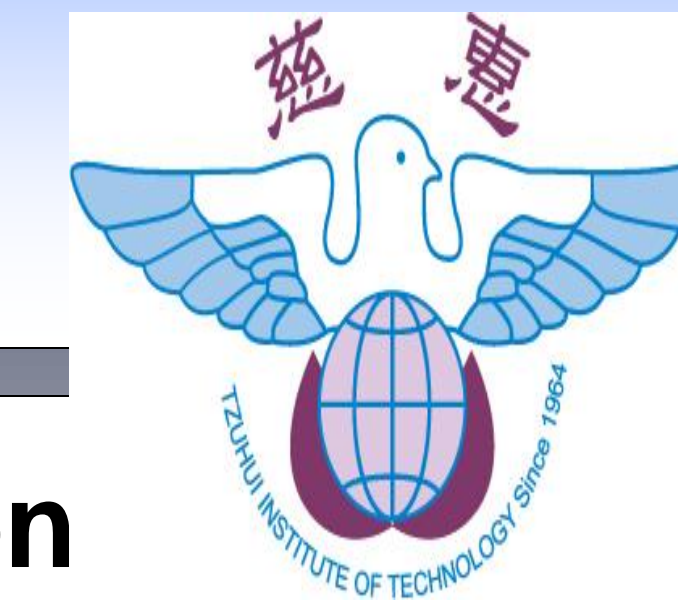


The Effects of the Senior Elastic Band Exercise Program on the Functional Fitness of Community Aged Adults --- Transtheoretical Model

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Introduction

According to the World Health Organization (WHO, 2013), the four primary risk factors of non-communicable diseases were tobacco use, harmful use of alcohol, unhealthy diets, and physical inactivity. Physical inactivity or having a sedentary lifestyle is one of the 10 main reasons for global mortality and disability (WHO, 2013). Approximately 60-85% of adults worldwide have sedentary lifestyles, and 6% of annual mortalities are related to insufficient physical exercise (WHO, 2013). Over two-million deaths occur because of sedentary lifestyles (WHO, 2013). Aging affects cardiorespiratory health, muscle and joint functions, quality of life, independent living, as well as an increasing mortality rate (Gremeaux et al., 2012; Nelson et al., 2007; Sui et al., 2007). Therefore, promoting a regular physical activity habit for aged adults has attracted substantial attention.

The TTM was developed by Prochaska and DiClemente in 1983. This model advocates that the behavioral change is a dynamic process that can be divided into various stages, instead of an all-or-none phenomenon (Prochaska & DiClemente, 1983): 1) the pre-contemplation stage: participants were not exercising and have no intention to exercise in the following six months; 2) the contemplation stage: participants were not exercising, but have the intention to exercise within the next six months; 3) the preparation stage: participants planned to start exercising within one month or were exercising irregularly; 4) the action stage: participants have been regularly exercising for the past six months; and 5) the maintenance stage: participants have been regularly exercising for over six months.

Various strategies can be employed in different stages to achieve behavioral changes. Interventions that correspond to the dynamic processes and principles of behavioral change are beneficial for the strengthening of exercise behaviors (Prochaska & Velicer, 1997). The Senior Elastic Band (SEB) exercise program is specifically designed to address the six common health problems (e.g., reduction of cardiovascular capacity, body flexibilities, upper limb muscle power, lower limb muscle endurance, poor balance, and sleep disorder) of community aged adults (Chen, Tseng, Huang, & Li, 2013). Hence, this study applied the TTM to test the effects of the group SEB exercises on the functional fitness of community aged adults who were in its contemplation and preparation stages.

Methods

Design

A quasi-experimental design with pretest and posttests on two groups was used in this study. Six senior activity centers from Southern Taiwan that volunteered to participate in the study were randomly assigned to either the experimental group (three centers) or control groups (three centers) using a lottery system. The functional fitness of the participants from the senior activity centers were collected at baseline and at three- and six-month into the intervention.

Setting & Participants

The study was conducted at six senior activity centers, Southern Taiwan. Approximately 30-35 aged adults from each senior activity center participated in this study, which yield a total sample size of 199 (experimental group $n = 97$, control group $n = 102$).

Ethical Considerations

This study was approved by the Institutional Review Board (IRB) of a university and the directors of senior activity centers. All participants were informed of the study by the researchers and indicated their consent to the study by signing or giving a thumbprint on the written consent form. During the study period, participants maintained the right to withdraw from the study at any time. All data were collected in an anonymous way and were coded to maintain confidentiality.

Intervention

The experimental group participants received the SEB exercise program three times a week, 40 minutes per time for six months. The program has three phases: 1) warm-up: 7 movements in 12 minutes aiming at loosening up the whole body's joints and improving the mental, physical, and spiritual health of the participants, 2) aerobic motion: 7 movements in 10 minutes aimed at increasing the participants' cardiovascular capacity and improving their balancing skill, and 3) static stretching: 6 movements in 18 minutes aimed at enhancing the participants' muscle power and endurance, and improving their body flexibilities (Chen et al., 2013).

Results

Table 1. Group Differences on Variables with Significant Interaction Effects at Third Month of the Study ($N=169$)

Variables		Adjusted M	SS	df	MS	F (p)
Lung capacity (L)	E	334.34	26881.23	1	26881.23	12.21 (.001)**
	C	307.24				
Cardiopulmonary fitness (times)	E	94.04	8327.91	1	8327.91	36.57 (< .001)***
	C	78.95				
Upper body flexibility (cm)	E	-3.67	292.73	1	292.73	12.51 (.001)**
	C	-6.50				
Lower body flexibility (cm)	E	7.50	379.37	1	379.37	16.73 (< .001)***
	C	4.28				
Upper limb muscle power (kg)	E	25.46	80.10	1	80.10	9.12 (.003)**
	C	23.98				
Lower limb muscle endurance	E	31.13	624.78	1	624.78	24.76 (< .001)***
	C	23.98				

Note. ** $p < .01$; *** $p < .001$; E = Experimental group; C = Control group

Table 2. Group Differences on Variables with Significant Interaction Effects at Sixth Month of the Study ($N=169$)

Variable		Adjusted M	SS	df	MS	F (p)
Lung capacity (L)	E	358.23	68433.35	1	68433.3	17.60 (< .001)***
	C	314.98				
Cardiopulmonary fitness (times)	E	107.33	14969.56	1	14969.5	39.78 (< .001)***
	C	87.11				
Upper body flexibility (cm)	E	-1.60	700.77	1	700.77	22.25 (< .001)***
	C	-5.97				
Lower body flexibility (cm)	E	10.87	1688.47	1	1688.47	48.53 (< .001)***
	C	4.08				
Upper limb muscle power (kg)	E	26.09	22	1	225.37	29.16 (< .001)***
	C	23.61				
Lower limb muscle endurance (times)	E	34.84	1820.23	1	1820.23	41.72 (< .001)***
	C	27.79				

Conclusion

The Taiwanese population is rapidly aging and the number of aged adults is increasing dramatically. Aged adults typically exhibit deteriorating physical functions and chronic diseases, thus hindering their performance in physical activities. In addition, exercise content and methods are often emphasized when encouraging aged adults to exercise, neglecting whether they have the intention or adequate preparation for exercising. In this study, the SEB exercise program improved the functional fitness of community aged adults. The program is inexpensive, easy to use, safe, and suitable for practicing at home. Moreover, this study adopted the TTM for selected aged adults using its contemplation and preparation stages. Subsequently, the SEB exercise prescription suitable for the aged adults in these two stages was provided to enhance their progress and increase their exercise behaviors. Therefore, providing appropriate exercise prescriptions according to various stages of behavior change can effectively facilitate regular exercise behaviors and enhance the physical health of aged adults.

Study Limitations

To prevent the exertion of confounding effects on the experimental and control group during interventions, the community centers, instead of individuals, were used as the unit for randomly assigning the participants into the two groups. Therefore, significant differences existed between the experimental and control group in the pretest regarding upper body flexibility, lower body flexibility, lung capacity, and upper limb muscle power. Subsequent statistical corrections were conducted on these significant differences using ANCOVA.