Eye-tracking as a tool to evaluate defibrillator handling

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DOI: https://doi.org/10.1016/j.resplu.2024.100566

Available online at www.sciencedirect.com

Resuscitation Plus

journal homepage: www.elsevier.com/locate/resuscitation-plus

Letter to the Editor

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To the Editor

With great interest, we read the article by Schumann et al.,[1] recently published in your Journal.

In a fascinating study, the authors share their research assessing the visual behavior of medical students while handling defibrillators.[1] Eye-tracking has been used frequently in medicine recently, including real-life or simulated critical care settings.[2,3] As we all know, the environment in intensive care units (ICU) can be challenging, fast-paced and complex. Crucially, well-trained staff should handle devices and machines, in order to minimize errors while using them. The study conducted by Schumann et al. is of high practical relevance, as defibrillation is a potential key life-saving intervention.[1] We would like to highlight some further aspects worth discussing.

First, the study was performed in a simulated setting. Understandably, a similar investigation would not be possible in real-life, due to the unplanned nature of cardiac arrests and the therapeutic celerity that emergencies require. The authors state that clearly in their limitations.[1] Nevertheless, apart from distractions and the different clinical environment in real ICUs, especially the commonly lacking mental or physical stress in simulated settings might be one of the most relevant confounders limiting comparability to real-life. It is known that professionals exhibit altered cognitive performance in stressful situations,[4] which are only reproducible to a limited extent when simulated. The collection of subjective stress levels (e.g. by questionnaires) during task execution would have been an interesting add-on.[1]

Second, the authors calculated time to first fixation (TTF) on their areas of interest (AOI). This approach is reasonable as it allows characterizing aspects of the importance of AOIs. However, the authors did not report revisits or average fixation time,[1] which are commonly available from eye-tracking softwares. Revisits are a surrogate of the complexity of AOIs and are associated with controlling/checking behavior.[5] In light of the importance of defibrillator handling, revisits would have provided more granular insights into the gaze patterns of students during defibrillation. In addition, average fixation duration would also be interesting. It allows statements to be made about the complexity of an AOI and may indicate the need for improvement of device-user interactions.

Third, the methods section does not precisely address the order in which subjects were tested. Was the order of the device testing randomized? Familiarity and a certain level of learning from previous tests naturally have impacts on subsequent testing. In a follow-up study, randomization could be implemented to exclude this effect. Finally, the authors assessed usability of the defibrillators by means of a System Usability Scale. Eye-tracking particularly allows distinction between subjective evaluations (e.g. by questionnaires) and objective measurements.[2] We demonstrated mismatches between subjective assessments and objective data during real ICU patient extubations.[2] The integration of questions regarding device handling (e.g. subjective assessment of temporal characteristics during defibrillator handling) would have provided additional information that could have been correlated to gaze metrics.

With interest, we await future research investigating interactions between humans and device interfaces.

Author contributions

DAH drafted the first version of the manuscript. PKB, PDWG and DAH read and approved the final version of the text.

Funding

None.

CRediT authorship contribution statement

Philipp K. Buehler: Conceptualization, Methodology, Writing – review & editing. **Pedro David Wendel-Garcia:** Conceptualization, Methodology, Writing – review & editing. **Daniel A. Hofmaenner:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Received 12 January 2024
Accepted 17 January 2024

https://doi.org/10.1016/j.resplu.2024.100566