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INDUCING EMOTIONAL STRESS FROM THE INTENSIVE CARE CONTEXT USING STORYTELLING IN VR

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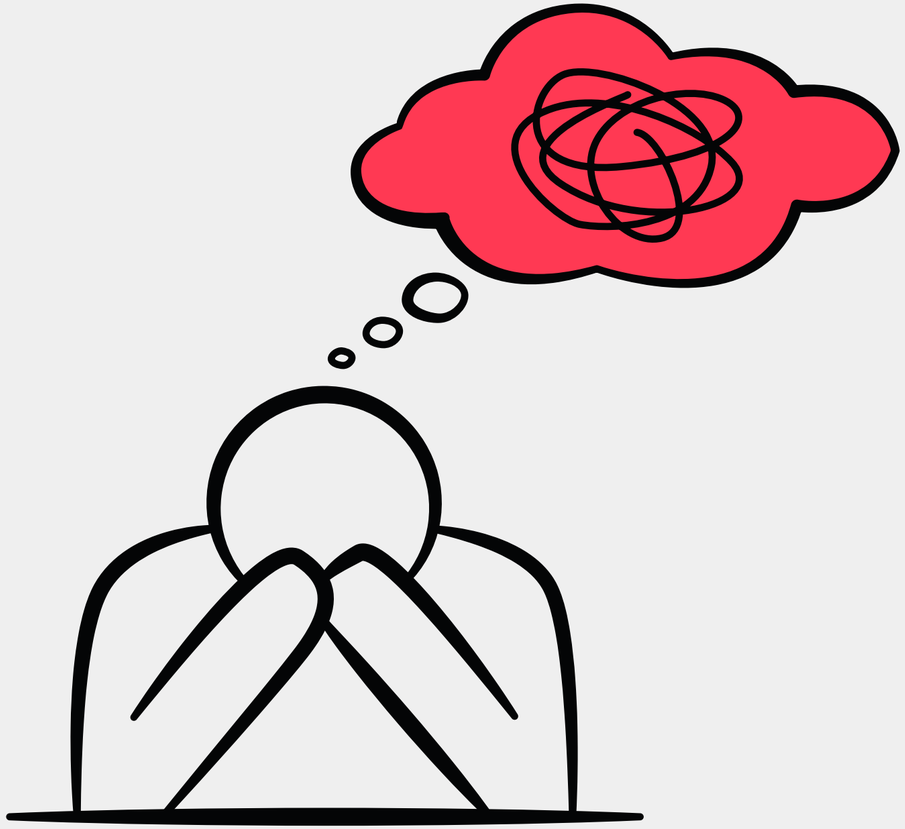
CONTENT

PAPER SELECTION CRITERIA

- Personal interest
- Relatable Topic
- Relevance



INTRODUCTION

Virtual Reality

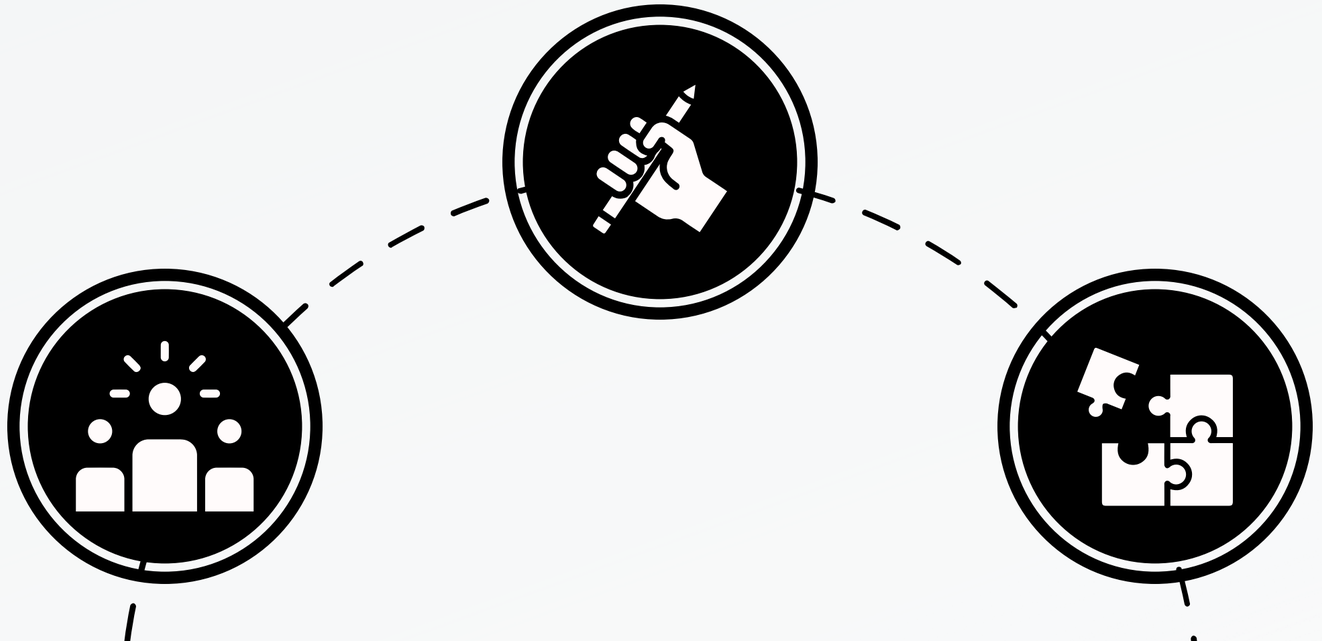
- Relevant in many areas
- Used to perform simulations

Stress

- Safety critical environments are bound to have/cause stress, such as an ICU
- Care provided by the nurses is affected

Coping with Stress

- Stress Inoculation Trainning (SIT)
- Use of stressors



RELATED WORK

- **Effects on Training Outcome**

Using emotional stressors in medical procedure training has been found to have positive effects, leading to improved performance and outcomes in simulated scenarios.

- **Empathy Towards Virtual Characters**

Nurses can feel empathy for virtual patients in training scenarios, allowing for practice without real patients experiencing negative experiences, as shown by Kleinsmith et al.'s study.

- **Stress Response**

Virtual environments (VEs) can induce stress responses similar to real environments, and storytelling in VR can create a sense of presence and induce stress when emotional connections are established with virtual characters.

- **Effect of Immersion Depth**

Pallavicini et al. found that emotionally-immersive films with drama and narrative create higher levels of involvement and physical presence, and the authors aim to use VR and storytelling to address ICU stressors based on this understanding.

METHODS
RESEARCH

- **First, literature review and interviews with experts were conducted**
  - Data on stressors was collected

- **The interview guidelines addressed these two questions:**

  - What are the relevant emotional stressors that regularly occur in the critical care context?

  - If we address concrete situations, what is a typical sequence of of these situations? Which actors are involved?

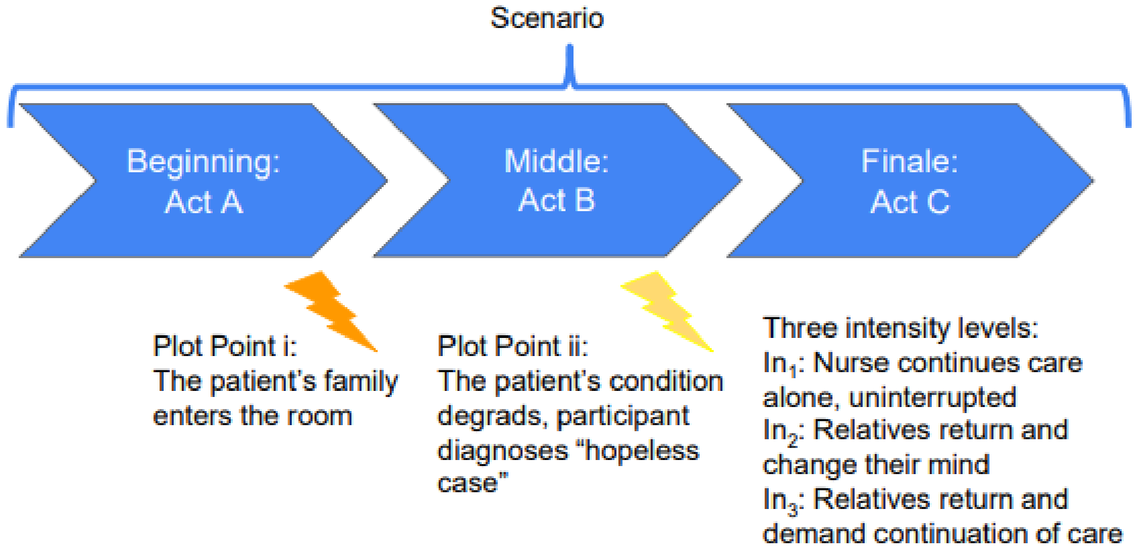
Table 1: Frequency of stressors mentioned in expert interviews.

Stressor	Times mentioned
Incompetent medical staff	5
Fulfill family's requests	5
Relationship to patient	5
Conflict with colleagues	4
Taking care of younger patients	3
Taking care of hopeless cases	3
Feeling unqualified	2
Conflict between medical and nursing staff	2
Unnecessarily prolong dying	2
Unsuccessful in spite of best efforts	2
Feeling not to have done enough	2
Confrontation with suffering of family	2
Disliking the patient	1

METHODS

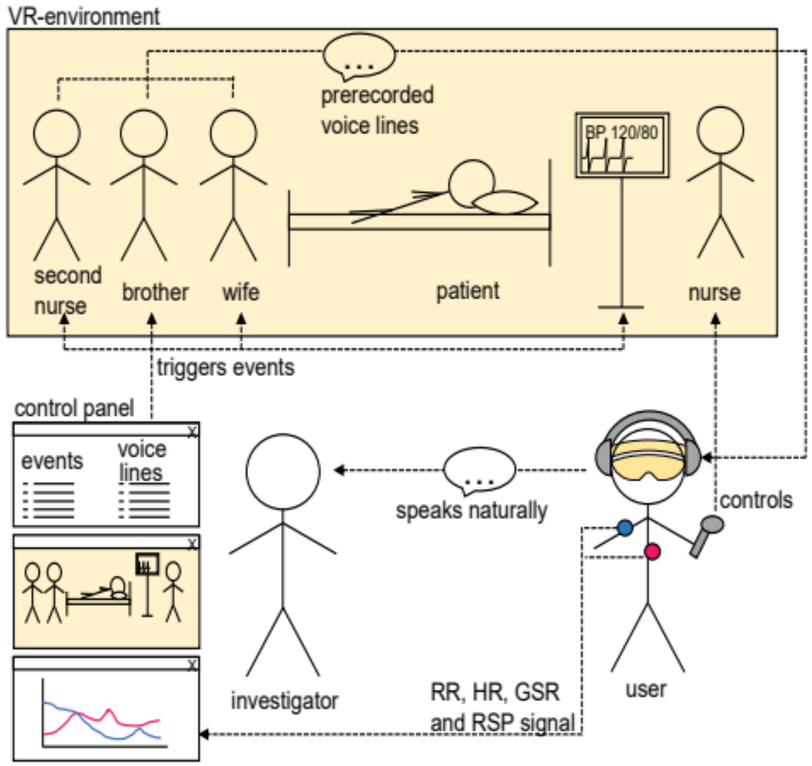
SCENARIO DEVELOPMENT

- **A Scenario was developed**
  - It consisted of 3 acts.
  - Moral distress as the main aspect
  - Acts A and B sare the same for everyone
  - Act C varies according to stressor's intensity
    - Each intensity had it's own group of participants



METHODS

STUDY DESIGN



- A vr-environment was built, so the experiment could take place
- Resembles a wizard-of-oz experiment
- Participants were given taks to perform
- 16 participants, 6 female and 10 male, aged 21-60.
  - Half had experience in ICU environments

METHODS
DATA ANALYSIS

01

OBJETIVE DATA

- Stress provokes change in the human body and such can be measured
  - breathing frequency
  - time between R peaks
  - Heart Rate
  - Galvanic Skin Rresponse

02

SUBJETIVE DATA

- Objective measures alone are not enough, as our bodies also react to eustress.

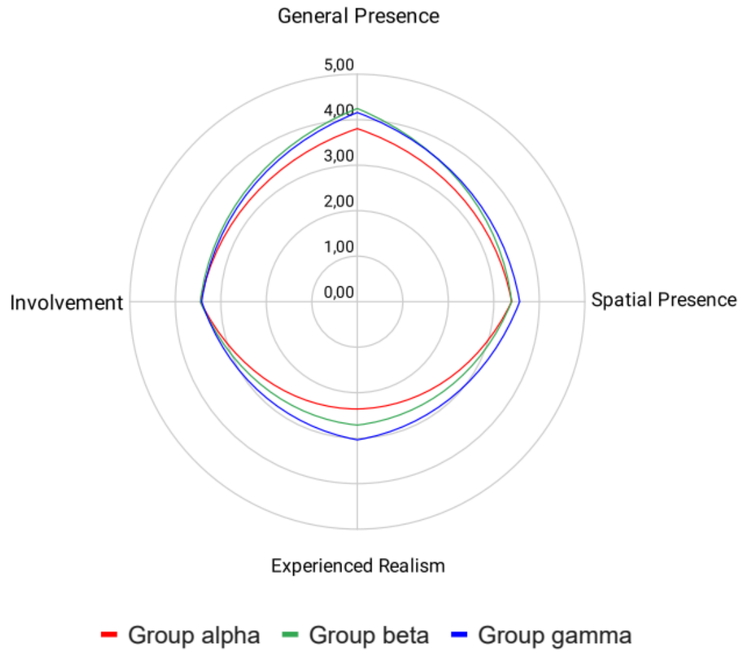
- Therefore, stress-specific questionnaires were employed

RESULTS

SUBJETIVE MEASURES

- **Objetive measures provided results through 3 diferent questionnaires**
  - PSQ20
  - LIKERT
  - IPQ

Measure	Group	Means (SD)		Mean (SD) Increase in %
		Pre	Post	
PSQ20	α	26.3 (10.5)	26.3 (11.8)	-3.15 (10.8)
	β	33.7 (8.0)	48.0 (11.6)	46.1 (39.5)
	γ	28.3 (9.3)	45.8 (69.3)	69.3 (61.7)
Likert	α	2.8 (1.6)	3.4 (1.1)	41.0 (43.7)
	β	3.2 (0.8)	5.4 (1.1)	78.3 (54.5)
	γ	1.7 (0.8)	5.3 (1.5)	308.0 (224.5)



RESULTS
OBJETIVE MEASURES

- **Objetive measures provided results through diferent parameters**

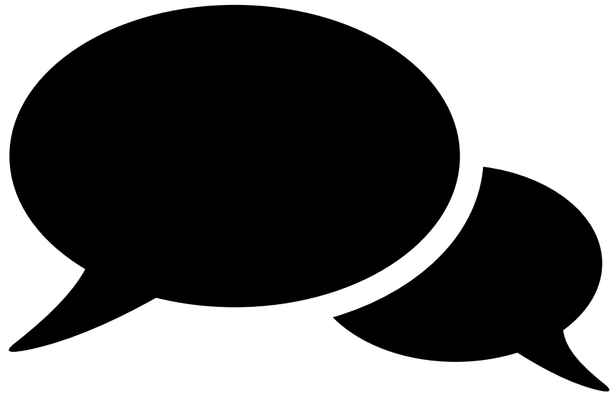
  - Breathing frequency
  - Time between R peaks
  - Heart Rate
    - Data of 3 participants could not be included due to equipment malfunction
  - Galvanic Skin Response
    - Data from a fourth participant could not be obtained due to faulty wiring

Measure	Group	Mean (SD) Increase in % BL→A	BL→B	BL→C
RR	α	-4.5 (3.6)	-3.5 (4.3)	-2.0 (1.1)
	β	0.1 (5.6)	0.5 (8.5)	-1.6 (8.7)
	γ	-2.6 (5.6)	-4.0 (5.8)	-4.5 (7.9)
GSR	α	-17.6 (17.1)	-21.8 (15.3)	-21.4 (11.7)
	β	-5.2 (26.2)	-13.4 (28.1)	-18.8 (31.7)
	γ	-15.0 (21.0)	-21.7 (22.3)	-29.2 (25.5)
HR	α	4.1 (4.5)	3.3 (3.8)	-0.5 (2.4)
	β	-1.2 (5.5)	-1.4 (9.0)	0.6 (8.7)
	γ	2.1 (4.5)	3.6 (6.1)	4.4 (8.7)
RSP	α	103.9 (49.3)	106.7 (48.5)	76.5 (66.9)
	β	104.8 (55.4)	78.6 (39.9)	64.7 (41.2)
	γ	77.3 (37.5)	91.3 (51.1)	70.9 (45.9)

DISCUSSION

Subjective Measures

- The intensity of the stressor had measurable impact on our participants.
- The intensity of the moral stressor was able to induce emotional stress in groups β and γ, with perceived stress being the strongest in group γ.
- The IPQ shows a significant increase in the perceived realism with each stressor intensity in the sub scale REAL.



Objective Measures

- Most measures follow the trend of showing a stronger stress response with increasing intensity level of the stressor.

LIMITATIONS

The number of participants did not allow us to compare the stress responses in nurses with the general population

LARGER SAMPLE

More confident in their interactions with family members. Other participants were showed uncertainity in their interactions the family members.

MORE ICU NURSES

In general, an age trend was noted, according to which younger participants behaved more confidently

VR EXPERIENCE

To avoid biases, IPQ should have been answered during the VR experience and compare the VR system's realism to a real environment with actors by comparing the response to a stressor.

STRESSOR IN REAL ENVIRONMENTS

CONCLUSION

- VR system developed for inducing emotional showed to be able to induce stress
- NPCs and pre-recorded speech fragments were used to effectively induce stress in participants
- Future research could explore further enhancements to the system
- Overall findings highlight the potential of the VR system for healthcare training.

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