

Exploring Emotions In Virtual Reality: A Physiological Approach

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Abstract

Background: The integration of Virtual Reality technology in healthcare enables the creation of safe and controlled environments for tests and exploration. It opens research possibilities in novel areas, such as the assessment of specifically elicited emotions through measurement of physiological parameters. The aim of this research is to explore whether immersive VR scenarios could successfully elicit specific emotional experiences, detectable through quantitative physiological changes.

Methods: Five interactive virtual scenarios were developed using Unity: four tailored to evoke an emotion among fear, disgust, happiness, and sadness, and one neutral as a baseline. 61 participants (34 M, 26 F, 1 O) underwent a 7-minute evaluation for each scenario, with a 2-minute baseline intermission between scenarios. Blood pressure, heart rate, and skin galvanic response were continuously acquired via FinaPres and EmbracePlus medical devices. At the end of the experiment, participants filled a questionnaire on the overall experience. Wilcoxon statistical analysis of collected data targeted at identifying physiological variations correlated to potentially experienced emotions.

Findings: The analysis revealed a trend of increase in the physiological parameters during emotional scenarios compared to baseline values. Significance was observed for emotions expected to yield a physiological increase ($p_{\text{valuefear,HR}} = 4,104e-09$). By investigating the relationship among emotional scenarios, the fear scenario was identified as the most impactful ($p_{\text{valuefear-sadness,GSR}} = 0,017$). Similarly, the questionnaire analysis revealed high levels of immersion and engagement among participants. Correlation analysis revealed significance between survey emotion scores and certain physiological trends ($\text{corr_Spearmandisgust,MAP} = -0,3440$).

Discussion: The results underscore the efficacy of the designed VR scenarios in eliciting emotional responses, as supported by both physiological trends and survey analysis, even though they also suggest a similar impact on physiological changes from diverse emotions. The developed VR immersive scenarios have proven their efficacy as a controlled environment, enabling the predictable elicitation of physiological responses.