

Physiological Responses to Running on a Land and Anti-gravity Treadmill

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ABSTRACT

Walking or running using partial body weight support can be a valuable rehabilitation tool when individuals are unable to exercise at full weight bearing capacity due to injury or pain. An anti-gravity treadmill (AGT) can provide varying levels of unweighting to effectively reduce the loads on the lower extremity. **PURPOSE:** To determine differences between cardiorespiratory responses while running on a land treadmill and on an anti-gravity treadmill (AGT) during 30 min of exercise followed by a run to volitional fatigue. **METHODS:** Participants (n=12, age=22.0 ± 4.3 years, weight=68.0 ± 13.0 kg) completed four visits (1 familiarization session and 3 testing sessions) with a minimum of 48 hours between each visit. The participants were asked not to consume stimulants (e.g., caffeine), and not to perform any exercise on the days of the familiarization and testing sessions. During the familiarization session, participants completed a submaximal treadmill test, two sessions on the AGT to determine the speed needed to reach 65-70% HRR for two different body weight percentages (70% and 90%), and a run on the land treadmill to determine the speed needed to reach 65-70% HRR and 95-100% HRR. A 15-min rest period was provided between each activity. Participants returned to the lab for three additional exercise sessions consisting of running on a land treadmill and on an AGT at 70% and 90% body weight. Each testing session consisted of a 2 min self-paced warm-up at 0% grade, followed by running for 30 min at 65-70% HRR at 0% grade, followed by running to volitional fatigue at 95-100% HRR at 0% grade. Heart rate, oxygen consumption (VO₂), respiratory exchange ratio (RER), and rate of perceived exertion (RPE) were measured at 15 min, 30 min and exhaustion. Blood lactate concentration, energy expenditure (EE) and total time to exhaustion (TTE) were recorded when the participant reached volitional fatigue. **RESULTS:** When compared to land treadmill exercise, VO₂ was significantly lower at 70% AGT (32.6 ± 9.5 vs. 41.1 ± 10.8 ml/kg/min; p=0.002) and 90% AGT (36.3 ± 10.2 vs. 41.1 ± 10.8 ml/kg/min; p=0.026). Oxygen consumption was significantly lower at 30 min when compared to TTE (31.5 ± 7.8 vs. 41.9 ± 10.6 ml/kg/min; p<0.001) for all conditions. A significant interaction for condition × time (p<0.01) for RER was found. Simple effects analysis indicated RER was lower at 30 min when compared to TTE for 70% AGT (0.86 ± 0.07 vs. 0.90 ± 0.06; p=0.005), 90% AGT (0.84 ± 0.05 vs. 0.91 ± 0.07; p=0.002), and land treadmill (0.85 ± 0.06 vs. 1.02 ± 0.09; p<0.001). At TTE, RER was lower when compared to the land treadmill for 70% AGT (0.90 ± 0.06 vs. 1.02 ± 0.09; p=0.002) and 90% AGT (0.91 ± 0.07 vs. 1.02 ± 0.09; p=0.007). Energy expenditure was not significantly different for the three conditions (p=0.355). **CONCLUSION:** When running at partial body weight, individuals may be able to achieve similar energy expenditure compared to running on a land treadmill; however, they may be running at a lower VO₂ on the AGT.