How does **emotional state** affect **gait**?

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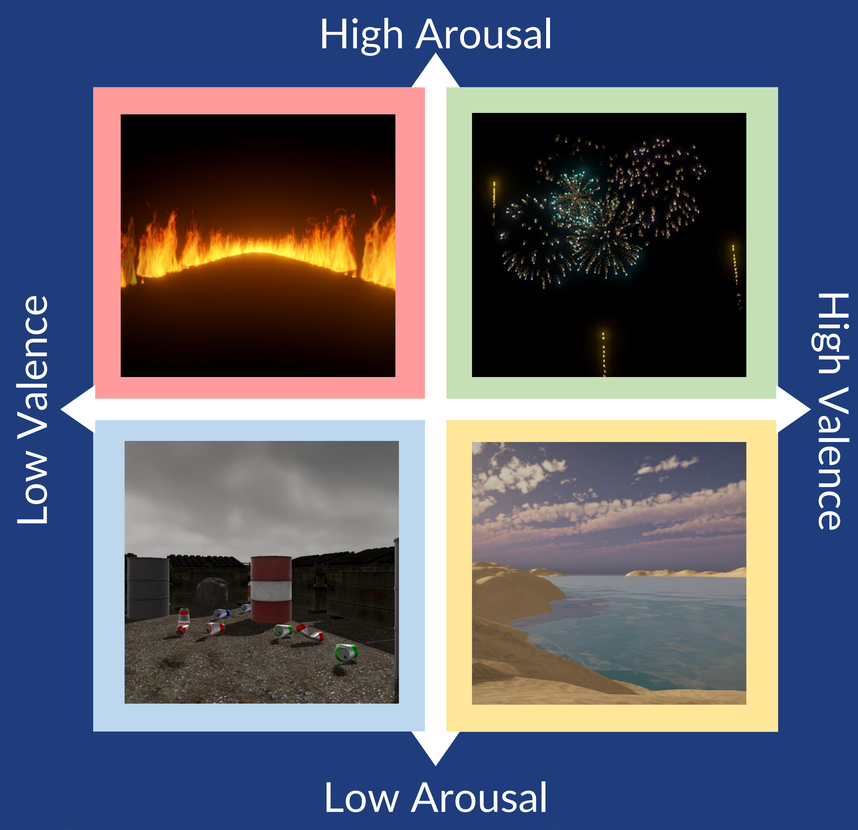

Figure 1. Visual representation of the virtual reality environments custom designed for the study and the emotional states they represent.

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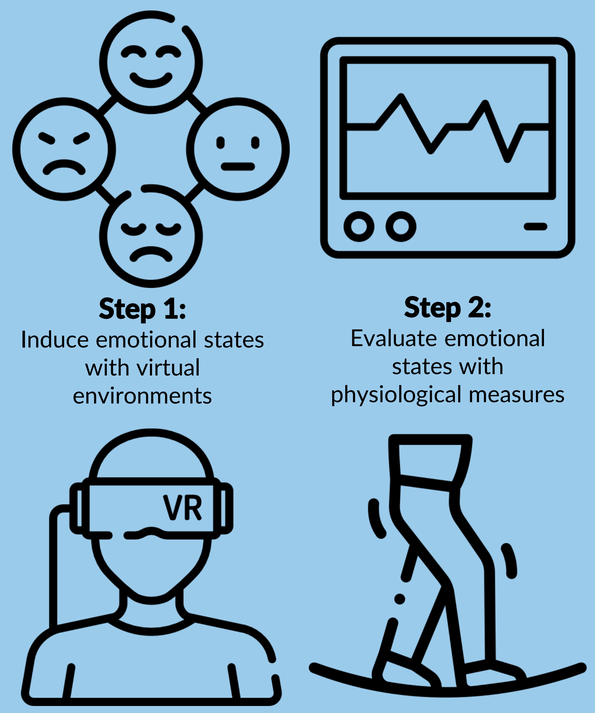
Background

Falls pose a significant threat to aging individuals, requiring effective interventions. Strategies like medical alert systems, lifestyle changes, and balance training programs have been developed to mitigate fall-related injuries[1], however, these strategies neglect to consider the contribution of emotional state to fall risk. This is important because age-related cognitive decline impairs a person's ability to process external stimuli[2] and emotions induce a cognitive load on the brain[3]. Therefore, processing emotions can increase an older person's fall risk. There has been some research into the effect of emotions on posture and balance[4], however, they mainly focused on discrete emotions like fear, anger, or contentment, making consistent emotional experiences across subjects difficult. Instead, by studying the emotional state of a person using a dimensional model of emotions[5], an element of objectivity can be added, accounting for this error. A study that examines the relationship between emotional state and gait is missing from literature and would aid in future research.

Objectives

This study aims to analyze the relationship between gait, arousal, and valence to extract valuable insights for the development of targeted fall prevention interventions. By investigating the intricate relationship between emotional states and fall risk, this study will contribute valuable insights for the development of targeted fall prevention interventions.

Experimental Design



Step 1: Induce emotional states with virtual environments

Step 2: Evaluate emotional states with physiological measures

Step 3: Immerse participant in virtual environment

Step 4: Evaluate gait using instrumented mat

Measurements

Valence: Facial electromyography of the corrugator supercilii and zygomaticus major muscles

Arousal: Heart rate collected via the Polar H10 chest strap heart rate monitor

Gait: Step length and step time variability and walking velocity collected using an instrumented mat

Hypotheses

Arousal ↑ Cognitive Load ↑ Fall Risk

Valence ↓ Cognitive Load ↑ Fall Risk

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