

Proof of Concept for Deriving Physical Activity (PA) Intensity Levels from Field-Based Walking Tests

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RATIONALE: As part of pulmonary rehabilitation (PR), patients receive individually tailored exercise training with walking exercise at its core. Despite the personalised nature of exercise prescription, the evaluation of PR on PA has been limited to a 'one size fits all' approach. Due to the natural decline in functional exercise capacity, many people with chronic respiratory disease (CRD) perform PA at a higher relative intensity than healthier individuals. This potential for underestimating or misclassifying PA means that the data may appear unresponsiveness to interventions. In the same vein as individualised PA prescription during PR, it may be appropriate to 'individualise' PA evaluation in CRD populations. Accordingly, this study aimed to develop individualized PA thresholds based on an individual's performance on the incremental shuttle walking test (ISWT) and endurance shuttle walk test (ESWT) and compare these with commonly used PA intensity thresholds. **METHODS:** Data from an ongoing randomized controlled trial of PR for adults living with post-tuberculosis lung disease in Uganda were used. During baseline ISWTs and ESWT, participants wore an ActiGraph wGT3X-BT accelerometer. Vertical axis counts per minute (vacpm) and cadence were used to derive relative PA intensity thresholds according to each ISWT level and ESWT-derived personalised walking exercise prescription. Median values for VA, VM, and cadence during ISWT and ESWT were calculated and used to determine the walking test-derived intensity thresholds. These thresholds were compared with the most common moderate-to-vigorous PA (MVPA) intensity thresholds: ≥ 1041 VA counts per minute (vacpm), ≥ 1952 vacpm, ≥ 2020 vacpm, ≥ 2690 vmcpm and ≥ 100 steps/min. **RESULTS:** Of the 10 participants (aged 20-68 years, 7 females), all were capable of an intensity equivalent to the ≥ 1041 vacpm threshold (Figure 1A). Two participants were not able to reach the ≥ 1952 vacpm, ≥ 2020 vacpm thresholds. One participant was not able to reach ≥ 2690 vmcpm (Figure 1B). For cadence, five participants were not able to reach the ≥ 100 steps/min threshold (Figure 1C). For the other respective participants, thresholds for their individually prescribed walking exercise were greater than the commonly used MVPA thresholds. **CONCLUSIONS:** The current 'one size fits all' approach to evaluating PA is not suitable, as shown by some participants not being physically capable of reaching the commonly used MVPA thresholds. The same MVPA thresholds are not equivalent to individually prescribed walking thresholds; thus, whether PR leads to patients spending more time in PA reaching individually prescribed walking intensity remains largely unknown.

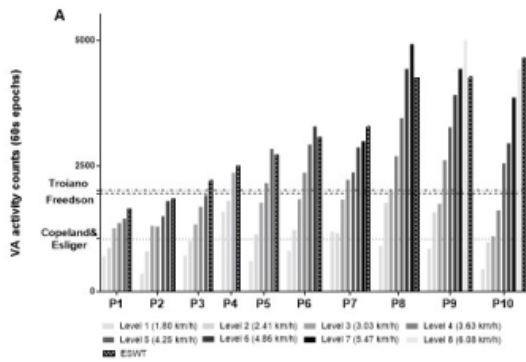


Figure 1A: Figure 1A. Vertical axis relative thresholds (cpm) derived from Incremental and Endurance Shuttle Walking Tests for each participant. Horizontal lines represent the comparison with absolute thresholds of moderate physical activity: Troiano (2020cpm), Freedson (1952cpm), and Copeland&Eslinger (1041cpm). Endurance Shuttle Walking Test levels corresponding walking speed: 3.00 km/h (P4), 3.27 km/h (P10, P5), 3.60 km/h (P1), 4.11 km/h (P2), 4.65 km/h (P6, P3), 5.14 km/h (P8, P7), and 5.40 km/h (P9)..

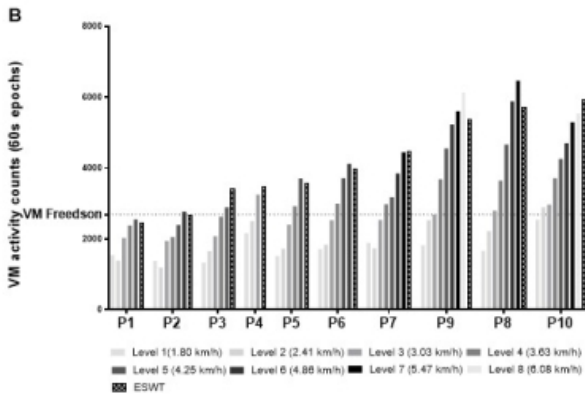


Figure 1B. Figure 1B. Vector magnitude relative thresholds (vmcpm) derived from Incremental and Endurance Shuttle Walking Tests for each participant. Horizontal line represents the comparison with absolute thresholds of moderate physical activity: Freedson VM (2690 vmcpm).

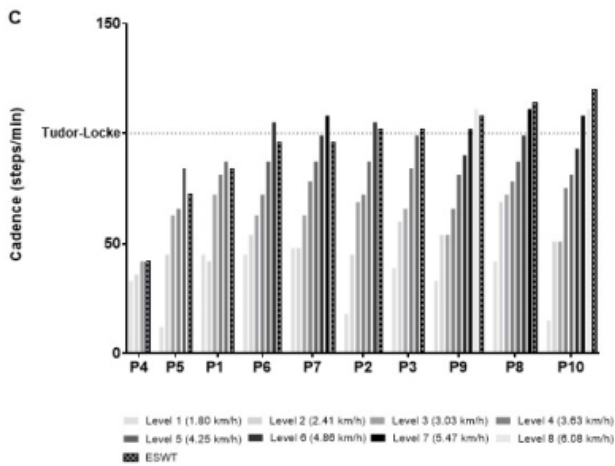


Figure 1C. Cadence relative thresholds (steps/min) derived from Incremental and Endurance Shuttle Walking Tests for each participant. Comparison with absolute thresholds of moderate physical activity: Tudor-Locke et al. (100 steps/min).

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