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Feature Article

Feasibility appraisal of an elastic band exercise program for older adults in wheelchairs

Kuei-Min Chen, PhD, RN^{a,*}, Wei-Shyuan Tseng, BS^b, Ya-Hui Chang, BS^a, Hsin-Ting Huang, BS^a, Chun-Huw Li, MS, RN^c

^a College of Nursing, Kaohsiung Medical University, 100 Shih-Chuan 1st Road, Sanmin District, Kaohsiung 80708, Taiwan

^b Center for Continuing Education and Social Resources, Kaohsiung Medical University, Taiwan

^c Department of Nursing, Yuhing Junior College of Health Care and Management, Taiwan

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ABSTRACT

This study appraised the feasibility of an elastic band exercise program for older adults in wheelchairs. A descriptive program review survey was used. A wheelchair-bound senior elastic band (WSEB) exercise program tailored to older adults in wheelchairs was initially developed by a group of 12 experts. A feasibility appraisal survey was administered to 10 older adults in wheelchairs through individual interviews after 4 weeks of the WSEB program. Study participants revealed that the WSEB program was feasible, safe, appropriate, and helpful to them. Participants further suggested practicing the WSEB program 3 times/week for 40 min/session in a group of 15–20 people. The finalized WSEB program has 2 levels: the basic and the advanced WSEB program. It is suggested that the basic level to be taught first with practice until participants are familiar with those exercises before proceeding to the advanced level.

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Introduction

Age-related decline in functional ability is associated with decline in skeletal muscle mass and voluntary strength,¹ which are essential in completing the activities of daily living and in maintaining an independent lifestyle.² In nursing homes, the number of older adults using wheelchairs is reported to be over 50% of the total population.³ One of the major contributors to the need for wheelchair use is muscle weakness in the lower extremities due to previous falls, strokes, etc.⁴ However, many of these individuals with muscle weakness may not require wheelchair use and have a high potential for rehabilitation.⁴ Inappropriate and excessive reliance on wheelchairs restricts physical activities,⁵ which in turn leads to an increased level of disability and mortality in older adults.⁶

Several wheelchair exercise programs have been developed and their beneficial effects have been reported. For example, a 16-week low-intensity aerobic wheelchair exercise on a treadmill (2 times/week, 30 min/session) improved fitness, upper-body health, and an

active lifestyle for inactive persons with chronic spinal cord injury (SCI).⁷ Also, an 8-week heavy-resistance exercise program (twice/week with 10–12 repetitions in 5 sets) was used with 8 male athletes with SCI (with another 8 healthy physical education students as the control group). Results indicated that athletes using wheelchairs showed a significantly higher improvement in the force development rate.⁸ Another study found that athletes with quadriplegia who used wheelchairs playing rugby had better respiratory muscle strength and thoracic mobility than those sedentary subjects with quadriplegia.⁹ Wheelchair rugby training has also been proven to be effective in increasing forced vital capacity, forced expired volume after 1 s, and maximal voluntary ventilation values for people with tetraplegia.¹⁰ Furthermore, a group of researchers¹¹ applied a 12-week upper body physical training program on 30 frail older women sitting in wheelchairs. Significant improvements were found in arms strength and shoulder flexibility.¹¹

Although these exercise programs were specifically designed for people in wheelchairs, most of these studies focused on people with SCI. Few studies focused on older adults only trained and evaluated their upper body strength. Brown, McCartney, and Sale¹² asserted that the muscles of older adults, both upper and lower extremities, are as trainable as those of their youthful counterparts. Since the reason for older adults in wheelchairs is due to muscle

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* Corresponding author. Tel.: +886 7 3136900.

E-mail addresses: kmc@kmu.edu.tw, kueimin@yahoo.com (K.-M. Chen).

weakness in the lower extremities not caused by the SCI, wheelchair exercise programs aimed at enhancing both upper and lower body strength are essential in preventing further deterioration and disuse syndromes.

Elastic band exercises are recognized as a safe and effective strategy to improve muscle strength^{13,14} and increase the older adults' ability to perform functional tasks.^{14–16} By changing the thickness and length of the elastic band, the level of resistance training can be flexibly increased or decreased.¹⁷ Our research group developed a senior-tailored elastic band (SEB) exercise program to remedy the common physical weaknesses of community-dwelling older adults, such as poor cardiopulmonary fitness, decreased body flexibility, weak upper body muscle power, reduced lower body muscle endurance, poor balance, and sleep disturbances.¹⁸ The SEB program included 3 phases with 20 exercises: 1) warm-up (7 exercises), 2) aerobic motion (7 exercises), and 3) static stretching (6 exercises).¹⁹ Results from a study of 172 community-dwelling older adults showed significant positive health promotion outcomes, such as enhanced lung capacity, body flexibility, and muscle endurance of the lower extremities.²⁰

However, whether the SEB program is applicable to those institutional older adults in wheelchairs with multiple morbidities is unknown since the health status of the institutional older adults in wheelchairs might be very different from community-dwelling older adults. Further, the literature contained few studies that focused on exercise programs that included both upper and lower body strength training. Thus, based on the experience of developing the SEB program and the consultations of 12 experts, our research group developed a new wheelchair exercise program specifically tailored for those older adults in wheelchairs due to muscle weakness, call the wheelchair-bound senior elastic band (WSEB). The purpose of this study was to appraise the feasibility of the WSEB exercise program for those older adults in wheelchairs.

Materials and methods

Design

A descriptive program review research was used. A feasibility appraisal survey was administered to 10 older adults in wheelchairs through face-to-face individual interviews after 4 weeks of the WSEB exercises. The study was approved by the Institutional Review Board of the University.

Setting and participants

The study was conducted in a 49-bed assistive living facility located in southern Taiwan. Inclusion criteria were: 1) aged 65 and over, 2) older adults in wheelchairs, 3) living in the facility for at least 3 months, and 4) cognitively intact (a score of 8 or higher on the short portable mental status questionnaire; SPMSQ).²¹ Exclusion criteria included: 1) having severe or acute cardiovascular, musculoskeletal, or pulmonary illness, or 2) suffering from an SCI with no rehabilitation potential. A convenience sample of 11 qualified participants was recruited and 10 of them completed the study (retention rate: 91%). Sample power was not analyzed due to the preliminary feasibility appraisal of the WSEB program.

Intervention

The preliminary WSEB program was developed based on the consultations of 12 experts: 2 geriatricians, 2 gerontological nurse practitioners, 2 physical educators, 2 physical fitness trainers, 2 occupational therapists, and 2 social workers. The program included 3 phases: 1) warm-up: 6 exercises to loosen up the body

and cultivate energy for a safe transition to the next phase (turning the wrists, pulling the arms, expanding the chest, elevating the knees, kicking the stone, and bouncing a shuttlecock); 2) aerobic motion: 6 low-to-medium speed exercises to stimulate cardiovascular-respiratory system (spreading the wings, boxing, raising hand, whipping out a sword, waving the trunk, and stepping and pushing); and 3) harmonic stretching: 6 low-speed, gentle stretching exercises to build up muscle strength/endurance and increase range of motion and flexibility (directing traffic, reaching the calf, separating the thigh, lifting the legs, pulling forward, and attacking the flank). The 18 elastic band exercises took 40 min to complete. The descriptions of some exercises in the WSEB program are provided in Table 1.

Data collection

Ten participants were interviewed individually after 4 weeks of the WSEB group practice (3 times/week, 40 min/session) to appraise the feasibility of the WSEB. Participants were asked to rate the level of simplicity, safety, appropriateness, and helpfulness of the program on a 10-point Cantril ladder scale,²² ranging from 0 to 10 with 0 meaning the exercise is very difficult to perform, very dangerous, very inappropriate, and useless in health promotion for older adults in wheelchairs; 10 indicating the exercise is very easy to perform, very safe, very appropriate, and very helpful in health promotion for older adults in wheelchairs. In addition, 4 open-ended questions asked participants to reflect on their elastic band exercise experiences and to suggest program protocol: 1) How do you feel after 4 weeks of the WSEB exercises? 2) How many times per week of elastic band exercise is appropriate? 3) How long per exercise session is appropriate? 4) How many people per group are appropriate in doing elastic band exercises? The researcher delivered the questions verbally to the participants and marked their verbal answers on the evaluation forms. The seniors' feedback was taken into consideration in revising the WSEB program.

Data analysis

The statistical package for the social sciences (SPSS) version 17.0 was used to analyze the data. Descriptive statistics were used to

Table 1

Descriptions of one exercise in each phase of the wheelchair-bound senior elastic band exercise program.

Phase: exercise	Descriptions
Warm-up: turning the wrists	<ol style="list-style-type: none"> 1. Sit up-straight, legs open as wide as the shoulders, raise hands in the front as high as the shoulders, and slightly bend the elbows. 2. Turn the left forearm and wrist from inward to outward for 6 times. 3. Same procedure to the right-hand side for 6 times. 4. Turn both forearms and wrists from inward to outward for 6 times.
Aerobic motion: stepping and pushing	<ol style="list-style-type: none"> 1. Sit up-straight, legs open as wide as the shoulders, and hold the elastic band in hands in front of the chest. 2. Stepping on the floor on the same point while both hands are pushing forward and backward as high as the shoulders for 6 8-beat times.
Harmonic stretching: separating the thigh	<ol style="list-style-type: none"> 1. Sit up-straight with legs closed, put the elastic band around the thigh, and hold 2 ends of the elastic band in hands. 2. Move the legs outward while holding the breath for 5 s. 3. Exhale and move the legs inward and touch the knees. 4. Repeat outward and inward for 6 times.

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