A review of participant satisfaction, stress and anxiety associated with video assisted feedback in simulation based medical education

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Abstract
Simulation acts as a replication of components of a clinical situation and allows a learner to practice in an ‘artificial’ and controlled simulated environment with guided exposure. Feedback of the trainee’s performance during and after the simulation activity is an essential component of simulation training. The affective domain (how participants feel) is the most often neglected domain in higher education but can be used to assess the effect of a learning activity or intervention. Studies suggest participant satisfaction with, and perception of, simulation training was enhanced by video assisted feedback of their performance. Although studies have established a link between simulation training and stress/anxiety this association has not been investigated to determine whether VAF results in a beneficial level of stress and anxiety or a detrimental level.

Keywords: stress/anxiety, acute medical emergencies, healthcare professionals

Introduction
In this review we aim to determine participant satisfaction, stress and anxiety associated with video assisted feedback (VAF) in medical education. A number of studies suggest improved satisfaction with simulation training including VAF although satisfaction with VAF was not specifically looked for during the studies. In addition, high levels of anxiety are associated with simulation but whether stress and anxiety associated with VAF are beneficial or detrimental to performance, have not been specifically assessed.

Simulation training
‘Simulation is a technique not a technology to replace or amplify real patient experiences with guided experiences, artificially contrived, that evoke or replicate substantial aspects of the real world in a fully interactive manner’ [1].

Simulation acts as a replication of components of a clinical situation and allows a learner to practice in an ‘artificial’ and controlled simulated environment with guided exposure. There is reduced risk to the patient or no risk, where the patient is replaced by a surrogate (actor) or a computer enhanced manikin [2]. Simulation provides an opportunity for concentrated exposure allowing particular skills to be obtained, especially where encounters in real life clinical practice would rarely occur. An example of this, in clinical practice, is the ability to manage acute medical emergencies that are not commonly encountered, but where effective and prompt management may determine a patient’s survival.

Simulation training has been used in the healthcare arena for more than twenty years [3], facilitating a learner’s progression through Dreyfus et al. [4], stages of skill acquisition with the healthcare professional being able to acquire, practice and maintain skills necessary for clinical practice.

Simulation training using high fidelity manikins and sophisticated computer programmes allow students to evaluate scenarios, plan strategies and intervene to alter outcomes, just as they would in the ‘real life’ clinical situation. Unlike real life, the simulated encounter is safe and there is no compromise to patient safety. This is particularly important in situations that are too rare or dangerous to be practiced using actual patients [5]. Realistic scenarios with environmental reality, high fidelity manikins, computer technology and audio-visual recording and display equipment are essential tools in order to maximise the impact of simulation training [6,7]. Feedback of the trainee’s performance during and after the simulation activity is an essential component of simulation training [8].

Scenario feedback
Kluger et al. [9], defined feedback as ‘actions taken by an external agent to provide information regarding some aspect(s) of one’s task performance.’ Feedback allows the trainee to gain insight as to the aspects of the simulation that were performed well and, more importantly, those aspects of the scenario that could be improved upon and how these could be addressed [10]. Scenario feedback (debriefing) is the most important aspect of simulation-based education [11] and all teaching activity should have debriefing at its heart, acting as a dynamic dialogue between teacher and learner, facilitating effective reflection and aiding learning.

Participant perception, satisfaction, stress/anxiety
The cognitive (knowledge) domain and psychomotor skills are most often assessed when evaluating students. However, the affective domain (how participants feel) is the most often neglected domain in higher education [12], but can be used to assess the effect of a learning activity or intervention. Studies have shown that the educational environment and a student’s perception of it, affects students’ achievement, motivation, happiness and success.
Aghamolaei et al. [17] stated a student’s perception of their learning environment had an impact on their learning. How satisfied students are with their learning activity and environment affects their motivation to learn [18]. Bakhshialibad et al. [19], stated student satisfaction was an important indicator of the quality of the learning experience and was related to outcome (whether they learned what was intended) and perception of the education activity and setting could be used to modify and optimize teaching strategies. Satisfaction also enhances self-confidence, aiding the development of skills and the acquisition of knowledge. Kinicki et al. [20] showed a recipient’s perception of the accuracy of feedback affected their future performance. Trainee satisfaction with the learning activity influences academic performance more than the performance during the event influences satisfaction [21]. When feedback fails to be helpful it is usually because it led to negative feelings in the learner such as embarrassment, defensiveness and anger [22]. Negative perceptions may lead to unfavourable learning outcomes such as decreased persistence and motivation [23]. Hence, in summary, student satisfaction and perception of the learning activity can be used to assess the benefit of teaching interventions [24]. Stress and anxiety are related [25]. Walton et al. [26], reported high levels of anxiety associated with simulation training. Stress is defined as ‘a state of mental or emotional strain or tension resulting from adverse or demanding circumstances’ (Oxford English Dictionary) with anxiety being ‘a feeling of worry, nervousness, or unease about something with an uncertain outcome’ (Oxford English Dictionary). Lazarus [27] stated stress was a feeling or condition experienced when a person perceives the demands of a situation exceeding the personal or social resources they are able to mobilise. Sarafino [28] stated ‘stress arose when an individual felt a discrepancy between the physical or psychological demands of a situation and their biological, psychological, or social resources.’ Excessive stress/anxiety in the clinical setting has been shown to affect performance and could compromise patient outcomes [29]. This view of anxiety led to Knowles’s [30] describing an optimal learning environment as one which has ‘physical comfort, mutual trust and respect, mutual helpfulness, freedom of expression and acceptance of differences.’ Sappington [31] suggested educators had a responsibility to create an emotionally safe learning environment, reducing fear of failure and embarrassment. Ganley et al. [32] suggested anxiety should be ‘reduced to provide an academically safe learning environment,’ and suggested that students should ‘experience healthy anxiety.’

However, Selye [33] stated the effect of stress depended on whether the activity outcome was successful, in which case it was beneficial or resulted in failure, in which case it was detrimental. Joels et al. [34] proposed when stress is experienced at an opportune moment it may facilitate learning. Demonstrating beneficial/detrimental levels of stress/anxiety associated with components of simulation training could act as a surrogate for benefit/harm when assessing simulation training and components of feedback.

Effect of video assisted feedback on participant satisfaction in simulation training

A number of studies have suggested improved satisfaction with simulation training including VAF although these studies did not specifically look for this [35-39].

Morgan et al. [35] studied medical students using an anaesthesia simulation to determine how reliably the simulation could be used to measure performance. This measure was compared to written and clinical evaluation in addition to the student’s opinion. Each of the students worked through one of six clinical problems with their performance being video-taped. The video tape was viewed and assessed by five independent evaluators. They concluded that the simulation training was a reliable assessment of performance and was associated with high student experience scores in terms of learning experience (4.6 ± 0.51), use as an evaluation tool 94.1 ± 0.92 and appropriate content (4.4 ± 0.74). Although students were video recorded, this was not used to provide feedback and their satisfaction was for the simulation including being videotaped but did not specifically assess video assisted feedback. In the study by Scherer et al. [40] residents who had been video recorded during trauma code resuscitations ‘often wanted to review their own videotapes from the previous night.’

In the study by Bond et al. [36], emergency medicine residents undertook simulation training involving cognitive forcing strategies. The participants received oral debrief together with a didactic lecture and PowerPoint presentation. Although video playback facilities were not available, about half of the participants stated that they would have liked this method of feedback.

Mckenna undertook a study on nine first year nursing students who received feedback from an instructor on aspects of history taking and assessment after simulation training. Students reported that the video-assisted debriefing was a positive experience.

Dusaj [38], showed increased satisfaction of student nurses undergoing simulation training with video assisted feedback compared to verbal feedback alone (p=0.001). This study utilised The Student Satisfaction and Self-Confidence in Learning Scale (SSSL) [3]. However, in this study participants in the video assisted group watched their performance while undertaking self-reflection and then received verbal feedback on their performance. No commentary was given by the reviewer during the watching of the video and, thus, was not truly video assisted feedback. Although Savoldelli et al. [41], found that students, on reviewing their performance, immediately recognise behaviours that require change, video assisted feedback should use excerpts of video recording to illustrate points of discussion rather than simply act as a reminder of what occurred.

Krogh et al. [39], showed debriefers felt video assisted feedback was ‘valuable’ in their manikin based simulation training with twenty-four trainers participating in a semi-structured interview. This study demonstrated the variable practice amongst the trainers some of whom used video assisted feedback infrequently (n=3), occasionally (n=8), substantially (n=8) and others consistently (n=5). Also, in contrast to Dusaj’s study [38], the debriefers preferred using VAF as a ‘supportive tool’ by playing short clips to ‘highlight points’ rather than playing the entire video recorded scenario. The study highlighted the difficulty of assessing participant satisfaction for VAF as the level of exposure to VAF is variable.

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Effect of video assisted feedback on stress and anxiety associated with simulation

The stress and anxiety caused by simulation training, to the trainee, could also be used to assess the benefit or detriment of video assisted feedback in simulation. To date, strategies that have been used to address stress management in the context of simulation training for healthcare professionals are limited [29].

Walton et al. [26], reported high levels of anxiety associated with simulation training. A large number of additional studies support this [32,42-44] and, largely, regard stress and anxiety in a negative manner. This is in keeping with Lazarus’ view of stress and anxiety [27].

Cordeau investigated nursing students during simulation training by asking them to write a reflection on their experience.

Perceived anxiety was present at multiples stages throughout the simulation activity, including confronting the ‘unknown’ in the scenario and during debriefing (critiquing the performance). The study recognised the impact of anxiety on learning. Ganley et al. [32] used a descriptive online survey to investigate the perceptions of faculty and staff on academic safety during simulation. Students identified multiple sources of anxiety including fear of humiliation, intimidation and nervousness. Gore et al. [45] demonstrated nurse student anxiety during a mock hospital simulation activity. Activities included review of patient charts, bedside care, medication administration and charting.

Knowles [30] stated that fear of being watched contributed to the stress of the simulation. Parker et al. [46] found being observed by others caused feelings of anxiety, fear and stage fright during simulation training. Cato [47] showed anxiety was caused by being on camera, being observed by faculty and peers. Schmidt [48] demonstrated high levels of anxiety for medical students during intensive care unit (ICU) ward rounds. However, video based feedback after ward rounds resulted in reduced anxiety during subsequent ward rounds when compared to those not provided with feedback. This was assessed by means of a questionnaire (Spielberger State Anxiety Inventory Score, -9.2 ± 9.3 versus -4.6 ± 8.2 p=0.024).

Similar results were also found in a study of 182 paediatric ICU staff (137 nurses, 50 physicians, 2 respiratory therapists and 3 nurse practitioners) whose simulation and subsequent video assisted feedback resulted in an improvement of the teams perceived ability to function and reduced anxiety during subsequent ‘real-life’ emergencies (p<0.01). The assessment of anxiety was in the form of a questionnaire [49].

These studies used the State-Trait Anxiety Inventory (STAI) [50], as a measure of anxiety. This measure contains forty items rated on a four point scale with higher scores indicating higher anxiety. Studies have shown it to be a sensitive predictor of caregiver anxiety and distress and varied with changes in support [51,52]. However, it is a linear score and equates a higher score to a more negative level of anxiety. This view of anxiety led to Knowles’s [30] describing an optimal learning environment as one which has ‘physical comfort, mutual trust and respect, mutual helpfulness, freedom of expression and acceptance of differences.’ Sappington [31] suggested educators had a responsibility to create an emotionally safe learning environment, reducing fear of failure and embarrassment. Ganley et al. [32] suggested anxiety should be ‘reduced to provide an academically safe learning environment.’ and suggested that students should ‘experience healthy anxiety.’ However, this concept/view of stress and anxiety and its effect on learning is limited and does not recognise the complex relationship that exists between stress/anxiety and performance/learning.

Stress stimulates the autonomic nervous system and hypothalamic-pituitary-adrenal system causing adrenaline release which enhances physical ability and corticosteroids release which enhances memory performance and focused attention [47]. Muller [53], recognised stress ‘modifies human performance and can influence the management of crises…. improving clinical and non-technical performance.’ However, stress may facilitate or impair learning and memory in a dose dependent manner [54].

Palethorpe et al. [55] described the relationship between stress/ anxiety/challenge and performance in their Comfort-Stretch-Panic (CSP) Model, where the degree of challenge presented to the learner influenced the degree of learning. When there is little challenge present, the learner remains in the comfort zone and little learning takes place. In the stretch zone, learners are stressed and motivated towards optimal levels of performance/learning, this...
While moderate anxiety enhances motivation/learning, too much can be devastating (Sogunro, 1998). High levels of stress interfere with performance [54]. ‘Anxiety becomes an obstacle that may prevent that person from successfully approaching and mastering new material’ [56]. Although the CSP model has been used to measure the effect of stress and anxiety in simulation training, the studies do not elaborate on the relationship between stress/anxiety and learning [47]. Whether the stress/anxiety associated with simulation training, verbal and video assisted feedback is beneficial or detrimental has not previously been investigated.

In a review on the effect of acute stressors on performance, Leblanc showed elevated stress levels could reduce performance in activities that required divided attention, working memory and information retrieval in addition to decision making. The stress felt was determined by an individual’s appraisal of the demands and resources of the situation. The relationship between the stressor and the task was also important, as too was the participants coping styles, locus of control and social supports. Leblanc’s work suggests the variables involved in the stress/anxiety experienced during learning are sufficiently diverse and extensive as to render any attempt to measure stress/anxiety and extrapolate to other learners or teaching activities, futile.

**Conclusion**

Simulation training has become established in the education of healthcare professionals over more than twenty years [3] improving clinical skills and performance [57] and learner transition into professional practice [58]. Scenario feedback (debriefing) is the most important aspect of simulation-based education and all teaching activity should have debriefing at its heart [11].

VAF provides an undeniably accurate record of the simulation training activity, stimulating learning and discussion of the observed events [37]. However, the use of computer enhanced manikins that mimic patients, with audio-visual recording facilities, to systematically evaluate students/healthcare professionals is still at an early stage. Studies are limited and often descriptive in nature [59] or have failed to show benefits in terms of learning outcomes, performance or attainment [60,61].

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