Achieving Immersion and Engagement in

High-Fidelity Healthcare Simulations

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PSYC3062

Tutorial 01

Tutor: Callum T.

Word count: 1980 (Excluding Title Page & References)

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With the growth of technology and need for improved healthcare training, simulation medical training is becoming increasingly popular, as an educational strategy and for medical training without the potential mistreat of real patients (Sorensen et al., 2017; Bowers et al., 2012; Ray & Hills, 2012; Datta & Jaideep, 2012; Jahangirian et al., 2015; Proudlove et al., 2017). Thus, many medical training centres, including CSDS, Queensland's Clinical Skills Development Service Centre, started utilizing high-fidelity simulations to replicate healthcare emergencies and scenarios with focus on the achievement of immersion and engagement (Jahangirian et al., 2015; Taekman & Shelley, 2010; Robinson et al., 2012; Roh & Jang, 2017**)**. Literature notes that simulated training (or just simulations) accentuate the achievement of immersion and engagement because they are important measurements of participant learning and behaviour during a high-fidelity simulation (Andersson et al., 2016; Jahangirian et al., 2015; Datta & Jaideep 2012). To validate the usage of simulations in medical staff training, it is crucial that high immersion and engagement can be achieved by researchers (Satish & Streufert, 2002; Parsons et al., 2012; Sorensen et al., 2017;). Due to their pivotal role in effective training, CSDS also utilize immersion/engagement focused simulations to train their potential medical staff.

When high-fidelity simulations are run at CSDS, participant immersion and engagement are achieved through replication of realistic environments and promoting physical/psychological interactions between the environment and the participants. Realistic tasks and medical scenarios are presented to the trainees for realism and to alter their behaviour as they should in real emergencies. Literature tells us that immersion and engagement are often achieved through various methods of environment replication and presenting a set of tasks to ‘trigger’ a change in behaviour (Engstrom et al., 2016; Andersson et al., 2016; Smith et al., 2013**).** CSDS utilize similar tactics from literature by allowing participants to engage in solving a battery of realistic medical problems. They develop changes in senses and behaviours as a result of high immersion and engagement, which can be translated to learning and training (Archer et al., 2007; Smith et al., 2013; Taekman et al., 2010)**.** Using CSDS’ comparison to literature, this paper discusses the achievement of immersion/engagement, including their benefits and importance to medical simulation training. The comparison can also be used to support that this form of education can be one of the most effective method of training medical staffs as it allows the development of required medical skills at a very low cost (Torrente et al., 2014; Ray & Hills, 2012; Kennedy et al., 2014).

Background

Immersion and Engagement, as defined by the literature, can be defined as an impression that one is participating in a comprehensive/realistic experience and the degree of attention/interest, respectively (Rutledge et al, 2014; Andersson et al., 2016; Archer et al., 2007). High immersion and engagement often indicate HIGH fidelity (or quality) simulations as they best resemble the real system it refers to (Archer et al., 2007; Engstrom et al., 2016; Datta et al., 2012; Parsons et al., 2012; Taekman & Shelley, 2010). Low level of immersion and engagement can indicate lower level of realism, hence a LOW-fidelity simulation. Literature has heavily emphasized strong immersion and engagement as they typically yield better results in participant learning – which may carry over in real medical scenarios (Engstrom et al., 2016).

Importance of Immersion and Engagement

Immersion and engagement are the highlighted measurement of fidelity and learning in healthcare simulations as they dictate the frequency of change in behaviour and the degree of realism felt by participants in the simulation, assisting in learning and cognitive development (Andersson et al., 2016; Engstrom et al., 2016; Jahangirian et al., 2015; Jennett et al., 2008; Satish & Streufert, 2002; Smith et al., 2013). This, however, does not imply that immersion and engagement are the only objective measurements nor does it imply other variables cannot be experimented in simulations (Jennett et al., 2008). It has been noted in some literature that engagement is a product of high immersion (Andersson et al., 2016). In other words, an immersive simulation will allow participant to be more engaged in the training. It has also been found that engagement helps participants to actively alter their behaviours as they would in real-life scenarios (Andersson et al., 2016; Engstrom et al., 2016; Parsons et al., 2012). By replicating the realistic responses in a closed-environment, participants are able to practice their physical and psychological ‘adjustments’ without creating real emergencies which can be costly and dangerous. It’s arguable that simulation is one of the safest and the most effective method of replicating a real-life scenario, (Bowers et al., 2012; Torrente et al., 2014; Rogers, 2011) thus making it a valuable investment in healthcare training centre such as CSDS.

The level of immersion and engagement are often determined by the fidelity of the simulation and vice versa. Higher fidelity often allows greater participant immersion and facilitates engagement (Bohil et al., 2011; Parsons et al., 2012; Taekman & Shelley, 2010; Engstrom et al., 2016). It is crucial that healthcare training centres emphasize achievement of immersion and engagement as they play a pivotal role in determining the fidelity of the simulation (Clark et al., 2005; Ray & Hills, 2012; Kennedy et al., 2014).

Immersion and Engagement Achieved at CSDS

When high-fidelity simulations are run at CSDS, participants are expected to engage in a highly realistic, replicated medical setting. Every object from lights, walls, and equipment arrangements are designed to visually mimic a hospital environment. Physical and psychological interactions with the environment and co-participants are encouraged at CSDS. Communicating with trainees to solve issues encountered during treatments and sharing the work load during a CPR treatment on a manikin count as interactions involving behaviour alterations achieved by engagement. Trainees utilize real medical tools for familiarization and alter their behaviours around them. Examples of this include adjusting real hospital beds, CPR manikins, handling test results, and utilizing conference rooms. Realistic medical scenarios such as CPR, wound treatment, PTSD counselling, etc. were few of the main immersive tasks to be completed by the trainees. Ultimately, CSDS maximized immersion and engagement by replicating the setting, the equipment, and the medical tasks that promote consistent change in behaviour through interactions.

One limitation of this report is the lack of full representation of training programs being conducted at CSDS. As they conduct simulations for several branches in medical training, it would be difficult to assess the reliability and validity of each simulation. However, the focus is that high-fidelity simulation training is one of the highly-effective modes of training (Bowers et al., 2012; Torrente et al., 2014), and that effectiveness is currently being emphasized at CSDS.

Immersion and Engagement Achieved & Measured in Literature

Andersson et al. provided a valid case study that measures immersion and engagement, as well as highlights their importance in healthcare training. They claimed that participant engagement is the result of immersion, and if the simulation is immersive (realistic), the level of engagement (change in behaviour and decision-making) will be higher.

It was predicted if the high-fidelity simulation is correctly designed to resemble the real system (real environment), it will have a high immersion score rating (ISRI). Two groups were randomly presented with a low-fidelity (basic) and a high-fidelity (complex) battery of medical tasks. In the simulation, triggers (changes in behaviour) were observed and counted for engagement. ISRI was then counted for the level of immersion for the two groups combined with individual tasks that were presented. Of the two groups, the high-fidelity simulation group showed more positive triggers and higher ISRI, indicating that it better created participant engagement. The utilization of high-fidelity simulations with increased equipment fidelity (realistic equipment/setting) and functional tasks (realistic/interactive medical tasks) resulted in more engagement - which play a pivotal role in learning (Webster et al, 2014).

The limitation in this study was the selection of only experienced medical groups. This could potentially invalidate the level of engagement measured by high-fidelity simulations as some participants may have retained previous medical knowledge, thus showing more frequent positive change in behaviour. Although, the results of low-fidelity simulations indicated that engagement and immersion were much lower compared to the high-fidelity simulation. This could mean that previous experience may not be too detrimental to the result if the simulation is immersive enough. It is also a valid option, for training centres, to randomise the presentation of more difficult tasks to best minimize the effects of previous knowledge in the future. It is also important to note Andersson et al., did not evaluate learning, but simply correlated high engagement and immersion with fidelity (in this case, realism). Nevertheless, the level of immersion and engagement through high-fidelity training found by Andersson et al. may still be of importance in learning.

A similar study conducted by Smith et al. has answered some of the limitations faced by Andersson et al. In this study, the two groups of medical staff were presented with similar realistic medical tasks and were observed for changes in behaviour. Instead of using an objective count of triggers, Smith et al. performed a cognitive task analysis on both inexperienced and experienced medical staffs. Upon testing, they found general cognitive attributes of expertise (cue gathering, inferential reasoning, and strategic/inferential thinking) across both groups when presented with challenging, realistic medical scenarios such as treating myocardial infarction in patients with gunshot wounds. They also emphasized interaction by placing participants in pairs across both groups of inexperienced and experienced trainees. Apart from the false positives and false negatives in spotting symptoms from the inexperienced group, both groups showed great cognitive development in response to the tasks. The results from the experiment suggest that by facilitating immersion and engagement from participants in a high-fidelity simulation, trainees, regardless of experience, can develop practice and learn from the complex scenarios. Unlike Andersson et al., which heavily focused on the achievement of immersion and engagement, Smith et al., conducted a cognitive analysis to find cognitive development and development of expertise (learning) across both groups as well. While it is difficult to compare the results with the traditional form of learning (e.g. schools and institutions), it is evident that groups who were engaged in high-fidelity simulations can develop some form of expertise that is required in the medical field.

CSDS vs. Literature

The focus on realistic environments, medical scenarios, and the tasks to generate changes in behaviour is being valued at CSDS and in literature. It is important to note CSDS, in comparison to Andersson et al., currently achieve immersion and engagement by presenting realistic scenarios and replicating real medical environments to work in. Regardless of participant experience (as tested by Smith et al.), all scenarios at CSDS are thoroughly analysed and assessed by medical professionals before being presented. This allows the most relevant and valid medical tasks to thoroughly challenge the participants as they alter their behaviours. While it is unclear if the trainees undergoing CSDS high-fidelity simulation training will directly reflect their results in actual healthcare, it is assumed that based on the validity and the reliability of previous literature, if CSDS continue to emphasize realism through tasks and environment, they will be able to continue achieving immersion and engagement in their simulation training.

DISCUSSION

When high-fidelity simulations are run at CSDS, participant immersion and engagement are achieved by presenting highly-engaging, realistic medical scenarios and tasks that facilitate behaviours such as communication, cognitive-thinking, and physical engagement in a safe, immersive environment. Upon comparison with previous studies in literature on immersion and engagement achievement, CSDS compare to be a reliable and valid training centre that carries out highly immersive and engaging simulations that could sufficiently prepare future medical staff members in real-life healthcare work. It is also inferred that with the current limited research on a more reliable method of medical training, that high-fidelity simulation can continue to be used as one of the most effective method of training (Taekman & Shelley, 2010).

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