5-km Time trial reliability of a non-motorized treadmill and comparison of physiological and perceptual responses versus a motorized treadmill

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Abstract

Purpose: This study examined reproducibility of performance across three non-motorized treadmill (NMT) 5-km time trials (TT) and physiological, gait, and perceptual differences of running at 5-km pace for both NMT and motorized treadmills (MT).

Methods: Ten male runners experienced in running that had never run on a NMT completed three TT to establish personal best 5-km pace. In a later session, participants ran at this pace for 5 min on the NMT while metabolic, gait, and perceptual measures were recorded and then ran at outdoor 5-km personal best pace on a MT at 1% grade (counter-balanced crossover design). Statistical Analysis: Intraclass correlation (ICC = 0.95) between the TT1 and TT2 was strong, but improved between TT2 and TT3 (ICC = 0.99) with considerable drop in variance for the third trial (Figure 1). Likewise, no main effect for TT order was found for time, velocity, or power across any 1-km segment (Table 1). Only two cases exhibited main effects for RPE (legs km 2 and overall km 1) for any single km section, but no differences were found after post-hoc adjustments were implemented (Table 1).

• The coefficient of variation when comparing the first and second TTs and second and third TTs were 3.1 ± 2.7% and 1.6 ± 1.1% respectively.
• Despite the second-TT average being approximately 25 seconds slower than the first and third trials, there was a considerable drop in variance for the third trial (Figure 1). Likewise, no main effect for TT order was observed for time, velocity, or power across any 1-km segment (Table 1). Only two cases exhibited main effects for RPE (legs km 2 and overall km 1) for any single km section, but no differences were found after post-hoc adjustments were implemented (Table 1).
• There was a very strong relationship found for TT one versus trial two, and ICC increased for TT two versus three (Figures 2 & 3). Mean finishing time was 21.8 s longer during the second versus first trial and 95% upper and lower levels of agreement ranged from -173 to 217 s (Figure 4). Upper and lower levels of agreement for second to third TTs change in performance decreased to -16 to 63 s with an improvement in time of 26.3 s for the third versus second trial (Figure 5).

Results

• NMT provide as reliable if not more reproducibility in comparison to traditional MT based on comparison of CV of similar studies if a familiarization session is implemented.
• The "hill" approach of the deck and resistance of the belt provides a challenge that offsets the reduced NMT velocity, but without altering cardiovascular, metabolic, and perceptual responses with minimum at average pace for personal best for 5-km distance between NMT and road personal best performed on a MT at 1% grade.
• The current study provides additional confirmation and supports (Stevens et al. 2013b) conclusions that 5-km finishing times are expected to take slightly greater than 20% longer for the NMT and cannot be used for direct comparison to outdoor or MT time trial performance.

Key Findings

• NMT provide as reliable if not more reproducibility in comparison to traditional MT based on comparison of CV of similar studies if a familiarization session is implemented.
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References

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