

SHORT REPORTS ON SIMULATION INNOVATIONS
SUPPLEMENT (SRSIS)

Does immersive simulation influence paramedicine students' situation awareness?

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Introduction

It is well established that human error may adversely affect health outcomes. This is highlighted by reports that healthcare errors are the third leading cause of hospital inpatient mortality, with estimates of up to 400,000 deaths per year in the U.S. [1]. While human error can never be entirely prevented, the ability to recognize, interpret and predict environmental cues and events is vital for appropriate clinical decision-making to minimize the health burden attributable to errors [2].

Situation awareness (SA) is a cognitive model which has been defined as “the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future” [3]. It is an essential non-technical skill that gives meaning to gathering information to formulate insight into the current and future risks of a given situation.

In the rapidly changing and complex clinical environment often encountered by paramedics in out-of-hospital emergencies, a lack of SA may have serious adverse consequences. One approach to enable the assessment and development of SA for paramedics through their education and training involves the use of different simulation techniques. However, scant research has been undertaken exploring if different types of simulation impact students' SA in paramedicine. Therefore, this study aimed to evaluate SA in third-year undergraduate paramedicine students during immersive simulation and non-immersive simulations.

Innovation

The study took place at Monash University, Melbourne, Australia, a large research-intensive university and provider of paramedicine education and research since 1999. Recently, a 360-degree immersive simulation centre was built for paramedicine-based education and training (see below) to produce more realistic and authentic clinical simulations in the measurement of both technical and non-technical skills. The immersive simulation room can project any recorded footage day or night (roadside, train station, playground, etc.) with high-quality sound 360 degrees around participants. It also houses an ambulance inside to allow paramedics to transfer and continue simulated care to hospital facilities.



Third-year paramedicine students were invited to participate in this study (conducted over 2 days) voluntarily and asked to complete two 15-minute simulations with manikins – simulations were randomly selected for each student group and included commonly encountered cases for paramedics including: chest pain, head injury, pelvic injury, fall, house fire, motorbike accident. Students were randomly allocated to the immersive simulation room or training space floor for the non-immersive simulation completing the same clinical simulations. Students would then cross over and complete a different simulation. Certain props were used in both simulations, for example, a necklace, helmet, sunglasses, etc. were placed on the manikin that allowed the different levels of SA to be measured at different points in the simulation.

Evaluation

The Endsley SA framework encompassing three levels: perception (level 1), comprehension (level 2) and projection (level 3) have been assessed as the most appropriate for use within paramedicine [4]. The Situation Awareness Global Assessment Technique (SAGAT), which incorporates these three levels, was originally developed to provide an objective determination of SA in aircraft pilots [3]. The SAGAT involves utilizing a simulated scenario appropriate to the area or work to be examined. In this study, and in others, each simulation was stopped by the instructor at various predetermined times and participants are asked questions about their perceptions of the situation at each point measuring the three levels of SA (5).

Outcomes

Eighteen third-year undergraduate paramedic students participated in this pilot study (female $n = 9$, male $n = 9$). Overall, SA results were poorer in the immersive simulation SA compared with the non-immersive simulation, with scores of 79% and 92%, respectively. This effect was especially evident for the SA component of perception (level 1) with a score of 60% during the immersive simulation

as compared to 86% achieved in the non-immersive setting. Comprehension (level 2) scores were 81% and 92%, respectively, and 97% were achieved for projection (level 3) in both types of simulations.

Our results reflect the importance of incorporating multiple forms of simulation and in particular highlight the significance of immersive simulation within an undergraduate paramedicine course. As healthcare research has shown, SA can improve personal and patient safety, particularly concerning recognizing and minimizing errors. Our pilot results have shown that more attention is required in addressing students' SA, particularly in level 1 perception. Results may play a role in bridging the gap from novice to expert more quickly through immersive simulation techniques. It is important to acknowledge that results have may have been influenced by participants undertaking different scenarios and the time (learned effects) between the immersive and non-immersive simulations.

What's next?

Further examination of this issue is warranted using mixed methods or larger, fully randomized cohorts within multi-institutional settings. The innovative methodology utilized in the present study would also be applicable for use in paramedic postgraduate education as well as for ongoing professional development. In addition, our study could inform the examination of SA within other healthcare professional groups, especially those in dynamic, high-stress professions such as emergency nurses or medical staff.

Declarations

Authors' contributions

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Availability of data and materials

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Ethics approval and consent to participate

None declared.

Competing interests

None declared.

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