

Concurrent Validity of Consumer-based Photoplethysmography Heart Rate Device

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Background: Photoplethysmography (PPG) is a recently commercialized technology to measure heart rate using LEDs to non-invasively detect pulsatile blood volume changes due to the heart contracting. The accuracy and reliability (and therefore validity) of these devices are unknown. Therefore, this study aims to assess the concurrent validity of four consumer-based photoplethysmography (PPG) devices worn at the forearm (Scosche), ear canal (The Dash, Bragi, Inc.), left wrist (Apple Watch, Apple Inc.), and right wrist (Forerunner 235, Garmin, Inc.). Heart rate recordings will be compared against the gold standard of heart rate assessment (3-lead electrocardiogram [ECG]). After consenting, subjects will complete a medical and training history form to ensure they are injury disease free and physically active defined as engaging in exercise at least 2 days/week for 30 minutes. PPG devices and the ECG will be donned and the following exercise regimen completed: 5 min of progressive treadmill exercise, 3 min rest, 5 min of progressive calisthenics, 3 min rest, 5 min progressive cycling, 3 min rest, and finally 5 min of progressive rowing. Knowledge of exercise intensity is vital for performance and health gains derived through physical activity. This study can aid end-users in determining which PPG device(s) are valid with regard to heart rate assessment and therefore exercise intensity determination when exercising.