



Feasible modalities and long-term effects of elastic band exercises in nursing home older adults in wheelchairs: A cluster randomized controlled trial



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ABSTRACT

Background: Physical activity holds promise for mobility-impaired older adults to prevent further disabilities and improve their health. However, staffing constraints have made it challenging to promote physical activity in long-term care facilities.

Objectives: To test the feasibility and effects of 12 months Wheelchair-bound Senior Elastic Band (WSEB) group-exercises that were led by volunteers for the first six months followed by the DVD-guided for another six months on functional fitness, activities of daily living (ADL), and sleep quality of nursing home older adults in wheelchairs.

Design: Cluster randomized controlled trial with two groups, pre-test and post-tests.

Settings: Ten nursing homes, Taiwan.

Participants: 127 participants participated voluntarily; 107 of them completed the study. Inclusion criteria: (1) aged 65 years and over, (2) using wheelchairs for mobility, (3) living in facility for at least three months, (4) cognitively intact, and (5) heavy or moderate dependency in ADL. Majority of participants were middle-old older adults (75–84 years old, 53.2%), female (51.4%), and had chronic illnesses (98.1%).

Methods: Participants were randomly assigned by facility to either the experimental (five nursing homes, $n = 56$) or control group (five nursing homes, $n = 51$). The WSEB program was conducted three times per week and 40 min per session in two stages: volunteer-led for the first six months (stage I) followed by the DVD-guided modality for another six months (stage II). The primary outcomes (functional fitness: lung capacity, body flexibility, range of joint motion, and muscle strength and endurance) and the secondary outcomes (ADL measured by the Barthel Index; sleep quality measured by the Pittsburgh Sleep Quality Index) of the participants were measured at three time points: pre-test, at the six-month interval, and at the end of 12 months of the study. No blinding was applied.

Results: All of the functional fitness indicators of the experimental group participants improved significantly ($p < .05$), and were all better than the control group at six-month and 12-month of the study ($p < .05$). No symptoms of discomfort occurred during interventions.

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Conclusions: Nursing home older adults in wheelchairs who received WSEB exercise training had better functional fitness, ADL, and sleep quality than those who did not. It was a feasible way of carrying out this exercise program by using the volunteer-led followed by the DVD-guided modalities. The program can be applied in institutional settings routinely.

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What is already known about the topic?

- Physical activity holds promise for mobility-impaired older adults to prevent further disabilities and improve their overall health. However, staffing constraints have made it challenging to promote physical activity in long-term care facilities.
- Trained volunteers could help nursing home older adults to engage in more physical activity and DVD-delivered exercise programs can produce clinically meaningful gains in physical functions that are maintained beyond intervention termination.
- Resistance training, such as elastic band exercises, can prevent the decline of muscular strength, which is a commonly seen problem in older adults, and has been proven to be beneficial in both healthy and frail older adults.

What this paper adds

- Nursing home older adults in wheelchairs who received Wheelchair-bound Senior Elastic Band exercise training had better functional fitness, activities of daily living, and sleep quality than those who did not.
- The positive effects of the Wheelchair-bound Senior Elastic Band exercise program occurred after six months of volunteer-led exercises and were maintained or even enhanced through the following six months of DVD-guided practices.
- The modality of being volunteer-led followed by the modality of being DVD-guided was a feasible way of carrying out the Wheelchair-bound Senior Elastic Band program in institutional settings, routinely and longitudinally.

1. Introduction

Older adults who live in long-term care facilities are increasing in number drastically with age (U.S. Department of Health and Human Services, 2013), and the ratio of their activities of daily living (ADL) dependency was increased from 3.9% in 2004 to 4.2% in 2014 (American Health Care Association, 2014). Over 50% of Canadian nursing home older adults sit in a wheelchair every day (Clarke et al., 2009), and the factors associated with the use of wheelchairs by ambulatory older adults included fear of falling during walking, muscle weakness, and impaired balance (Chen et al., 2013). Shore (2008) reported that 12.3% of older adults in wheelchairs experienced worsening health, and wheelchair-use has been associated with

many other adverse outcomes, such as deconditioning, falls, discomfort, loss of independence, social isolation, and sleep disturbances (Chen et al., 2015a; Gavin-Dreschnack et al., 2010). Being sedentary may result in a decline in physical fitness, and lead to a spiral of inactivity and further decline (Ikezo et al., 2013).

Physical activity holds promise for mobility-impaired older adults to prevent further disabilities and improve their overall health (World Health Organization, 2014). However, staffing constraints have made it challenging to promote physical activity in long-term care facilities since older adults are becoming older, sicker, and require more assistance with their ADL after being admitted to the facilities (Benjamin et al., 2011; Wang and Tsay, 2012). Volunteers would be an alternative resource to help nursing home older adults to engage in more physical activity. However, volunteers should receive proper training, and feasible modalities should be applied to carry out the activities (Van der Ploeg et al., 2014).

In terms of the feasible modalities used in physical activities for older adults, Froehlich-Grobe et al. (2014) found that the staff-supported group exercise approach holds promise for encouraging exercise among inactive wheelchair users. Compared to individual exercises, group exercises resulted in higher levels of interest and exercise participation, brought more positive emotional effects (e.g., increased social interaction and sense of personal accomplishment), and less financial and time burdens (Shin et al., 2007). Socialization and self-efficacy are key motivators for older adults to initiate and maintain exercise programs (Phillips et al., 2004). Group-based exercise contributes to a higher adherence rate (Martin et al., 2013). In addition, a DVD-delivered exercise program can produce clinically meaningful gains in physical functioning that are maintained beyond intervention termination (Wójcicki et al., 2014). The DVD technology had a positive effect on exercise compliance (Kingston et al., 2010), eased the workload of busy providers (Khan et al., 2011), and can be applied on a broad scale (McAuley et al., 2003). It is especially beneficial when applied in multicenter-based exercise training programs to reduce cost and preserve resources (Gothe et al., 2015).

Among various types of physical activities, resistance training can prevent the decline of muscular strength, which is a commonly seen problem in older adults (Burton and Sumukadas, 2010). Elastic band exercise is considered as an effective and safe resistance type of exercise (So et al., 2013). With its feature-rich characteristic, exercises can be designed for different purposes (Newton et al., 2002), even

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