

A COMPARISON OF MEASURED V. ESTIMATED METABOLIC EQUIVALENTS (METs) DURING THE SLED PUSH EXERCISE ON A COMMERCIALLY AVAILABLE STEP MILL

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Introduction

- Commercially available cardiorespiratory training machines provide a variety of metrics to contextualize exercise intensity, such as heart rate and metabolic equivalents (METs).
- Previous research indicates that the estimated MET values were consistently lower than measured MET values when using these machines(1,2).
- Recently, training equipment has been developed that enables the user to perform aerobic conditioning via stair stepping in conjunction with resistance training. One such example is the Stairmaster 10G, which features an "Overdrive" function that simulates carrying or pushing a load up stairs.
- However, the cardiometabolic load when performing these tasks has not been measured using laboratory caliber equipment.

Purpose

The purpose of this study was to compare METs collected via a metabolic cart to estimates provided by a commercially available stepping mill while performing the sled push exercise .

Methods

- Eleven (n=6 females, n=5 males) recreationally active college students participated in an exercise protocol using the Stairmaster 10G's "Overdrive" function to simulate a sled push exercise.
- The participants visited the lab once and performed an exercise protocol consisting of 20 seconds of work followed by 40 seconds of recovery repeated every minute for a total duration of 6 minutes. A 5-minute warm-up was performed prior to the protocol using the normal stair climbing function.
- METs were calculated via a metabolic cart using breath by breath gas exchange measurements.
- MET values calculated from the metabolic cart data were then compared to the estimated values provided by the Stairmaster 10G.



Results

- Paired-samples *t*-tests indicated that the mean estimated MET values ($m=12.6 \pm 0.9-13.4 \pm 0.6$) were significantly different than the mean measured MET values ($m=7.1 \pm 1.3-10.1 \pm 0.8$) for the sled push exercise ($p < 0.05$).

Table 1. Comparison of Estimated vs. Measured METs for the Sled Push Exercise

Exercise Bout	Estimated (10G)	Measured (Metabolic Cart)	Difference (%)
1	13.2 ± 0.5	7.1 ± 1.3*	60.1
2	13.4 ± 0.6	9.5 ± 1.4*	34.1
3	12.9 ± 0.7	10.1 ± 0.8*	24.3
4	12.7 ± 1.0	9.9 ± 1.0*	24.8
5	12.6 ± 0.9	9.6 ± 1.9*	27
6	12.6 ± 1.1	9.4 ± 1.0*	29.1

* $p < 0.05$

Conclusion

- When performing the sled push exercise using the Stairmaster 10G's Overdrive function, the estimated MET values provided by the commercial step mill were significantly greater than measured MET values at each time interval assessed using gold-standard techniques via a metabolic cart.

Practical Applications

- Individuals should be aware that actual oxygen consumption and metabolic expenditure may significantly differ from the values displayed on this piece of equipment when performing the sled push exercise.
- Consequently, characterizing exercise intensity based on estimated maximal heart rate and rating of perceived exertion may provide a more individualized approach to measuring intensity for this particular exercise using the Overdrive function.

References

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2. Butts, N.K., Dodge, C., & McAlpine, M. (1993). Effect of stepping rate on energy costs during StairMaster exercise. *Medicine and science in sports and exercise*, 25(3), 378-382.



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