# The effect of an immersive environment on basic life support quality in trained clinicians


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## Introduction

Sudden cardiac arrest is an unanticipated cessation of cardiac output and is the leading cause of sudden unexpected death (SCD) in the sporting environment (Dvorak et al., 2013). It is expected that medical personnel meet the standard competencies stipulated by their relevant governing bodies including delivery of fast and effective CPR and AED use to provide immediate support until advanced medical aid can be delivered. Research has demonstrated that effective CPR and use of an AED can double survival rates in an 'out of hospital' setting (Bottiger et al., 2016), and therefore those involved in pre-hospital care within sport must be prepared for such scenarios.

Given the importance of fast and effective basic life support, it's imperative that continuous training is provided within sports clubs. Typically, this training would occur in a 'classroom' environment, though over recent years, the use of immersive experiences (e.g., virtual reality or the CAVE) has been used across medical settings to enhance and better replicate a real-life scenario (Leary et al., 2019; Bench et al., 2019; Rushton et al., 2020). In sport, clinicians are expected to carry out basic life support, if required, in an environment where additional visual and auditory stimulus are present, yet training is rarely performed in this environment. Therefore, the use of an immersive room such as the CAVE might provide additional stimulus to enhance training and influence basic life support quality.

## Research Question/Objective/Hypothesis

**Research Question**: Does an immersive sport environment influence clinician's perceptions and quality basic life support?

**Objective**: To invite trained clinicians to perform basic life support in an immersive sport and standard classroom environment to assess their perceptions towards the task and overall basic life support quality.

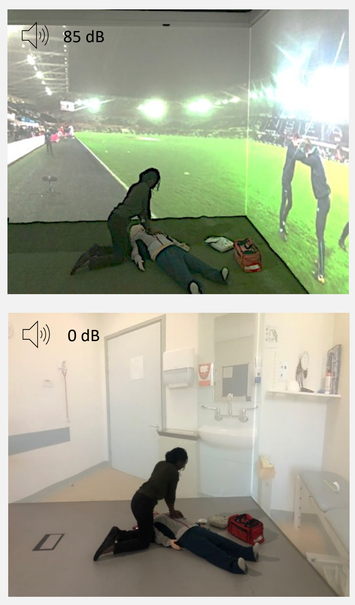
**Hypothesis**: It was hypothesised that the quality of basic life support would be negatively impacted by the immersive environment due to differences in attentional focus and greater audiovisual distraction.

## Methodology

Using a repeated measure study design, 7 (5M, 2F) physiotherapists who were working in professional sport and had completed at least the ITMMiF took part.

Prior to the trial, participants were immersed in the environment (Figure 1) for 5 minutes and completed the felt arousal (low to high arousal) and feeling (good to bad) scale. In a randomized order, participants were asked to respond to a sudden collapse and complete 4 minutes of basic life support in immersive or classroom environment. An AED was available and provided if requested. Basic life support was assessed using a QCRP mannequin with the score for each criteria recorded alongside observational notes. Once complete, participants were asked to complete the attentional focus questionnaire and about their experience in the two environments.

Quantitative data was analysed using a standardised mean difference (SMD) with 95% confidence intervals. SMD was interpreted at trivial (≤0.20), small (0.21-0.60), moderate (0.61-1.20), large (1.21-2.00), and very large (>2.00).




## Results

Within the immersion, participants recorded higher arousal levels (Figure 1) and were more associated with the task (Figure 2A). Distress was also lower in the immersive environment compared to non-immersion (Figure 2C). Trivial to small differences in the feeling scale and disassociation were observed (Figure 1A; Figure 2B).

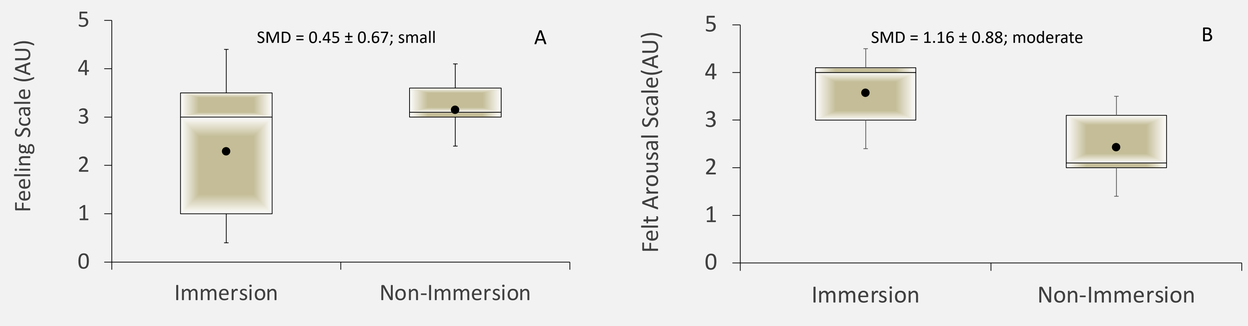



Figure 1. Differences in the feeling scale (A) and felt arousal scale (B) between environments.


Figure 2. Differences in association (A), disassociation (B) and distress (C) between environments.




Figure 3. Six of the key QCPR metrics

QCPR results indicated trivial to small differences between the two environments. A small improvement was noted for average compression rate, compression depth, and overall QCPR in the immersive environment. The results suggest only a small influence of the immersive environment on CPR performed by experience clinicians.

Observational notes and feedback revealed a more rush approach in immersion with some errors that led to delays in applying the AED (e.g., sequence, instructions). Participants did state they felt more focused in immersion. In non-immersion, few errors were observed, and communication was greater with the assistant. Participants indicated they felt greater distress in non-immersion due to a heightened focus on them with the quieter and brighter environment.

## Conclusion

Use of an immersive environment, placing the individual in sporting areas with crowd noise, alters clinicians' arousal levels which might explain the higher association, compression rate, compression depth and overall QCPR when compared to a classroom environment. Whilst only trivial/small differences in QCPR metrics were observed, use of an immersive environment might provide additional stimulus during training and assessment, thus increasing the ecological validity of giving basic life support.

## References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