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A response to Busey & Klutzke (2022): Regarding subjective assignment of likelihood ratios

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The author declares that they have no known competing financial interests or personal

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Abstract:

Busey & Klutzke (2022) states that "Morrison (2012) has argued that the likelihood ratio need not be quantitative but could be based on the expert's subjective evaluation." The statement appears to suggest that Morrison (2012) argued in favour of subjective assignment of likelihood-ratio values. This interpretation of Morrison (2012) is incorrect.

Keywords:

Forensic inference; Likelihood ratio; Subjective

Letter to Editor:

Busey & Klutzke [1], a paper recently published in *Science & Justice*, states that:

> Morrison [2] has argued that the likelihood ratio need not be quantitative but could be based on the expert's subjective evaluation.

This statement appears to suggest that Morrison [2] argued in favour of subjective

assignment of likelihood-ratio values. This interpretation of Morrison [2] is incorrect. Morrison [2] p. 26 explicitly stated:

> Whenever possible, strengths of evidence should be presented as numeric likelihood ratios calculated on the basis of databases, objective measurements, and statistical models, and accompanied by the results of empirical tests of validity and reliability.

Morrison [2] p. 27 further stated:

> I take the position that forensic analyses should be as objective as possible, and that more subjective analyses should be the exception rather than the rule

and, in footnote 84, that:

> the present paper argues in favour of more objective logically correct approaches over more subjective ones

Morrison [2] p. 16 also stated that:

> the validity and reliability of the forensic-comparison system must be tested, and if in a particular situation a more subjective system should turn out to have greater validity and reliability than a more objective system, then the more subjective system should be used in that situation.

This was not, however, an argument in favour of subjective assignment of likelihood-ratio values. Instead, it was a statement of a higher-level principle: The system which has been demonstrated to have the best performance is the system which should be used.

I prefer methods based on relevant data, quantitative measurements, and statistical models because they are transparent and reproducible, are intrinsically resistant to cognitive bias, and are practically easier to validate (see [3]).

In Morrison et al. [4], my co-authors and I explicitly argued against the practice of assigning likelihood-ratio values based solely on the "knowledge, experience and training" of forensic practitioners, and argued that if likelihood-ratio values are subjectively assigned:

> procedures must be adopted to reduce the potential for cognitive bias, the likelihood ratio value generated should be empirically calibrated, and the implementation of the whole method must be empirically validated under conditions reflecting those of the case.

Calibration had already been mentioned in Morrison [2] p. 26. What Morrison [2] and Morrison et al. [4] meant by "calibration" was different from the use of the term in Busey & Klutzke [1]. Using the same meaning of "calibration" as in Morrison [2] and Morrison et al. [4], if a forensic-evaluation system is well calibrated, the likelihood ratios of the likelihood-ratio values that it outputs will be the same as the likelihood-ratio values that it outputs (for any practical system, they will only be approximately the same). The calibration process involves having a forensic-evaluation system provide a response to each member of a set of same-source pairs and to each member of a set of different-source pairs, using those responses to train a statistical model, then using that statistical model to transform new raw responses output by the forensic-evaluation system. The results are calibrated likelihood-ratio values. Calibration can, and should, be preformed irrespective of whether the output of the forensic-evaluation system is based on relevant data, quantitative measurements, and statistical model or whether it is directly the subjective judgement of a practitioner. For descriptions of this type of calibration, see [5], [6], and [7], and references cited therein.

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