TITLE: Comparing the Fitbit Charge 2 Heart Rate Monitor with Electrocardiography during Sedentary Behaviors, Cognitive-Emotional Stress, and Mindfulness Meditation: A Validation Study

ABSTRACT

Background: Wrist-worn activity monitors (i.e. wearables) are increasingly being used to monitor heart rate (HR) in ways that are applied in medical treatments. Prior studies have assessed the accuracy of wearables only during steady-state aerobic and resistance exercise. Validation of heart rate at rest, and in multiple states of sedentariness have not yet been thoroughly investigated.

Objective: To validate the accuracy of HR for Fitbit Charge 2 during sedentary activities that challenge self-regulation, particularly artificial stressors that are cognitively demanding and emotionally provocative.

Methods: We assess the accuracy of HR for wrist-worn devices (Fitbit Charge 2) during sedentary activities with healthy subjects in: a) resting states, b) while passively viewing provocative imagery, c) during a deceptive cognitive-emotional stress task, d) during exposure to an empirically-derived self help modality for reduction of stress-related symptoms (guided mindfulness meditation). Accuracy of the commercial wearable versus research-grade ECG standards is assessed using Bland-Altman assessment methods, as well as correlational and error bias analyses. Secondary analyses will help determine the relationship between skin-typing and HR validity for the commercial plethysmograph (PPG) technology employed in the Fitbit Charge 2.