INTRODUCTION

➢ The most common indicator of VO2max is a plateau in VO2 despite an increase in exercise intensity, but there is no agreed upon ‘gold standard’ for what constitutes a plateau (1).

➢ A verification bout following a maximal graded exercise test (GXT) that requires participants to exercise at a greater absolute work rate (WR) than that achieved during the GXT helps to avoid issues concerning traditional (~150 ml/min) VO2 plateau criteria (2-3).

➢ Performing two maximal efforts in a single day may not be comfortable, practical, or possible for certain populations.

➢ A technique to confirm VO2max that does not require a second maximal test is a least-squares linear regression analysis of the slope of the VO2-WR relationship (2-3), but this has not been studied in a middle-aged and older sample.

➢ Purpose: Evaluate the efficacy of a regression strategy for identifying a VO2max plateau and therefore confirming that VO2max was attained in a sample of middle-aged and older adults on the cycle ergometer compared to the verification criterion.

METHODS

➢ Verification criterion was met if the difference between the highest VO2 during the verification trial was ≤2% greater than the VO2max achieved during the GXT (2).

➢ VO2 plateau was also identified via regression analysis and modeled VO2max (mVO2max) (Figure 1).

➢ Individual responses for the verification and regression methods were compared to confirm VO2max attainment (Figure 2).

➢ McNemar’s tests of marginal homogeneity was used to detect differences in the proportion of paired data of individuals’ attainment of VO2max criterion

RESULTS

➢ Twenty-one recreationally active (34.7 ± 9.2 ml/kg/min) middle-aged and older (61.0 ± 8.1 yrs.) men (n=11) and women (n=10) completed a maximal GXT and a verification bout on a cycle ergometer.

➢ The verification protocol consisted of exercising for 2 minutes at 50%, 1 minute at 70%, and until volitional exhaustion at 105% of the maximal WR.

Figure 1. Example of a plateau in VO2 identified through least-squares regression analysis of the linear VO2 kinetics during a 25 watts/min ramp protocol (n=1). A) Raw data of the VO2-WR relationship. B) Least-squares regression analysis.

• Results of McNemar’s test revealed no significant difference between participants’ ability to achieve the regression and verification criteria (X²(1) = 0, p = .999).

• R² for the regression models ranged from .85 to .99 with an average of .96 ± .04.

• Individual VO2 responses during the GXT revealed that; 9 participants (42.8%) had additional evidence of a plateau since their VO2max fell below the 95%CI of the modelled VO2max. 12 participants (57.1%) demonstrated linear VO2 kinetics as they were within the 95%CI, and no participants were above the 95%CI.

Figure 2. Comparison of individual responses for the verification and regression methods to confirm VO2max attainment.

CONCLUSIONS

1. Using a regression method is an effective strategy for determining VO2 plateau in a sample of middle-aged and older adults exercising on a cycle ergometer.

2. The regression method is comparable with the verification criterion but does not require a second maximal test, which may be advantageous for those where the verification trial may not be comfortable, practical, or possible.

3. We recommend considering using the regression method combined with the 95%CI of the modeled VO2max criterion to confirm VO2max during a GXT for middle-aged and older adults.

REFERENCES

