

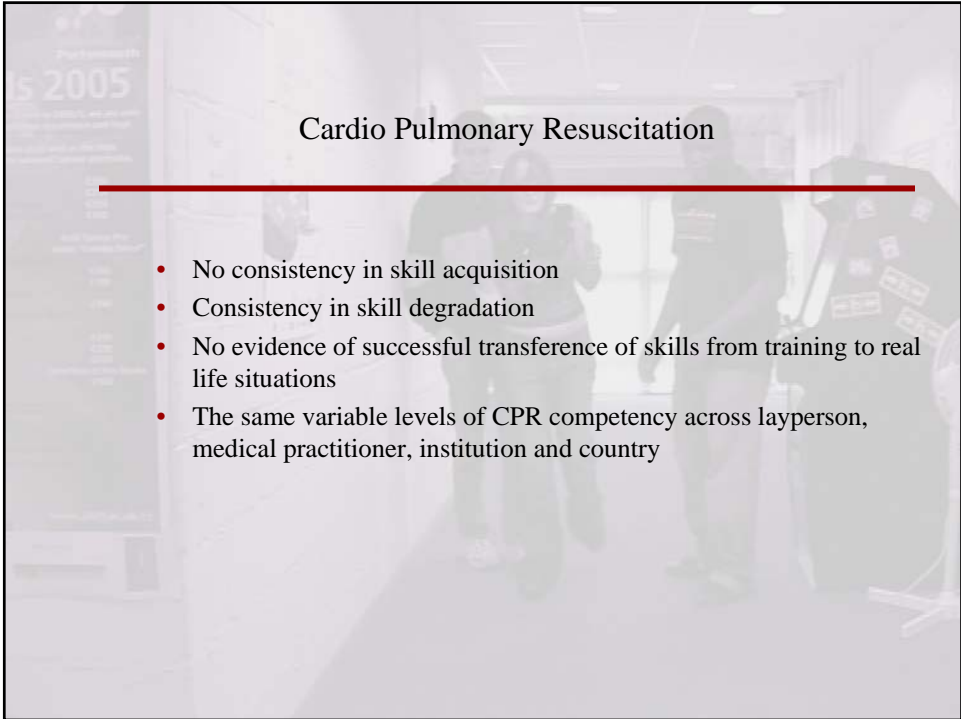
3D Virtual Immersive Scenarios – Bridging the Reality Gap Between Training and Real Life Situations

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Cardio Pulmonary Resuscitation

- No consistency in skill acquisition
- Consistency in skill degradation
- No evidence of successful transference of skills from training to real life situations
- The same variable levels of CPR competency across layperson, medical practitioner, institution and country

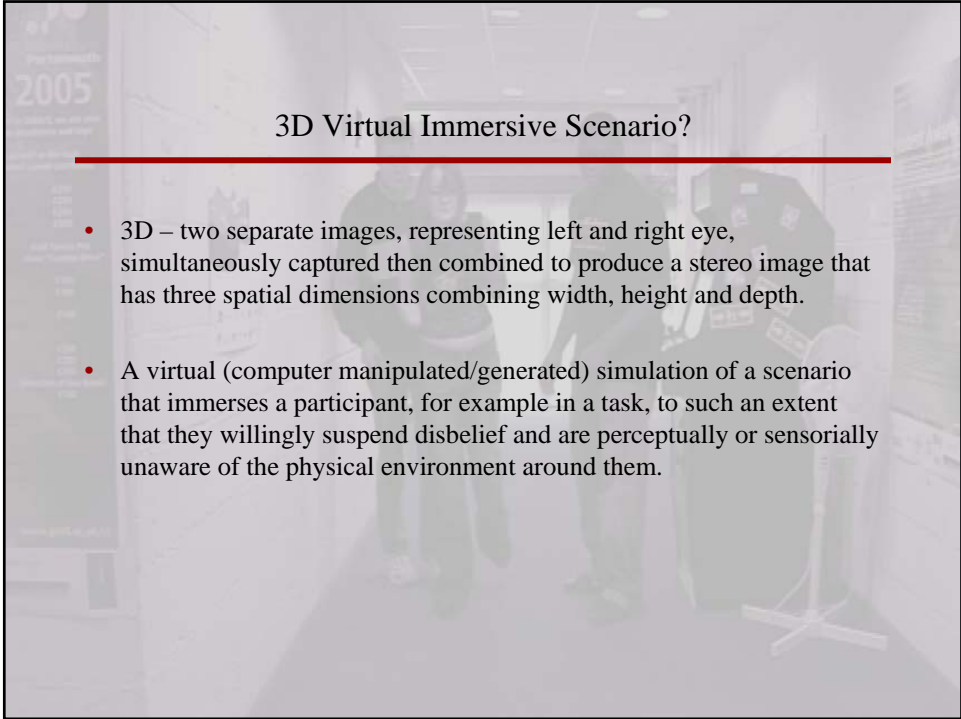
CPR Algorithm

An algorithmic task split into 5 components

1. Three H's = Hazards, Hello, Help
2. A = Airways
3. Telephone for help
4. B = Breathing
5. C = Circulation

High Human Cost Task Based Training

- High human cost when not performed correctly or not performed in time
 - In USA and Canada only 6.4% of cardiac arrest patients survive without resuscitation
 - In Britain less than 20% of in hospital resuscitation attempts will be successful



3D Virtual Immersive Scenario?

- 3D – two separate images, representing left and right eye, simultaneously captured then combined to produce a stereo image that has three spatial dimensions combining width, height and depth.
- A virtual (computer manipulated/generated) simulation of a scenario that immerses a participant, for example in a task, to such an extent that they willingly suspend disbelief and are perceptually or sensorially unaware of the physical environment around them.



Training versus Real Life Situations

- Training
 - controlled environments that address aims, objectives and outcomes within a recognized didactic model
- Real life
 - Unique situations and unpredictable outcomes require the successful transfer of the lessons learned in training to facilitate rapid analysis and diagnosis of a situation, process and evaluation of required actions, in quick succession and under immense pressure.

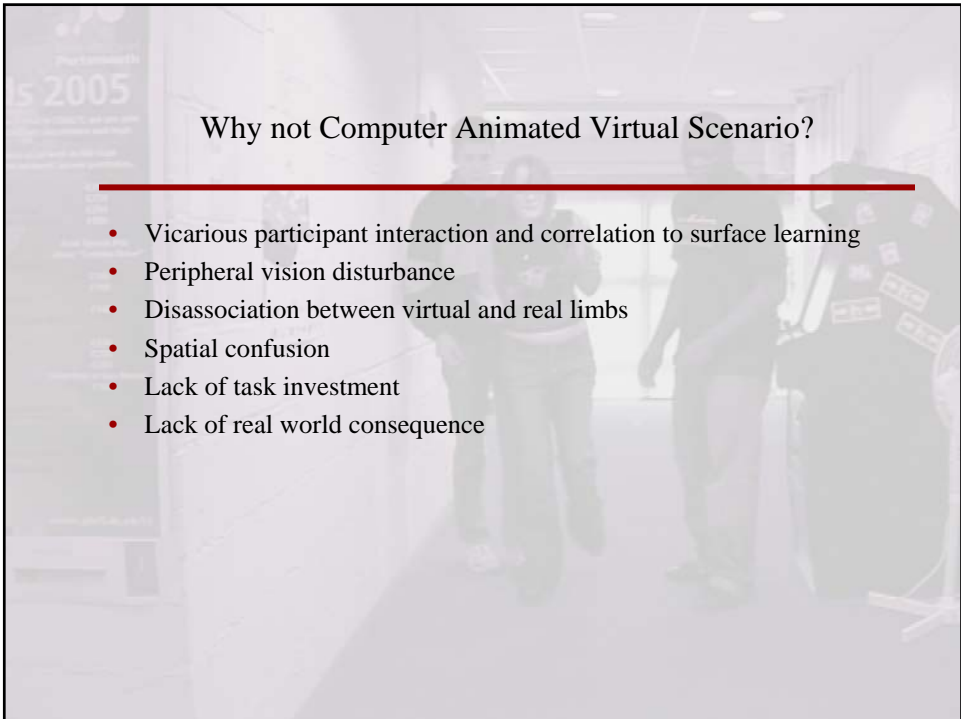


Goal

- Investigate the effects of greater task realism within a virtual immersive scenario by using 3D stereoscopic ecological video footage as opposed to a 3D computer generated scenario

In terms of this research is a combination of

- Resusci Annie a Human Patient Simulator (HPS)
- 3D stereoscopic “organic” video footage portraying a growing crowd scene around a casualty
- back projected onto a 5 x 2.5m screen within a Virtual Reality room



Why not Computer Animated Virtual Scenario?

- Vicarious participant interaction and correlation to surface learning
- Peripheral vision disturbance
- Disassociation between virtual and real limbs
- Spatial confusion
- Lack of task investment
- Lack of real world consequence

Why 3D Stereoscopic Organic Footage?

- Depending on the trainee's, perception of the experience combined with previous knowledge carried forward the state of emotional arousal dictates the degree of suspension of disbelief, presence and cognitive perception.
- This multiple stressor didactic model, undertaken in a single environment, can confront existing predetermined knowledge concepts, negate or displace them with an alternative representation that facilitates a new cognitive starting point on which to build a knowledge base.

Methodology

A three phase study with healthy adult participants $n=20$ with no prior CPR experience were randomly divided into four conditions to undertake standardized layperson CPR (Resus 2000) at Basic Life Support level training and testing in Phase 1 and testing only in Phases 2 and 3 by a qualified resuscitation officer

| Conditions | Training | Testing |
|------------|---------------|---------------|
| Group A | Non Immersive | Non Immersive |
| Group B | Immersive | Non Immersive |
| Group C | Immersive | Immersive |
| Group D | Non Immersive | Immersive |

Data collection

| Data | Pre Study | Post Study | During Study |
|--|-----------|------------|--------------|
| Immersive Tendencies Questionnaire | X | | |
| Visual Analog Scale - Confidence, Ability, Preparedness and Knowledge to perform CPR | X | | |
| Basic Physiological Readings | X | X | |
| Manikin Resuscitation Data | | | X |
| Resuscitation Officer Testing Procedure Marks | | | X |
| Video Footage recording participant behaviour | | | X |
| Presence Questionnaire | | X | |

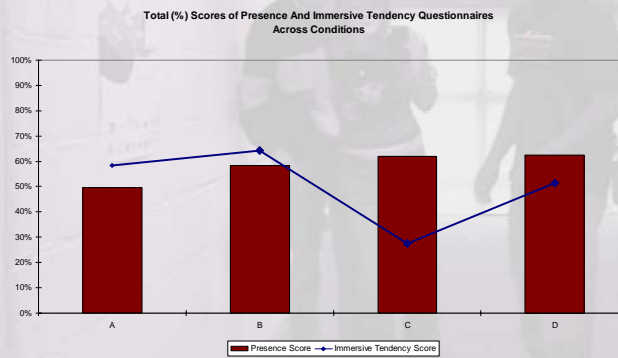
Non Immersive Testing



Immersive Testing



Immersive Tendencies and Sense of Presence Scores



Performance

In the control condition A all participants $n=5$ either failed to request/seek assistance before starting resuscitation $n=3$ or verbally requested assistance after resuscitation had started $n=2$

Ventilations -Tentative inference that conditions C and D show significantly better performance over conditions A and B

- C to A – One sided (upper tail) $P = 0.0163$
- C to B - One sided mid-P = 0.0002
- D to A - One sided mid-P = 0.0017
- D to B - One sided mid-P < 0.0001

Compressions –

- B to C – One sided mid-P < 0.0001
- B to D – One sided mid-P = 0.0002
- B to A – One sided mid-P = 0.0173

Condition B performed significantly better than groups C and D.

Conclusion


Early indications point to enhanced skill acquisition and performance in a combination of immersive and non immersive training and testing conditions.

Phases 2 (data under analysis) and 3 (poised to conclude) will return results relating to skill retention and confidence in skill and a point of comparison



Future Research

- With no “best approach” to address the current CPR training and testing strategies further a further study is needed
- Discussions are underway with our NHS collaborators at the Queen Alexander hospital to extend the research to nursing staff in a large scale ($n=200?$) study over the coming year



Thank you for your time and
any questions?

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