

**DEVELOPING AN ALGORITHM TO ASSESS MENTAL HEALTH
RESILIENCE IN VR-INDUCED STRESS USING HRV MONITORING**

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.



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ABSTRACT

DEVELOPING AN ALGORITHM TO ASSESS MENTAL HEALTH RESILIENCE IN VR-INDUCED STRESS USING HRV MONITORING

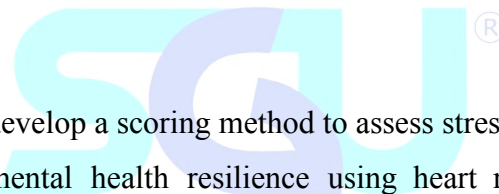
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This research aimed to develop a scoring method to assess stress levels and reinterpret the results to reflect mental health resilience using heart rate variability (HRV) metrics. The study was conducted by exposing participants to three sequential phases—calm, easy, and hard—through a VR-based simulation while recording ECG data. Four selected HRV metrics (RMSSD, SDNN, HF Power, and LF/HF Ratio) were normalized, weighted based on their correlation with mean R-R Interval values between stress states, and used to generate a composite stress score for each phase. RMSSD weighted 37.09%, LF/HF Ratio weighted 23.49%, SDNN weighted 31.14%, and HF Power weighted 8.27%. The comparison between the easy and hard phases from each metric provided insight into the magnitude of the stress response, while the hard-to-calm transition revealed recovery speed. The Calm State is compared against the participant's Brief Resilience Scale test results as it showed significant changes from the previous hard state with a Wilcoxon Signed-Rank test P value of 9.64×10^{-8} . The proposed method offers an objective, time-efficient way to track stress and resilience, supporting future real-time physiological monitoring systems.

Keywords: Mental Health Resilience, HRV, Virtual Reality, RMSSD, SD2/SD1 Ratio



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DEDICATION

I dedicate this work to the progress of mental health research and medical technology.



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