9.97% and 0% respectively, with no overall error rate reported. In 2019, Wilson-Wilde *et al.* [14] reported an error rate of 1.27% in handwriting and signature proficiency test results in Australia between 2005 and 2017. The results from relevant and appropriate empirical studies demonstrate, in relative terms, evidence of a high level of accuracy as well as a low associated error within the discipline of handwriting and signature examination.

The Australasian Society of Forensic Document Examination Inc. (ASFDE Inc.) seeks to adopt the PCAST and NIST recommendations by publishing this summary of empirical research relating to error rates in handwriting and signature examination. It is the intention of the ASFDE Inc. that this summary will be publicly accessible for use by Forensic Document Examiners and by any jurisdiction seeking this information.

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<sup>3</sup> Results reported by Found and Bird (2016), reference the first three of the five trials reported on by Found and Rogers (2005) [6] and report error rates for disguised and simulated writing samples of just 1.4% and 0.8%, respectively [4]. The significant difference between these error rates and the overall error rates reported for all five trials by Found and Rogers (2005) [6], indicates that one or more experimental effects, such as examiner fatigue and/or a difference in the difficulty level of the questioned samples in the last two trials, may have contributed to the higher overall error rates reported by Found and Rogers (2005) [6].

<sup>4</sup> Overall error rate is the factor of the total number of incorrect responses over the total number of responses. Called error rate is the factor of the total number of incorrect responses over the number of responses excluding all inconclusive responses.

<sup>5</sup> False positive rate is an error rate (either overall or called) calculated by including only responses for samples that were written by a writer that was not the specimen writer. False negative rate is an error rate (either overall or called) calculated by including only responses for samples that were written by the specimen writer.

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