CAN'T STAND IT:
ARE STANDING METABOLIC RATES TRULY STEADY?

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INTRODUCTION

Standing relatively motionless for any longer than a few minutes is uncomfortable and inevitably involves postural sway. Accordingly, balancing while standing requires muscular activation of limb and trunk muscles that elevates the body's rate of metabolism above resting levels. It has long been assumed that standing metabolic rates can be quantified as resting or exercise metabolic rates routinely are. However, recent evidence suggests that many, or perhaps even most, individuals may not have steady standing metabolic rates [Miles-Chan et al., 2013]. At a minimum, standing appears to be a more variable metabolic condition than lying or sitting [Betts]. These results raise the question of how steady metabolic rates actually are during standing. Standing is almost certainly less mechanically steady than sitting or lying down, therefore, we hypothesized that standing metabolic rates are more variable than supine rest, sitting and moderate speed walking.

METHODS

Seven healthy adults (2 M, 5 F, age 23 to 30) volunteered and reported to the laboratory in the early morning in a fasted condition. Rates of oxygen uptake were acquired in sequence for 15 minutes each under four conditions: (1) lying supine, (2) sitting, (3) standing quietly with the arms by the sides, and (4) walking at 2.7 mph. Participants were instructed to breathe normally and avoid fidgeting throughout all testing. Data were acquired from a Parvo Metrics TrueOne 2400 metabolic system. The relative variability of rates of O_2 uptake for the four conditions was assessed using the coefficient of variation (CV) statistic (=SD/mean). Potential differences were assessed using a one-way ANOVA with repeated measures.

RESULTS AND DISCUSSION

O_2 uptake and CV values appear in Figure 1 A and B. Non-significant increases in CV were observed from supine rest to sitting to standing. However, each of the three non-exercise conditions differed from walking. Lower walking variability resulted primarily from a larger O_2 uptake signal acquired compared to the other three conditions. The results for standing variability in our test subjects were less than the reports in existing literature, perhaps due to our smaller subject pool, most of whom were apparently able to reach a steady state while standing.

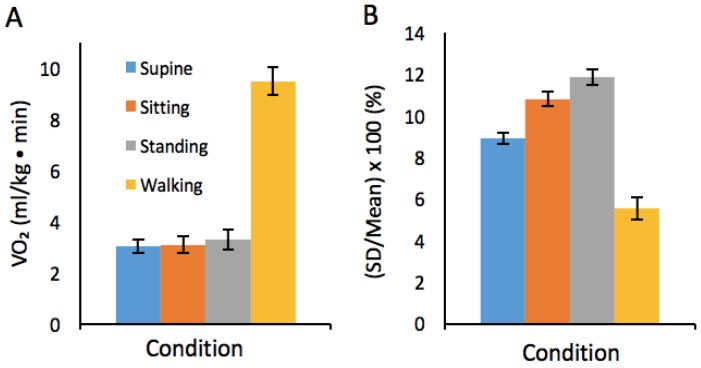

Figure 1. Mean rates of O2 uptake (A) and CV (B) across the four test conditions.

SIGNIFICANCE:

The determinants of standing oxygen uptake and relative unsteadiness require further investigation.

REFERENCES

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