The effect of an exercise program on the health-quality of life in older adults

A randomized controlled trial

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ABSTRACT

INTRODUCTION: An essential public health goal is to reduce age-related disabilities in the elderly. The present study aimed to investigate the effect of exercise program on health-quality of life (HQL) in older adults.

METHODS: Subjects were sixty healthy adult volunteers over the age of 55 years. None of the subjects had any experience in exercise programs but were physically active and able to perform activities of daily living independently. The subjects were randomly assigned into one of two groups each with 30 people: test (exercise) group and control (no exercise) group. The test group was taken into a 12-week aerobic exercise program. The exercises included a 5-10 minute circulatory warm-up, a 15 minute walking and a 5-10 minute stretching/cool-down period. The exercises were performed three times per week under supervision of an experienced instructor. No exercise program was prescribed for the control group. Both groups were assessed before and after the exercise program. The LEIPAD questionnaire was used to measure HQL.

RESULTS: The results showed significant improvements in all domains of the LEIPAD questionnaire whilst the level of HQL did not change and none of the scores obtained by the LEIPAD was significant. Measures of HQL improved with exercise so that there were no HQL changes in the control but significant changes were observed in the exercise group.

CONCLUSION: This study suggests that an exercise program has resulted in a significant improvement in HQL in older adults (NCT00999674).

An essential public health goal is to reduce age-related disabilities in the elderly. In the next 20 years, the number of people over 60 years of age will double [1], raising the issue of finding feasible means for their independent living [2]. In fact, the aging populations are those who are in need of specific encouragement to engage in physical activity [3]. Exercise and physical activity have been suggested as effective means to maintain independent living in old age [4, 5]. Health-related quality is defined as optimum levels of physical, mental, role, social functioning involving occupational and life roles, relationships, and personal perceptions of health, fitness, life satisfaction and well-being [6]. The elderly are more prone to experiencing various adverse events. Consequently, physical, social, economic well-being issues tend to be interrelated to a much greater extent than among other age groups [7].

Exercise can improve and maintain health-quality of life (HQL) and increasing the HQL is one of the primary goals for health improvement in older persons [8]. Various modes of exercise have been offered to improve physical functions and HQL in older adults. The goal of exercise for older adults is to increase their reserve capacities and therefore maintain the ability to perform daily activities [9]. As HQL is related to body function and structure, activity and participation [10, 11], exercise programs may lead to significant improvement in strength, endurance and body mechanics in older adults [12].

Many HQL instruments have been developed (e.g. studies of reactions to such diseases as cancer, cardiovascular disorder, AIDS and surgery), however, the LEIPAD questionnaire is a subjective assessment specifically designed to determine HQL in the elderly as it takes cognitive function into consideration [12]. This instrument is valid, reliable and also very practical. Its name is an acronym deriving from the first two of the three involved universities namely, LEIden (the Netherlands), PADua (Italy), and Helsinki (Finland). The present study aimed to investigate the effects of exercise program on HQL in older adults.

METHODS

This was a semi-experimental trial conducted in Shahrekord, Iran (NCT00999674). We assessed 69 subjects for eligibility. Sixty healthy volunteers over the age of 55 years were asked to participate in this study (Cochran's formula with a 99% confidence level, t = 2.326; d = 0.03; p = 0.869). The study subjects were recruited among those who responded to advertisements in outpatient clinics [8]. Subjects were randomly assigned into one of two groups each with 30 people: test (exercise) group and control (no exercise) group. Following Avlund et al [13], the sixty subjects were equally distributed between the two groups, but otherwise randomly selected by taking every second participant from a randomly organised computer file.

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None of the subjects had any experience in exercise programs but were physically active and able to perform activities of daily living independently [8]. Exclusion criteria were: neurological disorder (paresis, stroke, Parkinson's disease), acute heart impairment (hypertension, congestive heart failure), unstable chronic illness (diabetes mellitus, malignancies), severe musculo-skeletal impairment (inability to participate in the programs) [8]. Ethics approval was obtained from the university's medical research ethics committee. All subjects agreed to participate by providing written informed consent. The test group was taken into a 12-week aerobic exercise program. The exercises included a 5-10 minute circulatory warm-up, a 15 minute walking, and a 5-10 minute stretching/cool-down period. The exercises were performed three times per week at the rehabilitation unit under supervision of an experienced instructor. No exercise program was prescribed for the control group. Both groups were assessed before and after the exercise program. The same questionnaire was used for the subjects in both groups.

The questionnaire consisted of demographic data (such as age, gender, educational level, and employment) and the LEIPAD questionnaire used to measure HQL at week 0 and 12 [12]. The 31-item LEIPAD questionnaire designed to measure seven main HQL dimensions or domains and each item in the instrument was scored from 0 (the worst condition) to highest (the best condition). The questionnaire was administered by the same instructor who was not informed about the protocol:

1) The physical function dimension, scores ranging 0-15; 2) the self-care dimension, scores ranging 0-15; 3) the depression and anxiety domain, scores ranging 0-12; 4) the cognitive functioning domain, scores ranging 0-15; 5) the social functioning domain, scores ranging 0-9; 6) the sexual functioning domain, scores ranging 0-6; and 7) the life satisfaction domain, scores ranging 0-18.

Scale instrument consisted of 31 questions which measured seven dimensions of HQL: self-perceived physical health, self-esteem, interpersonal and social functions, expectations for the future, recreational activities and activity of daily living. Test-retest for reliability was based on 30 questionnaires within two weeks of early assessment. The reliability level measured 83%. All data were gathered and analyzed using SPSS (version 14). Chi-square and t–test were performed to analyse demographic and HQL differences between the two groups. Statistical significance was accepted at $p<0.05$. Mann-Whitney test was used to compare the measurements of characteristics and dependent variables between the two groups.

TABLE 1

Demographic variables in the study groups.

	Control	Test
Number of subjects	30	30
Women, %	47	56
Men, %	53	44
Age, yrs, mean ± SD	68.03±10.65	68.63±6.96
BMI, kg/m^2, mean ± SD	25.4±1.91	24.8±2.02
Employment, %		
Employees	20	15
Housewives	47	38
Workers	15	25
Retired	18	22
Education, %		
Primary school	45	35
High school	55	65
Insurance support,% (present)	60	73
Fall history,% (present)	47	53.1

BMI = body mass index; SD = standard deviation.

RESULTS

All subjects had completed the study. **Table 1** represents demographic details of both groups. Initially there was

TABLE 2

The results obtained in the two groups before (pre) and after (post) exercise using scores of the seven domains of the LEIPAD questionnaire. The values are mean±standard deviation. For comparison between groups, the paired t-test showed significant differences.

	Control			Test		
Domains	**pre**	**post**	**p- value**	**pre**	**post**	**p- value**
Physical function	5.45±1.23	4.84±2.03	0.923	5.39±1.11	7.39±2.43	0.0143
Self-care	3.35±1.02	3.31±1.15	0.678	3.45±1.73	5.23±1.92	0.003
Depression & anxiety	2.55±2.22	2.45±1.62	0.888	2.67±2.34	4.54±2.88	<0.001
Cognitive functioning	3.15±2.32	3.10±2.11	0.987	3.14±2.16	5.98±2.43	0.004
Sexual functioning	5.35±2.38	5.01±2.41	0.896	5.39±2.19	7.99±2.32	<0.001
Social functioning	6.26±2.74	5.99±2.47	0.798	6.19±2.77	8.25±2.39	0.0156
Life satisfaction	2.52±2.88	2.41±1.96	0.897	2.64±1.77	4.35±2.02	<0.001
Total	28.63±14.79	27.11±13.75	0.997	28.87±14.07	43.73±16.39	<0.001

no significant difference between the two groups of test and control in terms of the demographic features ($p > 0.05$, Chi-square and Mann-Whitney). However, after intervention (exercise), the overall level of HQL, measured by seven domains of the LEIPAD questionnaire, showed statistically significant improvement in the LEIPAD score in the test group (t-test, $p < 0.05$). In contrast, the level of HQL did not change and neither of scores obtained by the LEIPAD was significant so that no improvement in the LEIPAD score was found in the control group (**Table 2**). The results clearly indicate that an exercise program has a positive effect on HQL in older adults.

DISCUSSION

This study demonstrates that an exercise program improves HQL in older adults and that after a regular exercise significant improvement in all components of HQL in the older adults is observed.

In the recent industrialised world, HQL in older adults is particularly important in view of the increasing number of over 65 year-olds [12]. At this age physical abilities slow down and pharmacokinetic responses to treatment decline [12]. The results of the current study are in agreement with Acree et al [10] who found that HQL of the elderly who exercise is higher than HQL of the elderly who do not, so that the adherence to exercise improves HQL [13]. In fact, many studies have reported that the exercise interventions of any type (water, resistance and balance exercise) can lead to the improvement of HQL [14, 15]. Likewise, Barrett & Smerdely [16] suggested that progressive resistance training significantly improves strength, mobility and HQL in elderly people.

Many older people are reluctant to participate in the exercise programs because of medical obstacles such as poor health, fear of injury and transportation problems [17]. For adults, there is substantial evidence documenting the health-benefits associated with physical activity [18-20]. Physical activity improves health even for chronically ill or frail older adults [21, 22].

Indeed, exercise is a tool to help older adults to overcome their disabilities and improve all aspects of HQL particularly to maintain their health conditions and perform activities of daily living. Meta-analytic reviews have proven that exercise is associated with a variety of health improvements such as decreased risk of coronary heart disease and stroke [22], improved cognition in sedentary older adults [23], a modest benefit in HQL for frail or older adults [24], and a positive association with successful aging [25].

Because of this, recommendation of current public health is that all adults should engage in at least 30 min. of moderate-intensity activity (4.0-5.9 metabolic equivalents) on most days of the week [26]. Similarly, this study showed that a regular exercise has a positive effect on physical activity and improves HQL in older adults.

In addition, other investigations show that exercise interventions are able to modify physical risk factors for falls such as balance and mobility impairments and also reduced muscle strength [27-30], and as such the incidence of falls in older people reduces [31]. Nevertheless, it must be noted that exercise outcomes for older adults should be achieved as efficiently as possible due to the fact that elderly people can less easily afford multiple exercise programs and often have difficulties to travel to venues for exercise [15]. Therefore, further research should investigate specifically the best training exercise to improve HQL in older adults.

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REFERENCES

1. WHO. Health and development through physical activity and sport. http://whqlibdoc.who.int/hq/2003/WHO NMH NPH PAH 03.2.pdf (2006).
2. Wallin M, Talvitie U, Cattan M et al. Construction of group exercise sessions in geriatric inpatient rehabilitation. Health Com 2008;23:245-52.
3. Grant S, Corbett K, Todd K et al. A comparison of physiological responses and rating of perceived exertion in two models of aerobic exercise in men and women over 50 years of age. Br J Sports Med 2002;36:276-81.
4. Spirduso WW, Cronin DL. Exercise dose-response effects on quality of life and independent living on old adults. Med Sci Sports Exercise 2001;33:598-608.
5. Bean JF, Vora A, Frontera WR. Benefits of exercise for community-dwelling older adults. Arch Physic Med Rehab 2004;85:31-42.
6. Bowling A, ed. Health-related quality of life: a discussion of the concept, its use and measurement. In: Measuring disease. Philadelphia: Open University Press, 1995:1-19.
7. Eyigor S, Karapolat H, Durmaz B et al. A randomized controlled trial of Turkish folklore dance on the physical performance, balance, depression and quality of life in older women. Arch Gerontol Geriat 2009;48:84-8.
8. King MB, Whipple RH, Gruman CA et al. The performance enhancement project: improving physical performance in older persons. Arch Phys Med Rehab 2002;83:1060-9.
9. Demura S, Kobayashi H, Kitabayashi T. QOL models constructed for the community-dwelling elderly with ikigai (purpose in life) as a composition factor, and the effect of habitual exercise. J Physiol Anthropol Appl Human Sci 2005;24:525-33.
10. Acree LS, Longfors J, Fjeldstad AS et al. Physical activity is related to quality of life in older adults. Health Qual Life Outcomes 2006;4:37.
11. Rubenstein LZ. Falls in older people: epidemiology, risk factors and strategies for prevention. Age Ageing 2006;35:37-41.
12. Diego DL, Diekstra RFW, Lonnqvist J et al. LEIPAD, an internationally applicable instrument to assess quality of life in the elderly. Behav Med 1998;24:17-27.
13. Avlund K, Mehlsen MY, Thomsen DK et al. Physical functioning and use of health services in a young and old sample. Dan Med Bull 2008;55:147-51.
14. Devereux K, Robertson D, Briffa NK. Effects of a water-based program on women 65 years and over: A randomized controlled trial. Austral J Physiotherapy 2005;51:102-8.
15. Ishihara K, Nishimoto K, Mimura T et al. Effects of a balance training program on balance function in geriatric health services facility residents. Research Aid Report. Tokyo: Meiji Yasuda Life Foundation of Health and Welfare, 2001;16:18-25.
16. Barrett CJ, Smerdely P. A comparison of community-based resistance exercise and flexibility exercise for seniors. Austral J Physiotherapy 2002;48:215-9.
17. Cyarto EV, Brown WJ, Marshall AL et al. Comparison of the effects of a home-based and group-based resistance training program on functional ability in older adults. Am J Health Prom 2008;23:13-7.
18. Wendel-Vos GC, Schuit AJ, Feskens EJ et al. Physical activity and stroke: A meta-analysis of observational data. Int J Epidemiol 2004;33:787-98.
19. Palombaro KM. Effects of walking only interventions on bone mineral density at various skeletal sites: A meta-analysis. J Geriat Physic Therapy 2005;28:102-7.
20. Prohaska T, Belansky E, Belza B et al. J Gerontol Series Psychol Sci Soc Sci 2006;61:267-73.

21. Mallery LH, MacDonald EA, Hubley-Kozey CL et al. The feasibility of performing resistance exercise with acutely ill hospitalized older adults. Geriatrics 2003;3:3.
22. Singh NA, Stavrinos TM, Scarbek Y et al. A randomized controlled trial of high versus low intensity weight training versus general practitioner care for clinical depression in older adults. J Gerontol Series A Biol Sci Med Sci 2005;60:768-76.
23. Cornelissen VA, Fagard RH. Effect of resistance training on resting blood pressure: A meta-analysis of randomized controlled trials. J Hyper 2005;23:251-9.
24. Colcombe S, Kramer AF. Fitness effects on the cognitive function of older adults: a meta-analytic study. Psychol Sci 2003;14:125-30.
25. Schechtman KB, Ory MG. The effects of exercise on the quality of life of frail older adults: A preplanned meta-analysis of the FICSIT trial. Ann Behav Med 2001;23:186-97.
26. Depp CA, Jeste DV. Definitions and predictors of successful aging: a comprehensive review of larger quantitative studies. Am J Geriat Psychiat 2006;14:6-20.
27. Agency for Healthcare Research and Quality and Centers for Disease Control. Physical activity and older Americans: benefits and strategies. www.ahrq.gov/ppip/activity.htm (2005).
28. Gillespie LD, Gillespie WJ, Robertson MC et al. Interventions for preventing falls in elderly people. Cochrane Database Syst Rev 2003; 4:CD000340.
29. Liu-Ambrose T, Khan KM, Eng JJ, Janssen PA, et al. Resistance and agility training reduce fall risk in women aged 75 to 85 with low bone mass: a 6-month randomized, controlled trial. J Am Geriatr Soc 2004; 52:657–665.
30. Sherrington C, Lord SR, Finch CF. Physical activity interventions to prevent falls among older people: update of the evidence. J Sci Med Sport 2004;7:43-51.
31 Robitaille Y, Laforest S, Fournier M et al. Moving forward in fall prevention: an intervention to improve balance among older adults in real world settings. Am J Public Health 2005;95:2049-56.