

A Home- and Community-Based Physical Activity Program Can Improve the Cardiorespiratory Fitness and Walking Capacity of Stroke Survivors

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Background: The cardiorespiratory fitness of stroke survivors is low. Center-based exercise programs that include an aerobic component have been shown to improve poststroke cardiorespiratory fitness. This pilot study aims to determine the feasibility, safety, and preliminary efficacy of an individually tailored home- and community-based exercise program to improve cardiorespiratory fitness and walking capacity in stroke survivors. *Methods:* Independently ambulant, community-dwelling stroke survivors were recruited. The control (n = 10) and intervention (n = 10) groups both received usual care. In addition the intervention group undertook a 12-week, individually tailored, home- and community-based exercise program, including once-weekly telephone or e-mail support. Assessments were conducted at baseline and at 12 weeks. Feasibility was determined by retention and program participation, and safety by adverse events. Efficacy measures included change in cardiorespiratory

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fitness (peak oxygen consumption [VO_{2peak}]) and distance walked during the Six-Minute Walk Test (6MWT). Analysis of covariance was used for data analysis. **Results:** All participants completed the study with no adverse events. All intervention participants reported undertaking their prescribed program. VO_{2peak} improved more in the intervention group ($1.17 \pm .29$ L/min to $1.35 \pm .33$ L/min) than the control group ($1.24 \pm .23$ L/min to $1.24 \pm .33$ L/min, between-group difference = $.18$ L/min, 95% confidence interval [CI]: $.01-.36$). Distance walked improved more in the intervention group (427 ± 123 m to 494 ± 67 m) compared to the control group (456 ± 101 m to 470 ± 106 m, between-group difference = 45 m, 95% CI: $.3-90$). **Conclusions:** Our individually tailored approach with once-weekly telephone or e-mail support was feasible and effective in selected stroke survivors. The 16% greater improvement in VO_{2peak} during the 6MWT achieved in the intervention versus control group is comparable to improvements attained in supervised, center-based programs. **Key Words:** Stroke—cardiorespiratory fitness—exercise—home program—walking capacity. © 2016 National Stroke Association. Published by Elsevier Inc. All rights reserved.

Introduction

The cardiorespiratory fitness of stroke survivors is low^{1,2} with peak oxygen consumption (VO_{2peak}) values ranging from 26% to 87% of those of healthy age- and gender-matched individuals.² It has been estimated that over three quarters of people after stroke have low levels of physical activity or are sedentary.³ Stroke survivors spend a large proportion of their day (median = 19.5 hours, 81%) in sedentary behaviors, often accumulated via prolonged bouts of inactivity (median = 1.7 hours).⁴ Stroke survivors spend 4 hours more per day in sedentary behavior than age-, sex-, and body mass index-matched healthy volunteers.⁵ Low levels of cardiorespiratory fitness and physical activity and high levels of sedentary time can reduce the ability to perform activities of daily living and may contribute to an increased risk for recurrent stroke and other cardiometabolic diseases.⁶

Exercise programs that include an aerobic component have been shown to improve cardiorespiratory fitness,^{1,7-9} walking speed^{8,9} and walking endurance.⁸⁻¹⁰ Even modest amounts of aerobic training can improve cardiorespiratory fitness by 10%-15%.¹ Of the 28 studies included in a recent systematic review, 25 used multiple sessions of center-based supervised training each week¹; 2 studies used once-weekly center-based supervised sessions in conjunction with a home program; and 1 study used a one-on-one therapist-supervised home program.¹ For safety reasons supervised cardiorespiratory fitness training programs may be required for stroke survivors with significant impairments or multiple comorbidities.

Programs providing ongoing support with little or no face-to-face supervision may offer a safe and effective alternative. Such programs may address the unmet needs of more independent stroke survivors and can provide an option for health services where limited, if any, community-based therapy services are available. Recent audit data indicate that 44% of stroke survivors were discharged directly home from the acute setting, with only 31% subsequently accessing rehabilitation.¹¹ Although these

people might have minimal mobility issues, they may benefit from ongoing interventions to maintain or improve their cardiorespiratory fitness and to reduce their sedentary behavior. The need for studies of home-based programs with intermittent supervision has been recognized in a recent review, particularly to provide evidence for therapies that may help stroke survivors who live away from major centers.¹²

Individualizing exercise programs to suit each person's ability is particularly pertinent to stroke survivors, given the heterogeneity of abilities in this population due to the effects of stroke and the wide age range over which stroke occurs. Individual tailoring also allows participants to engage in activities that are of interest to them.¹³

The aims of the present pilot study were to determine the feasibility, safety, and preliminary efficacy of an individually tailored, home- and community-based exercise program to improve cardiorespiratory fitness in stroke survivors. The effects on performance measures, fatigue, depression, and health-related quality of life were also investigated to guide the design of a future larger, randomized controlled trial.

Materials and Methods

Study Design

A pilot controlled trial was undertaken to investigate the effects of a 12-week exercise intervention on community-dwelling stroke survivors ("How Fit is the Stroke Survivor?" [HowFITSS?] trial ANZCTR Trial ID: ACTRN12614000134628). Participants in both the control and intervention groups received usual care, and the intervention group also undertook the HowFITSS? exercise program. All participants were assessed at baseline and at 12 weeks.

Ethics Statement

The Hunter New England (11/04/20/4.04) and the University of Newcastle (H-2011-0172) Human Research Ethics Committees approved the study, which was conducted

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