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PEER-REVIEW REPORT

Name of journal: *World Journal of Methodology*

Manuscript NO: 100459

Title: Visual avatar to increase situational awareness in anaesthesia: Systematic review of recent evidence

Provenance and peer review: Invited Manuscript; Externally peer reviewed

Peer-review model: Single blind

Reviewer's code: 05327699
Position: Editorial Board
Academic degree: MD, Professor, Senior Researcher
Professional title:
Reviewer's Country/Territory: India
Author's Country/Territory: Italy

Manuscript submission date: 2024-08-16
Reviewer chosen by: Hong-Xin Jiang
Reviewer accepted review: 2024-12-25 06:01
Reviewer performed review: 2024-12-25 12:53
Review time: 6 Hours

Scientific quality	[ ] Grade A: Excellent [Y] Grade B: Very good [ ] Grade C: Good [ ] Grade D: Fair [ ] Grade E: Do not publish
Novelty of this manuscript	[ ] Grade A: Excellent [Y] Grade B: Good [ ] Grade C: Fair [ ] Grade D: No novelty
Creativity or innovation of this manuscript	[ ] Grade A: Excellent [Y] Grade B: Good [ ] Grade C: Fair [ ] Grade D: No creativity or innovation

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Scientific significance of the conclusion in this manuscript	[ ] Grade A: Excellent [Y] Grade B: Good [ ] Grade C: Fair [ ] Grade D: No scientific significance
Language quality	[ ] Grade A: Priority publishing [Y] Grade B: Minor language polishing [ ] Grade C: A great deal of language polishing [ ] Grade D: Rejection
Conclusion	[ ] Accept (High priority) [ ] Accept (General priority) [Y] Minor revision [ ] Major revision [ ] Rejection
Re-review	[ ] Yes [Y] No
Peer-reviewer statements	Peer-Review: [Y] Anonymous [ ] Onymous
	Conflicts-of-Interest: [ ] Yes [Y] No

SPECIFIC COMMENTS TO AUTHORS

Dear Authors of this narrative review article, 1.This narrative review is based on recent studies extracted by literature search in PubMed and retrieving selected evidence from Google scholar and Scopus. The PubMed for all types of articles using Medical Subject Headings (MeSH) terms, Boolean tools, and keywords for the topic of interest, such as “situational,” “situation”, “awareness,” “anesthesia” and “anaesthesia,” separately and in combination. Full-text peer-reviewed randomised controlled trials, case-control, cohort, and cross-sectional studies and reviews.Articles published in languages other than English, animal studies, grey literature, and articles which do not include anaesthesia environment or adult patients were excluded. The authors must add literature search from Embase, Medknow,RCA also to make this narrative review more conclusive. 2.How the eye-tracking technology, such as the Gazepoint GP3 or the Pupil Invisible mobile eye-tracking devices were exactly used in the Visual Patient Avatar and situational assessment for the anaesthetist is not clear? These data were analysed using Gazepoint Professional Analysis software (Gazept, Vancouver, BC, Canada) or Pupil Player for eye-tracking data analysis (Pupil Labs GmbH). Additionally, some tests were

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conducted using a Google Glass headset (Alphabet Inc.) The authors must add the data - analysed. 3. Regarding VPA-ICU - was 24X7 B.Sugar levels, Electrolytes level, RFT, KFT etcetera monitoring were possible? 4. Was there any AI based model to assess and decide which anaesthesia to be chosen for a particular patient? 5. No mention of Glasgow Coma Scale in VPA? 6. No mention of sensitivity and specificity in VPA vs manual observation of ICU patients? 7. Please add one para on the future of VPA in the modern era of medicine? 8. Please add one paragraph on what new your narrative review article adds to the existing literature. 9. Moreover, according to dual-processing theory, human thinking and visual information processing are categorized into two complementary types: associative system (System 1) and reasoning system (System 2). System 1 enables fast, instinctual decision-making without relying on working memory, driven by emotions and intuitive judgments. System 2 is associated with slow and rational decision-making, managed mainly by the frontal cortex. These systems work in parallel, forming a coherent perception of visual information. Current state-of-the-art monitors that use waveforms do not ideally support quick and confident interpretation with low cognitive effort. This paragraph in the discussion part must be rewritten with a more clearer message by the authors. Thanks

Answer to the Reviewer #1

First, thank you for your time and excellent comments.

1.This narrative review is based on recent studies extracted by literature search in PubMed and retrieving selected evidence from Google scholar and Scopus. The PubMed for all types of articles using Medical Subject Headings (MeSH) terms, Boolean tools, and keywords for the topic of interest, such as “situational,” “situation”, “awareness,” “anesthesia” and “anaesthesia,” separately and in combination. Full-text peer-reviewed randomised controlled trials, case-control, cohort, and cross-sectional studies and

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reviews.Articles published in languages other than English, animal studies, grey literature, and articles which do not include anaesthesia environment or adult patients were excluded. The authors must add literature search from Embase, Medknow,RCA also to make this narrative review more conclusive.

- We stated, 'The literature search did not include databases other than PubMed, Scopus, and Google Scholar, which might have excluded relevant studies published elsewhere", acknowledging this as a potential limitation of our paper. Although we had initially considered including additional databases in our first study protocol, access to resources such as Embase, Medknow, or RCA is not provided by our university institution."

2.How the eye-tracking technology, such as the Gazepoint GP3 or the Pupil Invisible mobile eye-tracking devices were exactly used in the Visual Patient Avatar and situational assessment for the anaesthetist is not clear? These data were analysed using Gazepoint Professional Analysis software (Gazept, Vancouver, BC, Canada) or Pupil Player for eye-tracking data analysis (Pupil Labs GmbH). Additionally, some tests were conducted using a Google Glass headset (Alphabet Inc.) The authors must add the data - analysed.

- In all the referenced papers, tests were conducted to evaluate the participants' ability to rapidly comprehend situations and process additional information presented on a visual avatar monitor compared to a standard monitor. The results demonstrated statistical significance, with a p-value of <0.05.

3. Regarding VPA-ICU - was 24X7 B.Sugar levels, Electrolytes level, RFT, KFT etcetera monitoring were possible?

- The typically displayed information includes the following parameters: PiCCO catheter, ICP sensor, neuromuscular relaxation, central venous line, ST segment, arterial line, urinary catheter, peripheral venous line, tube functionality, brain activity, etCO2, brain activity sensor, central venous pressure, temperature, peak inspiratory pressure, SpO2, FiO2, respiratory rate, cardiac index, ECG/pulse rate, tidal volume, and mean arterial blood pressure (ABP). (6,9) (so those features and information were not included in the VPA ICU monitor in those papers.)

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4. Was there any AI based model to assess and decide which anaesthesia to be chosen for a particular patient?

- No, none of the papers address that topic. The ability to assess, decide, and evaluate the type of anesthesia remains, for now, a distinctly human skill unique to anesthesiologists

5. No mention of Glasgow Coma Scale in VPA?

- No, we research through all the articles, but none mentioned it.

6. No mention of sensitivity and specificity in VPA vs manual observation of ICU patients?

- There were two articles that talk about it. Number 6 of reference: "The odds of correctly answering the associated question were higher with the Visual-Patient-avatar ICU compared with the conventional monitor (Odds Ratio [OR] 1.70, 95% CI 1.57–1.83, $p < 0.001$)." Number 9 of the reference "The rate of correct decisions was about 1.25 times higher using Visual-Patient-avatar ICU than the conventional monitor [rate ratio (RR) 1.25; 95% CI 1.19–1.31; $P<0.001$]."
So, as we tried to summarize in the main text "Controlled studies show that anesthesia providers using VPA technology were able to perceive and recall more vital signs correctly compared to traditional monitoring methods."

7. Please add one para on the future of VPA in the modern era of medicine?

- We understand the importance of VPA in ICU, in fact we dedicate one full para to it: User Acceptance and Integration. E.g.: "Despite some initial resistance and the need for adjustments to accommodate individual preferences, the overall reception was positive, suggesting a high potential for broader adoption in clinical practice" or "These efforts have sparked a new interest not only in advancing scientific knowledge but also in integrating these advancements into clinical practice" or also "Visual Patient Avatar technology represents a major advancement in patient monitoring, providing a more intuitive and effective way for clinicians to maintain situational awareness and manage cognitive load during critical procedures, but not one of these studies has been done during clinical practice. Even though, the evidence suggests that adopting this

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technology can improve diagnostic accuracy, reduce clinical errors, and increase user satisfaction, indicating a high potential for broader integration into clinical practice." In the end: "In conclusion, presented results suggest a promising role of VPA in improving SA ultimately leading to increased perioperative safety."

8. Please add one paragraph on what new your narrative review article adds to the existing literature.

- As stated in the introduction: "The aim of this systematic review is to summarize recent evidence related to the use of Visual Patient Avatar (VPA) technology in anesthesia to promote situational awareness (SA)." We believe that we have successfully achieved this objective. In the discussion, we noted: "This systematic review originally summarizes recent evidence related to the simulated training of VPA in anesthesia to promote SA, demonstrating that implementing VPA technology in anesthesia can enhance perceptual performance, reduce cognitive load, and increase user acceptance, thereby improving the safety and effectiveness of anaesthetic practices. "In addition, we sought to provide thought-provoking insights, such as: "Visual Patient Avatar technology represents a major advancement in patient monitoring, offering a more intuitive and effective way for clinicians to maintain situational awareness and manage cognitive load during critical procedures. However, none of these studies have been conducted during actual clinical practice." We also highlighted: "The chapter on Integration and User Acceptance, in our opinion, is the most interesting and original, as it has generated less debate within the scientific community. We place significant importance on this chapter due to our team's longstanding interest in and focus on the ergonomics and clinical integration of new technologies in anesthesia. Moreover, as shown in studies on the 'cockpit' environment, the rapid integration and acceptance of these technologies by clinical operators underscore the critical importance of ergonomics and usability in healthcare settings."All of this leads us to conclude: "Future studies, appropriately designed, should evaluate the impact of VPA technology in clinical practice. This review can serve as a foundation for designing future research protocols."

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9. Moreover, according to dual-processing theory, human thinking and visual information processing are categorized into two complementary types: associative system (System 1) and reasoning system (System 2). System 1 enables fast, instinctual decision-making without relying on working memory, driven by emotions and intuitive judgments. System 2 is associated with slow and rational decision-making, managed mainly by the frontal cortex. These systems work in parallel, forming a coherent perception of visual information. Current state-of-the-art monitors that use waveforms do not ideally support quick and confident interpretation with low cognitive effort. This paragraph in the discussion part must be rewritten with a more clearer message by the authors. Thanks

- Thank you for highlight this problem, we try to resolve in this way: "According to dual-processing theory, human thinking and visual information processing are divided into two complementary systems: the associative system (System 1) and the reasoning system (System 2). System 1 facilitates rapid, instinctive decision-making that does not depend on working memory and is primarily driven by emotions and intuitive judgments. In contrast, System 2 is responsible for slower, more deliberate, and rational decision-making, predominantly governed by the frontal cortex. These two systems operate in parallel, integrating to create a unified perception of visual information. However, current state-of-the-art monitors that rely on waveforms are not optimized to support quick and confident interpretation with minimal cognitive effort.

So, human brain is capable of rapidly detecting color, motion, and shape, seamlessly integrating this information to form associations. These principles can serve as a foundation for designing user-centered patient monitoring technologies that enhance situational awareness and optimize sensory perception. In contrast, the traditional single-sensor–single-indicator model, which displays information in isolation, may place a greater cognitive burden on the user."

In conclusion, we deeply appreciate your time and expertise and your thoughtful review and valuable

insights which have greatly contributed to enhancing the quality of our work.