



Examining evidence based resistance plus balance training in community-dwelling older adults with complex health care needs: Trial protocol for the Muscling Up Against Disability project



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ABSTRACT

Progressive resistance plus balance training (PRBT) has been demonstrated as effective in reducing later life physical disability, falls risk and poor health, even among those with complex health care needs. However, few studies have examined the influence of PRBT on health service utilisation, cognitive wellbeing and training modality acceptance or undertaken a cost benefit analysis. This project will investigate the broad scope benefits of PRBT participation among community-dwelling older Australians receiving Government supported aged care packages for their complex health care needs. Using a modified stepped-wedge design, 248 community-dwelling adults 65 years and older with some level of government support aged care have been randomised into the study. Those randomised to exercise undertake six months of twice weekly machine-based, moderate to high intensity, supervised PRBT, followed by a six month unsupervised, unsupported follow-up. Controls spend six months undertaking usual activities, before entering the PRBT and follow-up phases. Data are collected at baseline and after each of the six month phases. Measures include level of and change in health and care needs, body composition, muscle capacity, falls, sleep, quality of life, nutritional and mental health status. In addition, acceptance and engagement is determined through telephone and focus group interviews complementing a multi-model health cost benefit evaluation. It is hypothesised this study will demonstrate the feasibility and efficacy of PRBT in improving primary and secondary health outcomes for older adults with aged care needs, and will support the value of this modality of exercise as an integral evidence-based service model of care.

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Abbreviations: AEP, accredited exercise physiologist; BIA, bioelectrical impedance analysis; CHSP, commonwealth Home Support packages; CON, control group; EX, exercise group; GDS, geriatric depression scale; GAI, geriatric anxiety Inventory; GP, general practitioner; HCP, home care packages; MMSE, mini-mental state examination; MNA, mini-nutritional assessment instrument; PRBT, progressive resistance plus balance training; RAC, residential aged care; RM, research manager; SPPB, short physical performance battery; SVHA, St. Vincent's Health Australia.

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1. Introduction

1.1. Background

Like many developed and developing nations, Australia's ageing population will bring with it many challenges and place major stresses on the healthcare system due to increases in disability and prevalence of complex health conditions (Goss, 2008). When coupled with increasing intensive care service needs and the growth of the population 85 years and over, projected health care expenditure will soar and by 2050 the demand for home assist and residential aged care (RAC) placement will more than treble (Productivity Commission, 2011). Presently in Australia, greater than one million older adults receive government supported home care services each year (Productivity Commission, 2011). In addition to government supported care, some 2.7 million Australians provide family care giver services to prevent their spouse or loved one's transition in to RAC. Even with family care givers offering home support, increases in disability and care needs can have an associated 700% increase in expenditure when older adults transition from a lower level of support to a higher aged care package (Lewin, Alfonso, & Alan, 2013). As the median cost of a three-year Home and Community Care (HACC) support package for an individual reported to be \$11,365 (Lewin et al., 2013), any large-scale uptake of these HACC services places a large burden on the Australian health care expenditure.

While associated with increasing age, the decline in health and increased disability experienced by older adults may be closely related to the degree of sedentary behaviour and the development of the geriatric condition sarcopenia (Keogh, Senior, Beller, & Henwood, 2015; Senior, Henwood, Beller, Mitchell, & Keogh, 2015). With these changes in muscle composition, capacity and mobility comes an increased risk of disability, cognitive impairment, institutionalisation, and/or early mortality (Abellan van Kan et al., 2013; Fielding et al., 2011; Sánchez-Rodríguez et al., 2014). The question then becomes: How do healthcare professionals delay these age-related health and functional declines and attenuate transition of community-dwelling older adults into Government supported aged care packages and/or RAC? We propose the answer to this question is through age-friendly, community-based, cost-effective exercise programs that have a strong focus on progressive resistance plus balance training (PRBT).

Evidence is strong that older adults with a history of extended sedentary behaviour can reduce their disability needs and falls risk, and improve their general health and quality of life as a result of increasing their physical activity levels (Brett, Traynor, & Stapley, 2016; Denison, Cooper, Sayer, & Robinson, 2015). As an in-home model of care, physical activity orientated restorative and re-ablement services are associated with improved physical function and falls-reduction among older adults with complex health care needs (Burton, Lewin, Clemson, & Boldy, 2013; Clemson et al., 2012). However, while the research evidence surrounding this model is positive, programs are often short-term, not well based in evidence and may not be cost-effective as they require the time-intensive input of multiple health professionals working with one client on multiple occasions. Moreover, questions still remain about the feasibility of translating restorative care research into practice by care providers in contrast to provision by a research centre, especially if such care programs involving one-on-one interactions between therapists and clients can be delivered in a more cost-effective manner (Ryburn, Wells, & Foreman, 2009).

Progressive resistance training is a powerful mode of exercise that produces a plethora of significant muscle physiology and health benefits for old and very old, community-dwelling and

institutionalised adults (Henwood, Riek, & Taaffe, 2008; Valenzuela, 2012). It is the only exercise mode shown to reduce many of the adverse effects associated with normal ageing, including the reduction in physical disability and chronic diseases such as diabetes, osteoporosis and osteoarthritis, all of which are known to predispose the older person towards home and/or aged care service need (Crocker et al., 2013). When coupled with targeted balance exercise, progressive resistance training is suggested a significant countermeasure to latter life's disability and falls risk (Sherrington, Tiedemann, Fairhall, Close, & Lord, 2011; Sherrington et al., 2008). Progressive resistance plus balance training (PRBT) can be undertaken safely by older adults, independent of age, level of illness and disability, with community and RAC studies of high-intensity participation reporting increased muscle strength, mobility, bone mineral density, sleep and physical performance, and reduced disability, falls risk and depression (Chin, van Uffelen, Riphagen, & van Mechelen, 2008; Portero & Couillandre, 2011; Valenzuela, 2012). So powerful is participation in this form of training that gains in functional health are reported to remain for up to six months after the training stimulus is removed (Henwood & Taaffe, 2008).

When compared to currently available aged care services such as HACC, physical activity orientated restorative and re-ablement services have been demonstrated to be cost-effective, with three-year savings of ~\$9000 per individual (Lewin et al., 2013). However, these restorative and re-ablement services are typically only provided for between 8 and 12 weeks and generally involve the interaction of multiple healthcare professionals with each client in one-on-one sessions (Lewin et al., 2013). This raises a question of whether community-based PRBT exercise programs may be a more cost-effective approach to reduced disability-related healthcare costs in older adults with reduced muscle function and limited mobility. As sarcopenia can increase hospitalisation costs by 34% for older patients (Sousa et al., 2016) and as PRBT can significantly reduce disability and falls in older adults with mobility limitations (Gillespie et al., 2012; Liu & Latham, 2011), the focus of this intervention was on determining the cost effectiveness of a community, group-based PRBT program in such a population. We propose that such an intervention will not only protect the wellbeing of the client and prolong their capacity for greater levels of self-care, but have significant implications for the health care expenditure. Specifically, reducing the need for accessing care packages and the current rapid transition from level 1 – 4 will reduce Australia aged care spending significantly. When coupled with the expected reduced residential and hospital service utilisation, and pharmaceutical needs, major savings to the projected age- and disability-related increase in healthcare expenditure could be obtained within the next two decades (AIHW, 2014).

1.2. Hypothesis

We hypothesise that the performance of six months of moderate to high-intensity PRBT by older Australians accessing Government supported aged care packages will prove cost-effective for reducing their trajectory of health decline as well as improving and prolonging their functional wellbeing, with benefits retained for up to 24 weeks after the training period.

2. Methods

2.1. Trial design and protocol

Funding for the described investigation was secured at the beginning of 2015, with the first of four delivery phases beginning in September of 2015. To this end, the projected timeline of this

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