VR as a Tool to Enhance Jury Understanding of Complex Forensic Diagnoses

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Introduction

In England and Wales, death investigation involve either standard or forensic post-mortems (PMs). **Forensic PMs**, used in sudden, suspicious, violent, or custodial deaths, provide legally admissible evidence (Chief Coroner, 2019; College of Policing, 2019). Though comprising only ~2% of all PMs, they are vital to coronial and criminal justice processes.

Traditionally, forensic PMs involve full invasive autopsies. However, **post-mortem computed tomography (PMCT)** offers a non-invasive alternative, producing high-resolution 2D and 3D images valuable in trauma analysis, identification, and education (Rutty, 2020; Dobay et al., 2020). PMCT also preserves visual records and can accommodate cultural or religious sensitivities (Ben Taher et al., 2018).

Interpreting PMCT requires specialist expertise, and communicating its complex findings to jurors is challenging. **Virtual Reality (VR)** may help by providing immersive, spatially accurate visualisations, supporting juror understanding and aligning with **electronic presentation of evidence (EPE)** initiatives in UK courts (Villa, 2016; Ministry of Justice, 2013).

Evidence on courtroom visual aids is mixed; some studies show improved comprehension, others highlight risks of emotional bias or misinterpretation (Schofield, 2007; Summers & Wyler, 2022). While PMCT's potential in immersive settings is recognised (Ebert et al., 2021), **its use in juror-facing VR remains underexplored.**

Aim

This pilot study investigated whether presenting **3D PMCT scans in VR enhances juror comprehension, emotional engagement, and verdict decisions** compared to conventional 2D images. Findings aim to guide future integration of VR-enhanced forensic evidence in UK courtrooms.

Method

Design & Setting
A between-subjects experiment examined how visual evidence influences juror comprehension, emotional response and verdict decision. The study took place in the mock Crown Courtroom at The University of Staffordshire, simulating a realistic trial environment while allowing for experimental variable control (Wiener et al., 2011).

Participants
Twenty-four participants (12 per condition), aged 18–75, were recruited via online pre-screening. Eligibility reflected UK jury criteria (Juries Act, 1974) with additional exclusions for visual impairments and photosensitive epilepsy.

Materials & Stimuli
•**2D Condition:** Post-mortem photos showing a subarachnoid hematoma (Park et al., 2015).
•**3D Condition:** VR PMCT scans in a rotatable 3D skull highlighting injuries (Lyer et al., 2018).

Procedure
Participants were randomly assigned to one of two conditions:
•**2D Group:** Viewed 2D images with the case narrative.
•**VR Group:** Experienced the same narrative with immersive VR via Meta Quest HMDs.
Following the scenario, participants completed an anonymous QR code-accessed questionnaire.

Data Collection & Analysis
Responses were collected via Microsoft Forms and analysed in Excel and SPSS.
•**Quantitative:** Likert-scale data were assessed using Mann-Whitney U (Pallant, 2020); verdicts were analysed via Chi-square and Fisher's Exact Test where needed (McHugh, 2013).
•**Qualitative:** Thematic Analysis (Nowell et al., 2017) identified recurring themes in reasoning, evidence clarity, and emotional impact.
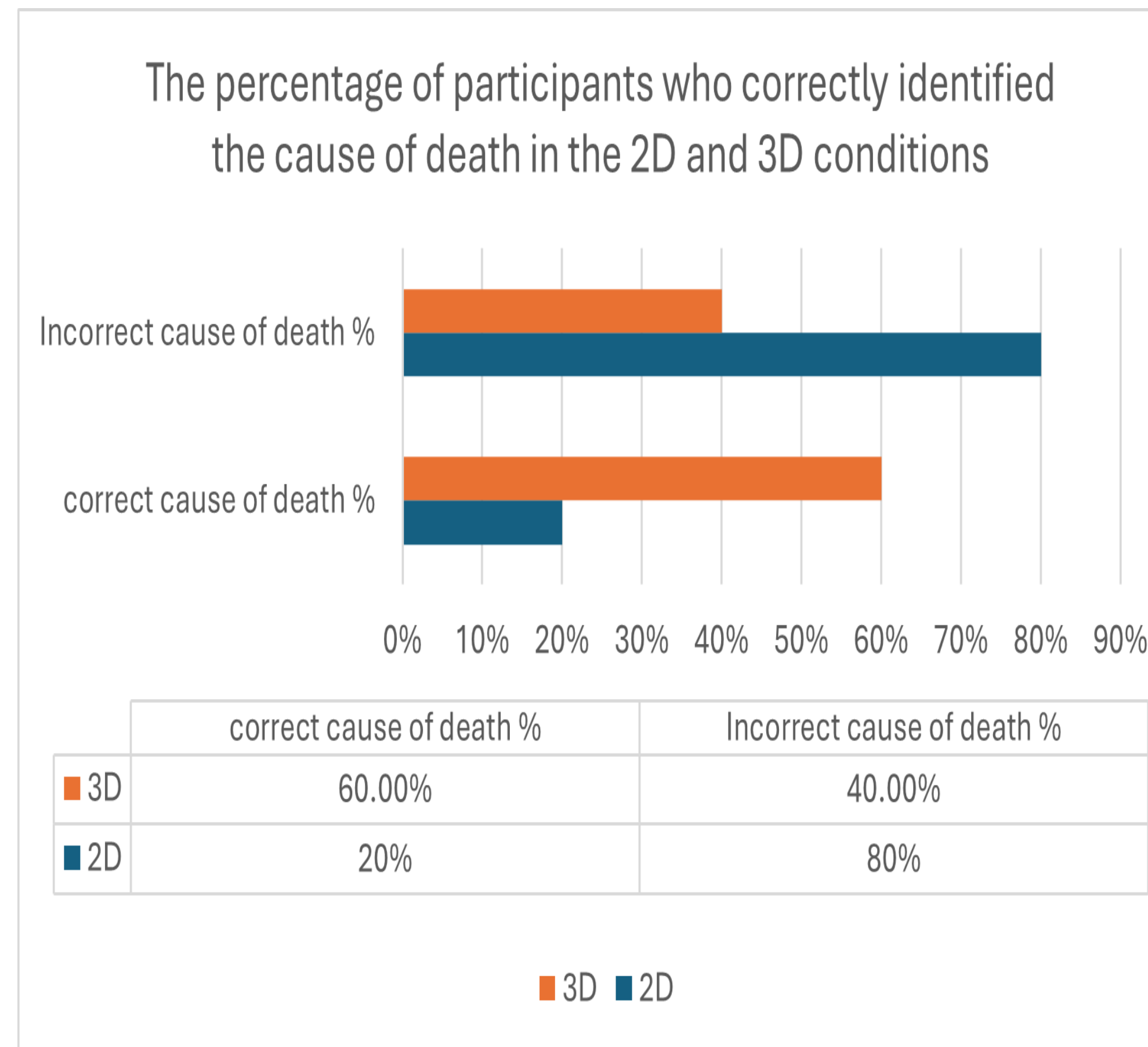

	correct cause of death %	Incorrect cause of death %
3D	60.00%	40.00%
2D	20%	80%

Fig 1.: The percentage of participants who correctly identified the cause of death in the 2D and 3D experimental condition.
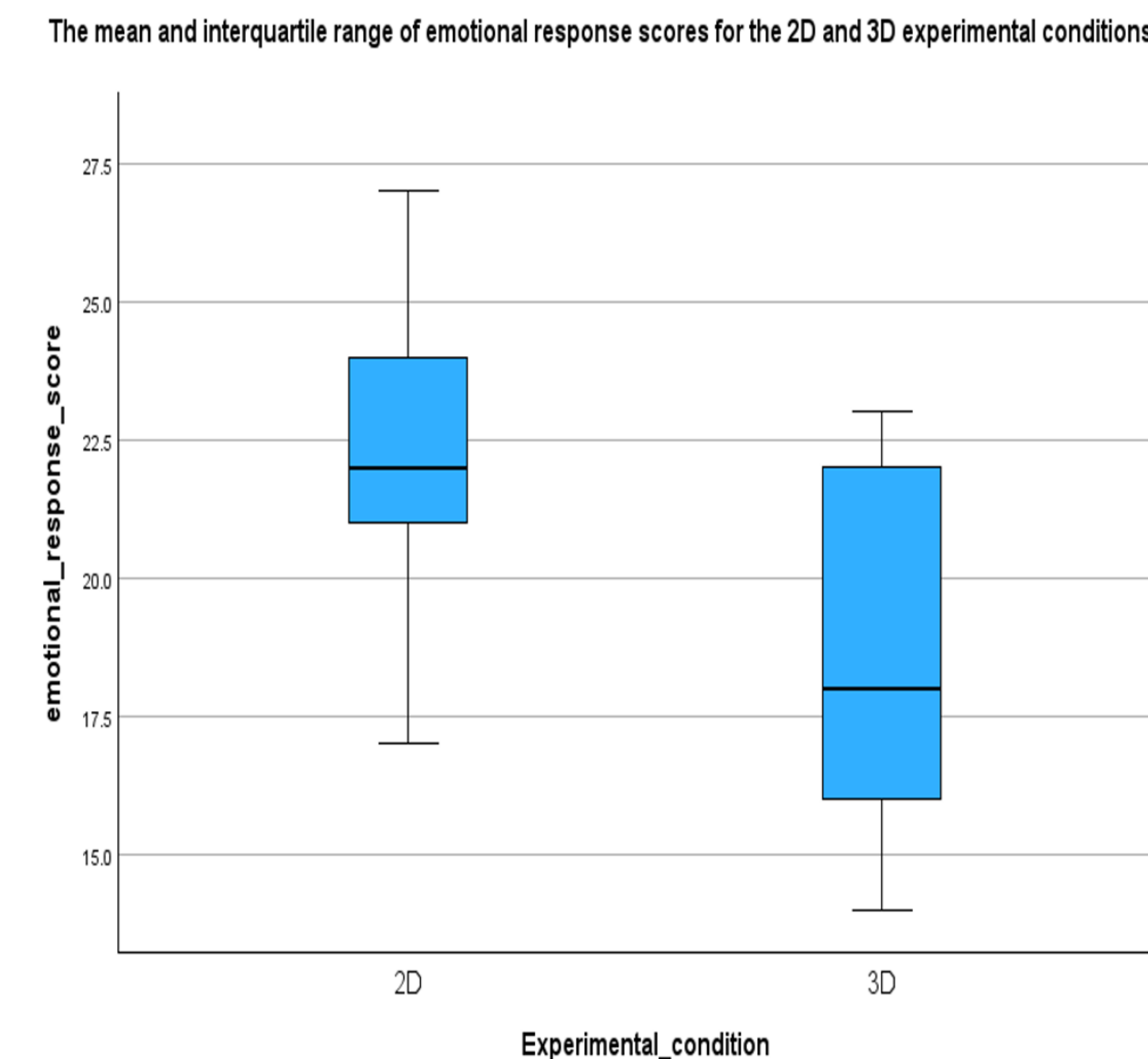

Fig 2.: The mean and interquartile range of emotional response scores for the 2D and 3D experimental conditions.
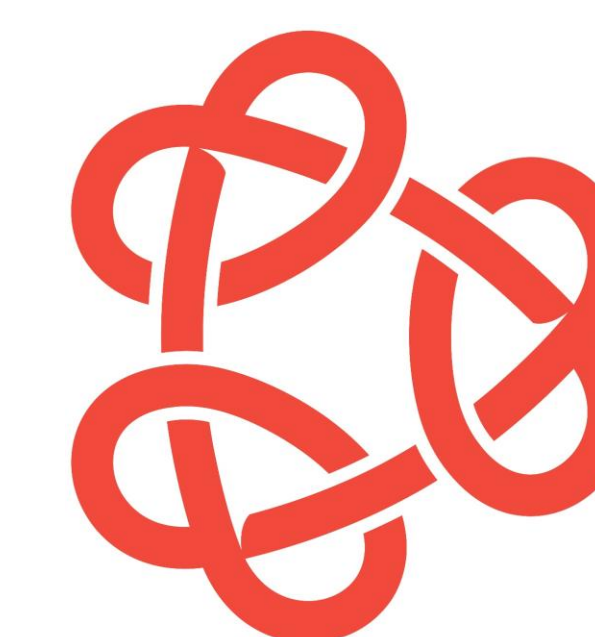
Results and Discussion

- **Jurors shown 2D images reported higher perceived comprehension, yet those in the 3D VR condition were more accurate;** correctly identifying the cause of death 60% of the time versus 20% in the 2D group (Figure 1). This disconnect suggests that confidence did not reflect actual understanding, possibly due to the Dunning-Kruger effect, where individuals with limited knowledge overestimate their ability (Smith, 2024). Despite VR's potential to enhance comprehension, thematic analysis revealed ongoing confusion between the mechanism, cause, and manner of death. This reflects a broader misalignment between legal, medical, and lay interpretations, which may affect jurors' judgments of culpability and intent (LaBat et al., 2023). Improved communication between forensic experts, legal professionals, and jurors, particularly around complex terminology, is essential (McCarthy Wilcox & NicDaeid, 2018). Without this foundational clarity, the benefits of either visual format to improve comprehension may be limited.

- **The VR condition resulted in lower emotional responses compared to the 2D condition (p < 0.05), indicating reduced emotional bias** (Figure 2). This finding suggest that VR may provide a less emotionally charged platform for presenting forensic evidence (Sheppard et al., 2020). However, the 2D condition used graphic PM photographs, while the 3D VR condition featured less graphic PMCT images. This raises the question of whether the reduced emotional response was due to VR's immersive nature or the less graphic PMCT images. Bright & Goodman-Delahunty (2006), suggest that gruesome imagery, rather than the presentation format, may drive emotional responses. Further studies should investigate whether VR's immersive features or the less graphic nature of PMCT images are responsible for the reduced emotional response.

- **VR did not negatively influence verdict outcomes;** the Chi-square analysis showed no significant difference between VR and 2D conditions (p>0.05), challenging assumptions about VR's persuasive power. However, it did not enhance decision confidence; half of participants in both groups chose the "unsure" verdict. This contrasts with findings from Reichherzer et al., (2022), where VR improved spatial understanding and subsequent verdict determination, suggesting its benefits may be context-dependent. Participants also reported distraction in the VR condition and emphasised the importance of oral testimony, aligning with Eldridge (2019), on narrative coherence in juror reasoning. Future research should include more realistic trial elements, such as cross-examination and deliberation; crucial elements of trial proceedings (Ross, 2023).

Conclusion

This study found that VR-based 3D PMCT scans improved jurors' objective understanding of cause of death, despite lower self-reported comprehension compared to 2D images. VR also reduced emotional responses, indicating potential to minimise bias in legal decision-making. Verdicts were not significantly influenced by presentation format, but reliance on oral testimony, and distraction in the VR condition, highlighted the importance of narrative coherence. **These findings support the promise of VR for presenting complex forensic evidence in a clearer, more neutral format.** Future work should develop objective comprehension measures, isolate the effects of format versus content, and explore VR in full trial simulations. Addressing usability issues and ensuring accessibility across diverse juror populations will be key to its effective, ethical courtroom implementation.

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