

Does Aerobic Intensity Level in Standard Physical Therapy Relate to Change in Walking Endurance in Patients with Stroke?

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Introduction

- Individuals with stroke have blood vessel blockage (ischemic stroke) or rupture (hemorrhagic stroke) in parts of the brain, leading to weakness on one side of body and impairing their ability to walk^{[1][2]}
- Aerobic exercise is effective in improving motor performance (i.e. muscle strength, motor control, gait, and balance) in individuals with stroke^[3]
- Individuals with stroke who performed higher dosage of exercise (i.e. increased physiotherapy (PT) time, step counts) have better functional recovery, in the forms of walking endurance, gait speed, and quality of life^[4]
- Understanding predictive factors of walking endurance assists clinicians in prescribing exercise for individuals with stroke
- This project's aim was to explore whether aerobic intensity level in a typical PT session is related to change in walking endurance; we hypothesized that higher levels of aerobic intensity, younger age, and being male would relate to greater improvement in walking endurance in individuals with stroke

Methods

Study Design

- Canada wide, 12 site clinical trial

Participants

- Inclusion criteria: Individuals with stroke with weakness on one side of body, admitted to the inpatient stroke unit with walking as a rehabilitation goal
- Exclusion criteria: Diagnosis of other neurological disorders (i.e. Parkinson's Disease)

Outcome measures

- Walking endurance was assessed by the Six-Minute Walk Test (6MWT) at admission to the unit and at discharge. Change in endurance was calculated as the difference between these scores in meters.



Fig 1. The Garmin watch worn by participants



Fig 2. Physiotherapy session attended by participants

- Heart rate data in one PT session (Fig. 1&2) was recorded using a Garmin Forerunner 235 activity watch
- Aerobic minutes in moderate- and high- intensity zones were recorded during the PT session (Fig. 1)
 - Using a Garmin Forerunner 235, participant-specific moderate- and high- heart rate reserve zones were calculated using:
 - Heart Rate Reserve = (Maximum Heart Rate - Resting Heart Rate)
 - Target Heart Rate = (Heart Rate Reserve x %intensity) + Resting Heart Rate
 - %Moderate-Intensity = 40-60% Maximum Heart Rate
 - %High-Intensity Zone = 60-100% Maximum Heart Rate

Statistical Analysis:

- A linear regression model was constructed using Lme4 package in R

Results

- 64 participants with stroke were included (27 females/37 males; age = 66+/-13 years)
- More minutes in the high-intensity zone related to greater change in walking endurance (p=0.047) (Fig. 3)
- A positive association between the aerobic minutes in moderate-intensity exercise zone and walking endurance change was found, but the effect was not significant (p=0.345) (Fig. 4)
- Sex and age did not predict change in walking endurance

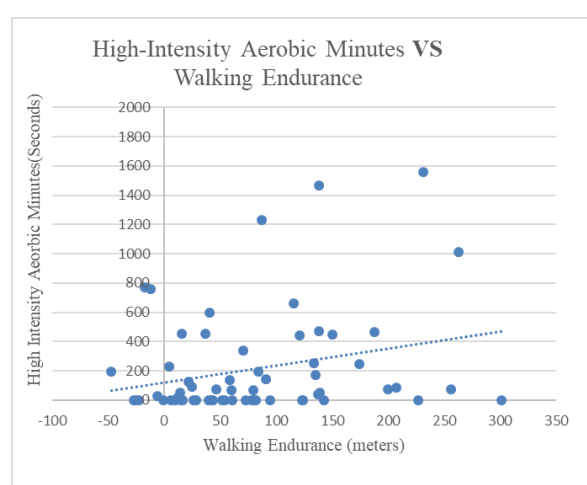


Fig 3. More aerobic minutes in high-intensity exercise zone related to greater change in walking endurance

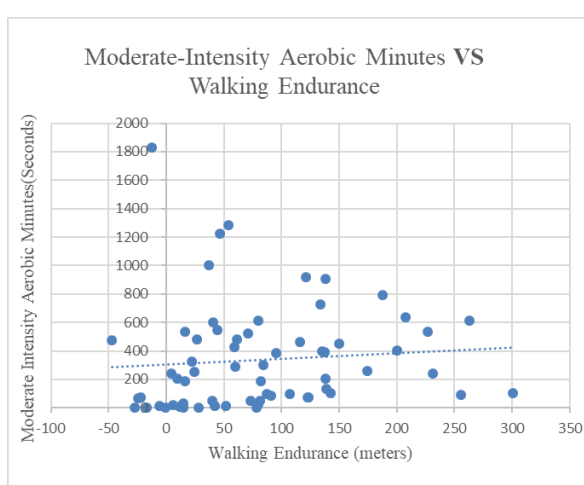


Fig 4. Positive relationship between aerobic minutes in moderate-intensity zone and walking endurance

Discussion

- More aerobic minutes in high-intensity exercise zone improved walking endurance to a greater extent in individuals with stroke
- Our results show that age and sex did not predict a larger improvement in walking endurance; this may be because other variables, such as location and type of stroke, higher aerobic intensity during PT session, and medication intake also influence walking endurance with inpatient rehabilitation
- Limitations: Data from a single PT session only provides a snapshot of walking endurance as a function of aerobic intensity. We do not know if changes to walking endurance persist after discharge. We plan to follow up with these participants 1 year post-stroke to determine if changes to walking endurance remain.
- In conclusion, more aerobic minutes in high-intensity exercise zone related to better walking endurance for individuals with stroke

References:

[1] Brewer et al. (2013). Journal of the Association of Physician, 106(1), 11-25. [2] Danks et al. (2016). Journal of Neurological Physical Therapy, 40, 232-238. [3] Billinger et al. (2014). Stroke, 45(8), 2532-2553. [4] Klassen et al. (2020). Stroke, 51(9), 2639-2648

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