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Original Article

Efficacy of Progressive Resistance Tube Training in Community Dwelling Older Adults: A Pilot Study

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SUMMARY

Background/objective: Falls are known to be one of the most prevalent public health problems in older adults. Currently, the aging population is growing fast. It is essential to use low cost, time-efficient exercise intervention programs for increasing strength, functional mobility, and balance in older adults, and subsequently decrease the risk of falls. This is a pilot study to assess the effects of a 12-week progressive resistance tube training session on the lower limb muscle strength, dynamic balance, and functional mobility in elderly people.

Methods: Seventeen community dwelling older adults with a mean age of 69.2 ± 4.62 years were recruited among residents of a senior day care center in Malaysia to participate in this pilot study. Eight out of 17 participants completed their lower extremity resistance tube training sessions three times per week for 12 weeks. Lower limb muscle strength and functional mobility were tested by five times sit to stand test (FRSTST), and timed up and go test (TUG), respectively. Functional reach test (FRT) and four square step test (FSST) were applied to measure dynamic balance.

Results: The results revealed significant increases in lower limb strength (30.3%), dynamic balance (29.6% in FRT and 15.3% in FSST), and functional mobility (27.1%) (all significant at $p < 0.05$).

Conclusion: It was concluded that the use of a simple and inexpensive strength training program may improve leg muscle strength and consequently dynamic balance and mobility in elderly people and make them independent in their daily activities.

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1. Introduction

Falls are common and potentially fatal events causing functional, psychological, and also social problems in elderly people[1,2]. Annually, nearly 30% of people over the age of 65 years have experienced a fall[3], in which one out of three are hospitalized as a result of fall related injuries[4]. The injuries vary from slight bruising to fracture, coma, and even death[5] and lead to less independence[6]. Impairments in balance, gait, and lower limb strength are important factors that increase fall rates and inactivity[7] which might impact on the quality of life for elderly people[8].

Muscle strength reduces nearly 15% after the age of 50 years and by twofolds after the age 70 years per every decade[9]. It is believed that both muscle mass atrophy and muscle fiber reduction are effective factors in this process. Fortunately, it is potentially preventable and reversible with proper nutritional interventions and exercise involvement[10]. Strength training has been shown to prevent and improve the reduction of muscle strength, mass, and functional capacity[11,12] and falls in older adults[13,14]. In spite of these benefits, there are only a few safe and efficient progressive resistance training programs accessible and affordable for older adults[15]. Most resistance training is performed in a clinical laboratory using weight machines[14]. However, elderly people have difficulties in traveling to sport locations, and therefore do not achieve enough exercise[13]. To impart the benefits of resistance training exercise, development of inexpensive and practical alternative instruments are required[16].

Elastic bands or tubes are easily available, inexpensive, and easy to carry, and older adults can use this equipment to perform and maintain the exercise programs long-term almost everywhere[13,17]. Hence, the objectives of this study were to assess the effects of a cost effective and accessible resistance training program on lower extremity muscle strength, balance, and functional mobility in

Conflicts of interest: All contributing authors declare that they have no conflicts of interest.

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elderly people using elastic tubes. The provision of low-cost exercise programs would help to decrease frailty and improve independent lifestyle in older adults.

2. Materials and methods

The study was approved by the Medical Research Ethics Committee of the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Selangor, Malaysia {UPM/FPSK/100-9/2-MJKEtikaPen [IG_Jun (12) 05]} which were in agreement with the Declaration of Helsinki on ethical principles for medical research involving humans.

This pilot study applied single-group, pretest–posttest design to assess the intervention effect. We selected this design with regard to some rational reasons. This design has natural limitations regarding the power and also generalizability of the outcomes, consequence of small sample size as well as lack of a control group. However, a pilot study provides a way to explore sample recruitment, intervention design, and methodological issues which enable it to indicate whether further investigation is necessary. Conducting a pilot study assists with developing, modifying, or confirming the feasibility of techniques and also estimate what the final sample size should be.

2.1. Sample

The potential participants aged $\geq$ 60 years were recruited from an elderly day center under the Central Welfare Council of the Federal Territory of Kuala Lumpur to participate in the pilot study. The process of the study is shown in the flowchart (Fig. 1). Potential participants were interviewed to obtain demographic data, health history, physical activity, fall history, and mental status based on individual structured questionnaires. All participants completed and signed the consent form after being informed on the nature, the potential risks of the study provided by the researcher, and the information sheet. They were assessed by a physician for medical clearance prior to taking part in the study. Inclusion criteria consisted of independence in daily living activity, not recent (past 3 months) participation in regular lower body resistance training (at least twice per week), ability to understand the study protocols and follow the instructions. Recruited persons were excluded if they had an allergy to the natural rubber latex in the resistance tube; recent myocardial infarction; uncontrolled hypertension; Parkinson's disease; diagnosed vestibular disorders; severe knee and back pain, knee joint replacement, rheumatoid arthritis, lower limb surgery in the past 6 months, Multiple sclerosis, known diabetic neuropathy, diagnosed osteoporosis; stroke within the past year; diagnosed stage three and four of heart failure in accordance with the New York Heart Association functional classification system; and any medical problems that would prohibit safety involved in moderate intensity progressive resistance training. The seniors who take regular medications impairing balance ability (sedatives, antidepressants, neuroleptics, or benzodiazepines) or muscle strength (corticosteroids) were excluded from this study.

2.2. Exercise program

Prior to the exercise program, participants attended a training class on how to use the elastic tube. They were also given an exercise book (consisting of pictorial elastic tube training guidelines).

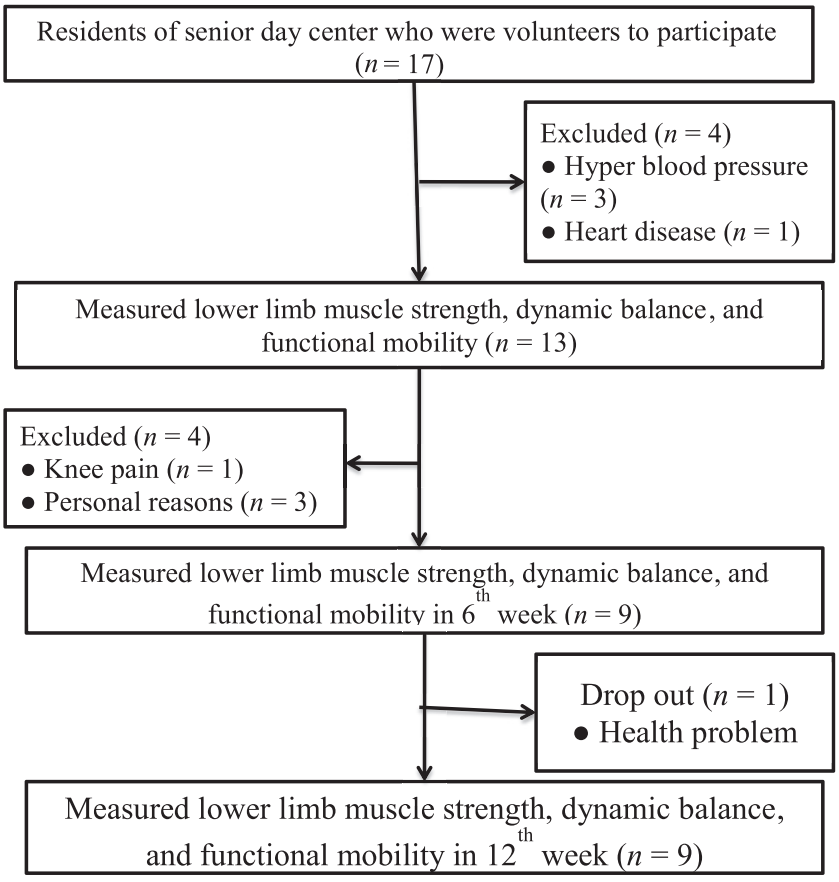

Fig. 1. Procedure of selecting participants, intervention, and outcomes by flowchart.

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