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Reliability and Validity Analysis of the COSMED K5 Portable Metabolic System

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Increased energy expenditure via physical activity has been shown to improve health outcomes. It is difficult to accurately measure energy expenditure and physical activity outside the laboratory. **PURPOSE:** To determine the reliability and validity of the K5 portable metabolic system. **METHODS:** 27 ($n = 15$ females) healthy adults (27 ± 5 yrs; $21.0 \pm 8.2\%$ body fat) completed a treadmill walking protocol. Participants completed 3 identical trials of 5-min stages that included standing and 6 walking speeds from 1.5 to 4.0 mph in 0.5 mph increments, with a 2-min rest between stages. Visit 1 consisted of wearing the K5 system. During visit 2 (1-7 days later), participants wore the K4 and K5 systems in a randomized, counter-balanced order. Oxygen and carbon dioxide consumption (VO_2 and VCO_2 , respectively), ventilation (V_e), and metabolic equivalents (METs), were recorded breath-by-breath and averaged from minutes 2.5 to 4.5 from each stage for analysis. Reliability of the K5 was determined using an intraclass correlation coefficient (ICC). Validity was assessed using Pearson correlations (r) and paired t-tests. **RESULTS:** In standing, the ICC for all metabolic variables ranged between .50 and .63. For all walking speeds, the ICC for VO_2 , VCO_2 , V_e , and METs ranged between .69-.84, .59-.80, .75-.87, and .53-.77, respectively. The range of mean differences between systems for VO_2 , VCO_2 , V_e , and METs was -52.3-1.23 mL/min; -46.8-79.1 mL/min; -0.06 - -0.67 L/min; -0.07 - 0.07 METs, respectively. There was a moderate to strong relationship between K4 and K5 in VO_2 , VCO_2 , and V_e ($r = .49-.80$; .51-.82; .69-.87, respectively) and a low to moderate relationship for METs ($r = .38-.57$). Statistically significant mean differences between K4 and K5 were only noted in VCO_2 ($p \leq 0.043$) at 1.5mph, and 2.5-4.0 mph. **CONCLUSIONS:** The K5 provided reliable and valid measures of VO_2 , VCO_2 , V_e , and METs across a variety of walking speeds, with higher reliability and validity noted at 3.0-4.0 mph. Although significant differences in VCO_2 were observed, they were fairly small (-48.2-79.1 mL/min). Results were less consistent for standing. Future studies should examine the reliability and validity of the K5 during running.