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HEALTH TECH

SESSION TITLE: MACHINE LEARNING TO DETECT CARDIOVASCULAR DISEASE AND PREDICT OUTCOMES

Abstract 14606: Accurate Detection of Acute Psychological Stress Events Using Single Lead ECG Data

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Abstract

Introduction: Stress has been linked to numerous health conditions, including heart disease, diabetes, and mental health issues. By monitoring changes in physiological signals, such as heart rate (HR) and heart rate variability (HRV), wearable biosensing technology allows acute stress to be non-invasively tracked over long periods, providing valuable insights for preventative healthcare.

Methods: This two-phase study comprised several protocols designed to induce varying levels of psychological stress in participants (N=39). HR and HRV metrics, derived from electrocardiogram (ECG) data collected throughout the protocol on the single lead HeartKey® Chest Module, were used by the HeartKey Stress algorithm to generate a relative stress score (0-100), which was validated against two clinically recognized methodologies for assessing patient stress: i) state-trait anxiety index (STAI), a questionnaire that subjectively measured the individual's perceptual stress after each stage of the protocol, and ii) electrodermal activity (EDA), which continuously monitored conductive changes at the skin's surface with an Empatica® E4 wrist wearable.

Results: Over both phases, participant STAI scores increased significantly during stress

protocols (49.9 ± 23.3) relative to the baseline (30.0 ± 10.0). Mean HR showed a similar significant increase ($p < 0.001$), and HRV gradually decreased throughout the testing protocol. HeartKey Stress scores derived from HR and HRV data showed a strong correlation to STAI scores. Furthermore, the HeartKey Stress trend closely replicated that of the EDA data.

Conclusions: HeartKey Stress algorithm consistently generated accurate and reliable stress scores in response to events of induced, acute psychological stress. The results suggest that the algorithm has potential utility for continuous clinical monitoring of patients with stress-related illnesses.

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Footnotes

Author Disclosures: For author disclosure information, please visit the AHA Scientific Sessions 2022 Online Program Planner and search for the abstract title.

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