Effects of regular exercise on functional fitness of community elderly

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Abstract. This study aims to discuss the effect and the retention effect of regular exercise on functional fitness of community elderly. Total 65 community elderly aged above 65 (77.03 ± 6.41 years old) who voluntarily participate in this study are selected as the research subjects. Functional fitness pretest is practiced before the regular exercise intervention, the posttest is preceded in the 12th week, and the retention test is preceded in the 24th week. The results show that the functional fitness test, after the 12-week regular exercise intervention, reveals that males make significant progress in upper/lower limb strength, cardiorespiratory endurance, static balance, upper limb flexibility, agility and dynamic balance and females appear remarkable progress in upper limb strength, cardiorespiratory endurance, static balance, upper limb flexibility, agility and dynamic balance. Regular exercise could remarkably promote functional fitness of the elderly. In this case, designing community fitness programs as long-term continuous activity would promote and maintain fitness.

1 Introduction

The advance of technology and the change of societies result in large changes of population structure. The 2012-2060 Population Projection report, proposed by National Development Council, stated that aged population above 65 years old in 2060 would largely increase 2.9 times more than it in 2012 and the ratio of total population would increase from 11.2% in 2012 to 39.4% in 2060, in which the ratio of aged population above 80 years old would largely increase from 25.4% in 2012 to 41.4% in 2060. Moreover, the aging index was 76.3% in 2012, i.e. the proportion of aged population and young population was about 1:1.3; aged population in 2016 would exceed young population and the aging index would exceed 100%; and, the aging index would be up to 401.5% in 2060 when aged population was about 4 times more than young population [1]. It proves the increasing aged population structure in Taiwan that aging becomes the inevitable trend.

The elderly are facing the threat of chronic degenerative diseases. Past research indicated that regular physical activity could effectively improve physical and mental health and prevent cardiovascular diseases and chronic diseases from occurrence. Health promotion therefore is the trend developed from the global strategy to cope with national health. The so-called health promotion refers to applying various educational, organizational, economic, and environmental supports to facilitate the public practicing behaviors good for health. One or more lifestyle-related behaviors is generally selected as the objective, such as

smoking, drinking and drug abuse, nutrition, exercise, stress adaptation, and safe protection [2]. Li-juan Chen & Chin-yi Wu proceeded 20-week walking intervention [3] and found out the similar effects of improving cardiovascular risk factors and reducing the risk of coronary heart diseases. The cultivation of regular exercise habits and the promotion of physical fitness standards to establish healthy lifestyles therefore are the primary issues at the moment.

Functional fitness refers to a body being able to independently and safely complete daily physical activity, without over-fatigue [4]. It contains strength, aerobic endurance, flexibility, agility/dynamic balance, and body mass index. Accordingly, functional fitness combines health physical fitness and exercise physical fitness to form functional fitness. For the elderly, vitality and independent life are necessary; and, functional fitness is the comprehensive ability to enhance the elderly adapting to various stimuli. The demand for and the importance of functional fitness for the elderly therefore are far larger than physical fitness. In consideration with the physical function degeneration of the elderly [5], Mei-ling Lu pointed out an important course for health promotion to promote the quality of life of the elderly by testing the functional fitness standard of the elderly and providing suitable exercise prescription and programs. Apparently, functional fitness is critical for the health promotion of the elderly.

This study aims to discuss the effect of the 12-week regular exercise intervention on the functional fitness of community elderly.

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2 Methodology

2.1 Research subject

With purposive sampling, total 65 healthy community seniors aged above 65 (33 females and 32 males) with independent daily behaviors in Nantou City (Taiwan) are selected as the research subjects. All participants are requested to sign the agreement before the experiment and fill in the questionnaire.

2.2 Experiment procedure

The participants are proceeded the 12-week integrated exercise training and cognition course, including weekly group course and twice-a-week home-based independent exercise. Functional fitness tests are preceded before and after the intervention. The participants are requested to maintain normal lifestyles except participating in the courses and tests and not to additionally engage in other exercise. They have to fully participate in the weekly group course and fill in exercise records about the physical activity. The examiners in this study have the national physical fitness examiner certificate approved by Sports Administration, Ministry of Education, to ensure the test accuracy.

3 Result

Table 1 reveals notable differences in lower limb strength (chair stand) and upper limb strength (musculus biceps brachii left arm curling, musculus biceps brachii right arm curling), cardiorespiratory endurance (high knees in place) and static balance (open-eye single leg standing), as well as upper limb flexibility (scratching), but not lower limb flexibility (chair sit-and-reach) of male elderly. The agility and dynamic balance (chair stand detour) also present remarkable differences ($p < 0.5$).

Table 2 show significant differences in upper limb strength (musculus biceps brachii left arm curling, musculus biceps brachii right arm curling), but not lower limb strength (chair stand), of female elderly. The cardiorespiratory endurance (high knees in place) and static balance (open-eye single leg standing) also achieve notable differences. The upper limb flexibility (scratching) reaches remarkable differences, but not the lower limb flexibility (chair sit-and-reach); and, the agility and dynamic balance (chair stand detour) also reveal significant differences ($p < 0.5$).

Table 1. Male functional fitness pretest/posttest difference ($n = 32$).

Item	Pretest	Posttest	<i>t</i>	<i>p</i>
Chair stand	15.16 ± 3.90	16.57 ± 4.16	-2.83	0.008 *
Musculus biceps brachii arm curling (left)	19.03 ± 4.16	20.19 ± 4.49	-3.97	0.000 *
Musculus biceps brachii arm curling (right)	18.97 ± 4.29	20.72 ± 3.96	-6.09	0.000 *
High knees in place	89.38 ± 16.39	91.00 ± 15.81	-3.32	0.002 *
Chair sit-and-reach	-7.39 ± 11.99	-5.06 ± 10.42	-1.92	0.065
Open-eye single leg standing	14.58 ± 15.28	16.75 ± 14.64	-4.07	0.000 *
Scratching test (left)	-19.22 ± 9.58	-16.66 ± 8.84	-3.80	0.001 *
Scratching test (right)	-9.51 ± 12.21	-7.66 ± 11.59	-4.90	0.000 *
Chair stand detour	7.93 ± 2.35	7.33 ± 2.26	5.55	0.000 *

* $p < .05$

Table 2. Female functional fitness pretest/posttest difference ($n = 33$).

Item	Pretest	Posttest	<i>t</i>	<i>p</i>
Chair stand	16.18 ± 4.10	17.28 ± 5.05	-1.97	0.057
Musculus biceps brachii arm curling (left)	20.12 ± 3.74	21.48 ± 4.05	-4.43	0.000 *
Musculus biceps brachii arm curling (right)	20.24 ± 4.56	22.21 ± 4.87	-5.28	0.000 *
High knees in place	83.82 ± 23.36	88.55 ± 24.71	-4.18	0.000 *
Chair sit-and-reach	-0.27 ± 6.79	1.04 ± 6.63	-1.42	0.165
Open-eye single leg standing	12.64 ± 7.21	14.46 ± 14.10	-4.32	0.000 *
Scratching test (left)	-16.00 ± 10.35	-13.58 ± 8.38	-3.80	0.018 *
Scratching test (right)	-5.12 ± 9.18	-2.64 ± 7.81	-4.36	0.001 *

* $p < .05$

4 Discussion

This study reveals the remarkable improvement of the functional fitness of the elderly after the physical fitness exercise training and cognition courses. Both male and female elderly present notable progress on upper limb strength, cardiorespiratory endurance, static balance, upper limb flexibility, and agility and dynamic balance. Such a result is similar to several studies. Tsung-ching Lin, Li-ying Chang, Yun-dai Ling, Yin-hsin Li & Tzu-yuan Hsiang proved that the 12-week hydraulic resistance intervention could remarkably promote the physical fitness of female elderly [6]. Aiming at the elderly in nursing homes, Grönstedt et al. preceded 3-month individual physical activity intervention [7], covering the balance, physical activity, and muscles of the elderly. The experimental group appeared significant improvement on walking and wheelchair pushing speed and leg muscle strength. Nevertheless, the lower limb flexibility of both males and females and the lower limb strength of females did not reach the significance, but revealing the improving trend. It might be the reason that distinct exercise would enhance physical fitness differently. From the literature, continuous 40~60min Taiji exercise for 2~3 times a week could effectively promote the lower limb strength and flexibility of the elderly after 8-12 week training [8]. Taiji exercise therefore could be arranged in the exercise course to achieve better training benefit. In terms of static and agility/dynamic balance, Shimada, H., Uchiyama, Y., & Kakurai, S. preceded 12-week balance training and gait exercise for the elderly [9] and found out the remarkable improvement on static and agility/dynamic balance. The result conforms to this study. The functional fitness improvement could enhance the daily physical activity ability, promote the functional fitness performance of the elderly, and improve the health condition.

Acknowledge

We are grateful for the project funding support of Ministry of Science and Technology (MOST 104-2629-E-468-002) and would like to show our appreciation.

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