

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

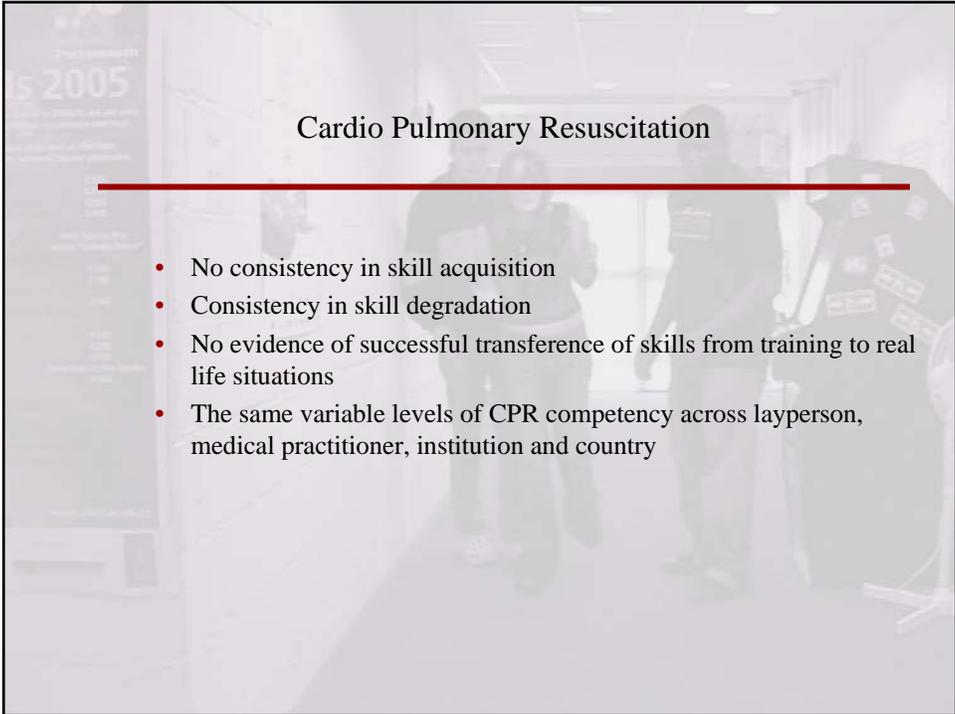
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## Cardio Pulmonary Resuscitation

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- 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

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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

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- 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?

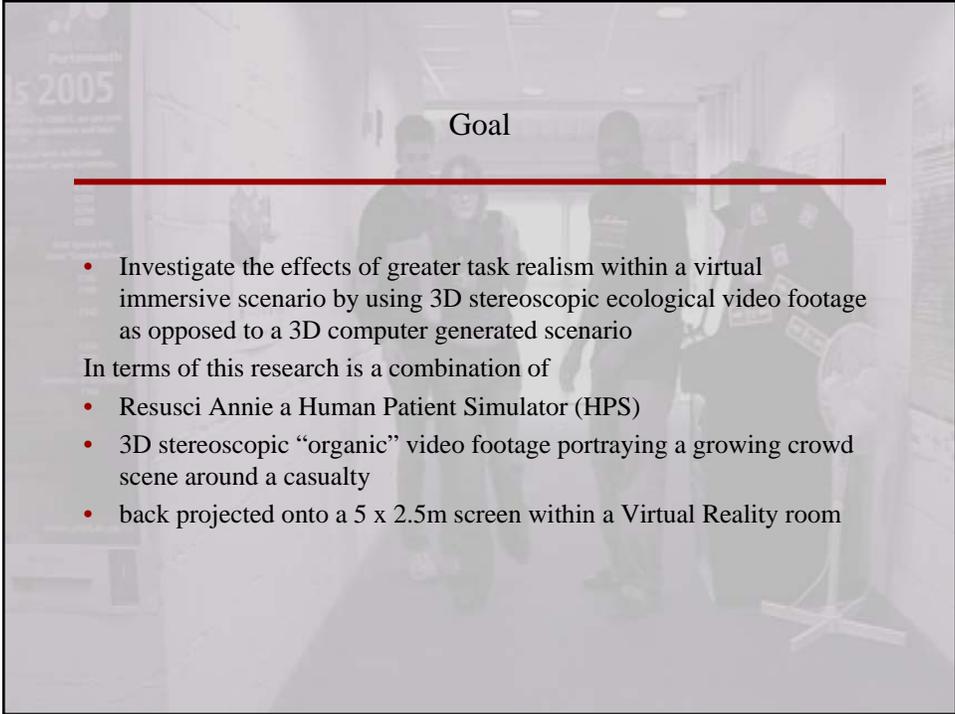
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- 3D – two separate images, representing left and right eye, simultaneously captured then combined to produce a stereo image that has three spatial dimensions combining width, height and depth.
- A virtual (computer manipulated/generated) simulation 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

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- 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.



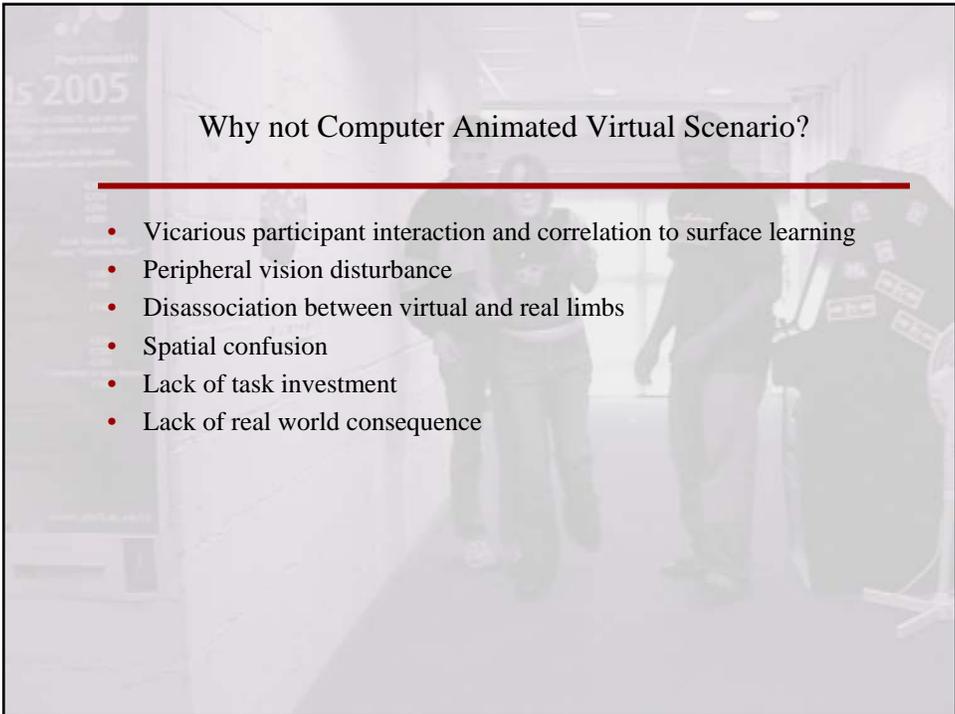
## Goal

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- 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?

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- 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?

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- 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

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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

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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

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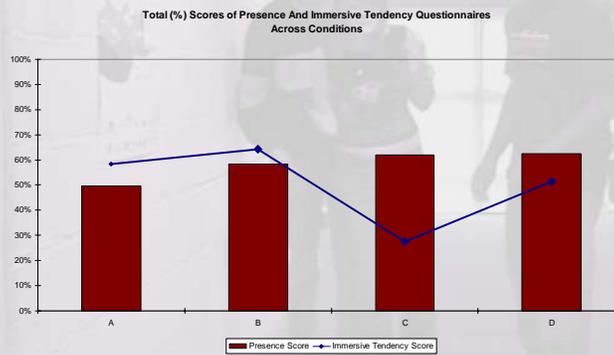
## Immersive Testing

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## Immersive Tendencies and Sense of Presence Scores

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## Performance

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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

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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

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- 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



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Thank you for your time and  
any questions?

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