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HEALTH TECH
SESSION TITLE: WEARABLE DEVICES TO IMPROVE CARDIOVASCULAR DISEASE OUTCOMES

Abstract 13181: Accurate, Non-Invasive Monitoring of VO2 Max Using Wearable ECG Technology

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Abstract

Introduction: Maximal aerobic capacity (VO2 max) corresponds to the maximum volume of oxygen the body can utilize during high-intensity exercise and is widely regarded as the criterion measurement for cardiorespiratory fitness (CRF). In addition to its use as a metric to evaluate aerobic endurance, VO2 max has been identified as a significant and independent risk factor for all-cause and disease-specific mortality. The integration of VO2 max functionality into wearable devices allows CRF to be unobtrusively monitored, providing an important insight into clinical health.

Methods: ECG data acquired on the non-invasive HeartKey® Chest Module throughout a multi-stage, high-intensity exercise protocol was used by the HeartKey VO2 Max algorithm to generate a VO2 max rate. The algorithm's performance was evaluated against data simultaneously collected on gold standard CRF equipment using indirect calorimetry (Korr® CardioCoach). Participants (N=45) of varying ages and physical fitness were recruited to ensure a wide range of CRF levels were represented.

Results: A strong correlational relationship (R=0.9) was observed between the HeartKey VO2

max values and those generated on the criterion device. HeartKey VO2 Max algorithm demonstrated high accuracy, with a mean absolute percentage error of ~6% over the 45 subjects. The mean absolute error for the HeartKey algorithm was 3.1 ml/min/kg, with a root mean square error value of 3.9 ml/min/kg.

Conclusions: HeartKey generated highly accurate and reliable VO2 max metrics from ECG data collected on a non-obstructive, non-invasive, dry electrode wearable device, with a performance comparable to that of a gold standard indirect calorimetry device. This study highlights the opportunity to make CRF monitoring accessible in everyday scenarios by using wearable ECG devices functionalized with accurate VO2 max capability, which is convenient, cost-effective, and highly scalable.

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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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