



Analysing the Effectiveness of Consumer-ready Simulation Software in Training for Maritime Navigation Under Pressure

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Acknowledgements

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Abstract

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1.3 Maritime Navigation Under Pressure

2 Literature Review

2.1 Maritime Navigation Training

2.2 High-pressure Scenarios and Decision-making

A high-pressure situation is one which can be defined as a scenario where an individual has a difficult task or decision to make, which is likely to make the individual feel stressed or anxious. In such situations, the individual may experience a range of physiological and psychological responses, such as increased heart rate, sweating, and impaired cognitive function. These responses can impact the individual's ability to think clearly and make effective decisions, which can have serious consequences in critical situations.

Some examples of high-pressure situations include emergencies, meeting deadlines, public speaking and competitive activities. They do not necessarily have to be life-threatening or pose a great risk to the individual to be considered high-pressure. One such example in popular media is Richie's Plank Experience [1], a virtual reality game in which the player has to walk across a plank suspended high above the ground. Although the player is not in any real danger, the immersive nature of the virtual reality experience can trigger a fear response, making it a high-pressure scenario. [4]

Some factors which can contribute to the experience of stress in a situation are information overload, time pressure, complexity and uncertainty. [12] Fear can also be considered a factor which contributes to the experience of stress. [9] Fear results from the perception of threat of danger to the person and can greatly impact decision making abilities by causing a person to focus only on things which

they deem to be "catastrophic" in a given scenario. [3] For example, in a survival situation, one may be so focused on avoiding a threat that they struggle to open a door.

2.3 Necessity for Regular Exposure to High-pressure Scenarios

Certain career paths require individuals to regularly make decisions under pressure such as emergency service [6][13], military [14][7][5] and transport [8][2] personnel. In these professions, the ability to think clearly and make sound decisions under pressure is critical to the safety and well-being of the individual and other people they may come in contact with or be responsible for, either directly or indirectly [11].

For example, armed police officers may be required to make a decision on whether or not to deploy lethal force in a situation which is influenced by all of the aforementioned decision stressors, including fear. For many people, this is a scenario which they are unlikely to ever have to face. However, armed police officers could, in theory, have to make this decision regularly.

2.4 Training for High-pressure Scenarios

Repeat exposure to the feeling of stress can help individuals to become more accustomed to it and learn how to deal with it. For this reason, military training around the world is normally designed to be stressful and, at times, unpleasant.

One such example of this is the shouting and aggression which is often used by instructors to help recruits become accustomed to thinking while under the stress of noise and unpleasant attention.

As portrayed in the film "Jarhead", which is based on the training of United States Marines in the early 1990s, in one scene Jake Gyllenhall's character is being slapped on the back of the head by the senior drill instructor while he is trying to recite some information. The recruit character states that he can't think while being hit on the head and the senior drill instructor retorts that if he can't think while being slapped on the head, how does he expect to effectively fire his rifle in combat, an inherently stressful situation.

2.5 Virtual Environments for Training

2.6 Measuring Stress Levels

Data regarding the stress level of a participant can be attained by measuring a person's heart rate, heart rate recovery time, salivary cortisol and amylase. Further surveys and interviews can be conducted with volunteers to gather information. [10]

2.7 Application of Virtual Environments in Training for High-pressure Scenarios

3 Virtual Environments for Training Built in Unreal Engine 5

3.1 Introduction

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4.3.1 What is Mutilus?

4.3.2 Prototype Experiments

4.3.3 Results

5 Applications of this Research

The findings from this research have significant implications for the field of maritime navigation training. By demonstrating the effectiveness of consumer-ready simulation software, this study paves the way for more accessible and cost-effective training solutions. Maritime academies and training centers can integrate these simulations into their curricula, providing students with realistic and immersive training experiences without the need for expensive, specialized equipment.

Furthermore, the research highlights the potential for using virtual environments to train individuals for high-pressure scenarios. This can be extended

beyond maritime navigation to other fields such as aviation, military, and emergency response, where decision-making under stress is critical. The ability to create customizable and repeatable training scenarios allows for targeted skill development and assessment.

Additionally, the use of digital twins and advanced simulation technologies, as explored in this study, can be applied to various industries for training, planning, and operational purposes. For instance, in the oil and gas industry, virtual simulations can be used to train personnel on complex procedures and emergency responses, thereby enhancing safety and efficiency.

Overall, this research contributes to the growing body of knowledge on the use of virtual simulations in training and underscores the potential for these technologies to revolutionize training methodologies across multiple domains.

5.1 Training for Stressful Scenarios

6 Methodology

7 Results

8 Discussion

9 Conclusion

10 References

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11 Appendices