

## 17. SWACSM Abstract

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### Validation of the Garmin Fenix 6S Maximal Oxygen Consumption (VO<sub>2</sub>max) Estimate

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#### ABSTRACT

Commercially available fitness watches provide recreational athletes insight into aerobic fitness. The Garmin fenix® 6S (GF) is a recently released multisport watch that provides estimations related to aerobic and endurance performance, including maximal oxygen consumption (VO<sub>2</sub>max). VO<sub>2</sub>max is an important physiological metric to determine aerobic capacity, structure training, and anticipate race performance. **PURPOSE:** Therefore, the purpose of this study was to determine the validity and accuracy of the GF's prediction of VO<sub>2</sub>max in the general population compared to lab-based measurements. **METHODS:** 20 healthy participants (9 male, 11 female, 24 ± 5.4 years, 30.45 ± 21.79 km run/wk) participated in two testing sessions; a graded exercise test to exhaustion (GXT) on a treadmill and a 10 to 15-minute submaximal outdoor running session. During the treadmill GXT, the volume of expired carbon dioxide and inspired oxygen were collected and analyzed using a ParvoMedics metabolic cart. The highest average values of inspired oxygen were recorded as VO<sub>2</sub>max, at the 4-breath, 15-second, 30-second, and 1-minute average. Participants then returned within 2 to 7 days after the GXT to complete a 10 to 15-minute outdoor run with the Garmin heart rate monitor and GF. The watch was reset to factory settings prior to inputting participant information. The watch generated a VO<sub>2</sub>max estimate based on heart rate and pace during the outdoor run. Validity of the wearable device was determined by comparing the GF to the lab data via a 2-tailed paired t-test, mean absolute percentage error (MAPE), Pearson Correlation (r), and Lin's Concordance Correlation Coefficient (CCC). **RESULTS:** The GF produced a valid 30-second VO<sub>2</sub>max estimation, as determined by a non-significant t-test ( $p = 0.891$ ), MAPE value of 5.64%, and CCC value of 0.72. The 15-second and 1-minute VO<sub>2</sub>max estimation met secondary validation criteria using Pearson's Correlation (0.77 and 0.76, respectively). The GF did not provide a valid 4-breath VO<sub>2</sub>max estimation ( $p = 0.00$ ). **CONCLUSION:** Using the validation criteria established in the literature, the GF demonstrated a valid 30-second VO<sub>2</sub>max estimate compared to lab testing. These results suggest that the GF, when paired with the Garmin heart rate monitor, generates an accurate assessment of aerobic capacity for the general population and can be used to determine VO<sub>2</sub>max when lab-based methods are not available.