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Outdoor recreational exercise programs and functional capacity: a study of sedentary seniors

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Abstract

This study evaluated the effects of a 12-week outdoor recreational exercise program on functional capacity of 45 sedentary seniors, ranging in age from 60 to 75 years. The variables, measured using a Likert scale, were twenty of the most habitual daily movement activities among elderly. Subjects were allocated to one exercise group (n= 30) and one control group (n=15). Exercises were performed for one hour twice a week for the experimental group, whereas the control group did not participate in any kind of exercises. Subjects were pre and post-tested for the selected variables. Significant differences (p<. 05) were found between exercise and non- exercise groups. The main effects of the training program were significant for most of the variables examined, indicating that subjects who participated in the exercise program had a significant higher level of physical abilities than the control group. Findings are discussed in terms of design and measurement improvements and the need to focus research efforts on multiple components of wellbeing in relation to fitness level in the elderly.

Keywords: daily mobility level, functional capacity, aging, exercise program.

Comparison of work motivation in camp supervisors and camp counselors in Greek private camps

Introduction

Average life expectancy has improved in the last century. By 2025 global projections reveal that more than 822 million will be 65 years of age and over (Martin & Preston, 1994). Overall, there is more than a doubling in the total number of elderly persons over the 35-year period, with the greatest increase occurring in developed countries (McPherson, 1999). Available data on demographic developments reveal that in Greece the aging population has been increased from 13% in 1981 (S.Y.B., 1983) to 16% in 1997.

Age has been found to have an impact on declining motor functions including endurance, reaction time, balance, flexibility, gait velocity, and muscle strength (Agre, et al., 1988; Raad, et al., 1988; Rikli & Endwards, 1991; Judge, Underwood & Gennosa 1993). As a result all these aliment, walking, climbing stairs, getting up from bed or chair, entering a bus or train becomes more difficult and fatiguing, and eventually impossible. In addition, the ability to lift and carry weights becomes reduced. The aging persons will lose their independence and autonomy. As a consequence a large and increasing number of elderly persons will be living below, at, or just above 'thresholds' of physical ability needing only a minor intercurrent illness to render them completely independent (Astrand, 1992).

For years, these performance declines were thought to be a normal and necessary consequence of aging. Several recent studies, however, indicate that these declines relate more to low lifelong physical activity level than to age (Rikli & Busch, 1986; Hurley et al., 1998). According to Avlund, Schroll, Davinsen, Lovborg and Rantanen (1994), physical inactivity is one of the major causes of limited mobility and functional ability of the elderly. In Greece, more than 80% of the elderly are not regularly involved in physical activity programs (Matsouka et al., 2001). Similarly, in other developed countries, 30% to 80% are physically inactive (ACSM, 1998). Furthermore physical activity has proven to be favorable for musculoskeletal health in the elderly (Vuori, 1995). Muscle mass, strength, power, and endurance are all important

components of functional ability and are the major causes of limited mobility and activity (Avlund, et al., 1994), especially for women (Horton, 1992).

It is worthwhile to emphasize that the improvement in muscle strength in old or very old people have been shown to be accompanied by better coordination, better balance, shorter reaction time, increased gait speed, and increased flexibility, all of which are important elements or indicators of mobility (Fiatarone et al., 1990). Elderly women who participated in a 25-week exercise program gained significantly increased range of motion in ankle plantar flexion, shoulder flexion, shoulder abduction, and left neck rotation (Raad, et al., 1988). Healthy elderly women were found to have higher performance levels, in comparison to frail elderly women on grip strength, movement time, kinematics movement characteristics, and basic functional movement abilities. Bassey et al. (1992), found significant correlation between leg power and functional, gross motor performance activities such as rising from a chair and walking up stairs, in frail elderly subjects. Also, thirty-two healthy elderly people were found to have higher performance levels, in comparison to frail, elderly women on grip strength, movement time, kinematics movement characteristics, and basic functional movement abilities after their participation in an 7-week exercise program twice,three times weekly (Parkatti, Rantanen & Hartikka (1994). As such, stronger individuals reacted and moved faster, spent less absolute time in acceleration and deceleration, produced fewer adjustments in movements, and generated higher peak velocity and impulse (Meyer, Goggin & Jackson, 1995).

Based on the aforementioned studies it could be recognized the value of exercise is an important element in improving functional autonomy and quality of life. However, whereas the physiological benefits of training in the elderly are unequivocal, there is little mention of the relationship of differentiated frequency physical activity programs to improved function or the ability to better perform tasks of daily living. In a review of 28 group-based short term interventions, reported by Akke et al., (2002), the duration of the programs varied among 1 and 10 months. In most studies, the frequency of exercise varied from 2 to 5 days per week (M=3.54) and 54 min, sessions (McAuley & Rudolf, 1995). However, the benefit of lower frequency training regiments has not been adequately addressed (Valliant & Asu, 1985) in older populations. Moreover, in an intervention study Matsouka et al., (2003), it was found that women who participated in a three month indoor exercise program, three or even two – times per week, reported significant subjective improvements for the most part of the 20 daily's living activities

(ADLs). Based on previous findings, the same researchers hypothesized that older people who participate twice weekly in an outdoor recreational exercise program would improve participation in activities involvement as a part of daily living, in a relatively short time.

Methodology

Sample

Participants in this study were 45 healthy seniors aged between 60 and 75 years (M=64.8, SD= 4.7) with an average body weight of 80.59 kg (*SD* = 5.60), and their height at 1.57 m (*SD* = .07). Participants were permanent residents in a town located in Northern Greece, and members of the Public Care Institutes for the Elderly (PCIE), who had not been involved in any physical activity for at least 6 months before the exercise program began. The participants were assigned into one experimental group (n=30), and one control group (n=15). For the most part, the participants had graduated at the first-degree education level (41.3%), while the majority of them were retired (61.5%). Their previous profession were as civil servants,(35.3%), and free professionals (32.3%). With regard to their familial situation the results showed that the majority of them (70.4%) were married and were living with their spouse (70.4%). The majority of the participants (70.5%) had a moderate daily mobility level according to the AAHPERD exercise consent form for adults (Osness, Adrian, Mclark, Hoeger, Raad, & Wisnell, 1990). Participants had similar general health status. Specifically, the participants of this study did not suffer from seriously cardiovascular problems (coronary illness, infarction) respiratory or neurological diseases as well as other serious orthopaedics problems. The more important problems of health that the participants faced were mainly orthopaedic in nature (34.4%), as well as problems of high pressure (31.5%), which did not however constitute as an obstacle in their attendance in the research.

Questionnaire

The evaluation of the daily functional capacity level of senior females was based on a reconstructed form of Lawton and Brody's (1991) Instrumental Activities of Daily Living Scale (IADL). The new data composed out of the 20 most important items (see Table, 2). This measure included such activities as getting up and down from a chair, carrying items that weighed more than 5 lbs, and reaching overhead. During the first and

last week of the study, special researchers rated each of the 20 ADL's separately on a 7-point Likert scale, ranging from 1 (cannot do) to 7 (can do easily) for each program participant.

Process

The duration of the whole program applied was 12 weeks and consisted of: 1 week of pretesting, 10 weeks of the intervention training program, and 1 week post-testing.

Preprogram Procedures:

Prior to the enrollment in the training program, all subjects of the experimental group were required to provide a signed letter of clearance from their personal physician regarding their participation in the program. At the onset of the program, individuals were informed that they would be participating in an exercise program and were inducted on a brief demonstration of the program's content.

During the first week, both the experimental and control group completed the Revised Physical Activity Readiness Questionnaire (PAR-Q; Thomas, Reading, & Shephard, 1992) and a short demographic questionnaire assessing age, height, and weight. Finally and before the training program began, each participant completed the ADL scale.

Intervention Program:

The experimental group participated in the 10-week intervention program twice a week with each exercise session lasting approximately 45 min in length. The control group did not follow any physical activity program. The training program was based on the Long Term Physical Activity Workshop (Ecclestone, 1997), and consisted of outdoor leisure activities and callisthenic exercises for the improvement of flexibility, general strength, and coordination as well as for the reinforcement of self-esteem and self-confidence. Specifically, the intervention phase took place in the natural environment, with the basic training components of fitness, using wooden sticks, parts of the trees, and sands bags as well as exercises using the weight of their body. The exercise intensity according to the American Heart Association varied 50 to 75% of their maximum heart rate, as determined by the pilot study. Subjects were taught to monitor their pulse rate according to perceived exertion (Ecclestone, 1997).

Post program Procedures:

At the conclusion of the 10-week training program, during the last week (12^{th}), each participant of the study completed once again the ADL scale.

Results

The normality of the distribution and the equality of variances for the twenty ADLs variables were checked through the Kolmogorov-Smirnov test for each group. The results for all variables revealed a normal distribution and equality of variances in all groups, with values in some cases approaching 1 ($p \approx 1.000$). The Bartlett-Box and Cochran's C test used to check the differences among groups in the selected variables at the pre test revealed that there was no difference beyond the .05 level of significance for any of the groups.

The mean scores for pre and posttest were then examined through the t-test for paired group's analysis to determine if the experimental group versus the control group had significantly improved in each of the twenty daily living activities. The results indicated in Table 1 reveal significant differences between pre- and post-measures for the experimental group. In contrast, there were no significant differences for ADLs, between pre and post measures for the control group (no exercise at all).

Table 1. PairT-Test on the Activities Daily Living

Variable	Group A		Group D	
	t-value	Sig	t-value	Sig
Reach overhead	2.24	**.026**	1.00	.171
Get in and out of a car	2.71	**.012**	1.00	.171
Walk on different surfaces	2.45	**.018**	1.00	.171
Stand or be on feet for long periods of time	4.58	**.000**	*	*
Walk for about 2 to 3 blocks (1/4 mile)	3.21	**.005**	*	*
Get items down from shelves	1.31	.113	1.00	.171
Get up and down from a chair	1.81	**.045**	1.50	.084
Pick up and hold children	3.00	**.007**	*	*
Stoop, crouch or kneel	3.00	**.007**	1.00	.345
Reach out as if to shake someone's hand	3.00	**.007**	*	*
Open jars, containers, etc.	1.63	**.047**	1.00	.171
Participate in physical recreation	2.24	**.026**	*	*

Get up and down from a bed	1.41	.064	1.50	.084
Reach to floor to pick up items	3.86	**.002**	1.50	.084
Dress without help	1.96	**.040**	1.77	.550
Pull open drawer	1.15	.144	*	*
Get in and out of a tub	1.50	.084	.00	.500
Bathe without help	2.71	**.012**	1.00	.171
Carry items that weighs more than 5 Ib	1.81	**.042**	*	*
Get up and down from a couch or recliner	1.96	**.040**	*	*

$p<0.05$

** The difference between pre and post-testing measures concerning the control group is 0.*

As can be seen also, from mean scores in Table 2, after the 10-week training program, there was a marked increase in reported ADLs for the two experimental groups that exercised three times and/or twice weekly, while the others two groups evidenced a stability in ADLs during the same period of time.

Table *2.* Means and Standard Deviations for Activities Daily Living Scores.

	EXPERIMENTAL GROUP				CONTROL GROUP			
	Pre-program		Post-program		Pre-program		Post- program	
Variable	M	SD	M	SD	M	SD	M	SD
Reach overhead	4.90	1.20	5.40	1.34	4.90	1.10	4.90	1.10
Get in and out of a car	5.00	1.33	5.60	1.26	4.60	1.34	4.70	1.33
Walk on different surfaces	4.70	0.94	5.10	1.19	4.10	0.31	4.22	0.44
Stand or be on feet for long periods of time	4.20	1.13	4.90	0.99	3.70	0.30	3.70	0.94
Walk for about 2 to 3 blocks (1/4 mile)	4.90	1.52	5.70	1.15	5.30	1.33	5.30	1.33
Get items down from shelves	4.70	1.88	5.10	1.37	4.50	0.97	4.70	1.25
Get up and down from a chair	5.40	1.95	5.80	1.54	4.80	1.39	5.00	1.24
Pick up and hold children	4.10	1.10	4.60	0.96	4.10	1.19	4.10	1.19
Stoop, crouch or kneel	4.30	2.05	4.80	1.68	4.60	1.42	4.70	1.33
Reach out as if to shake someone's hand	5.10	1.52	5.60	1.34	6.30	1.25	6.30	1.25
Open jars, containers, etc.	4.60	1.26	5.10	144	5.20	1.61	5.30	1.49
Participate in physical recreation	5.80	1.31	6.30	1.05	4.70	1.25	4.70	1.25

Get up and down from a bed	5.50	1.58	5.80	1.32	5.10	0.32	5.30	0.48
Reach to floor to pick up items	5.00	1.56	5.90	1.10	4.40	0.96	4.90	1.19
Dress without help	5.20	1.75	5.50	1.58	5.20	1.39	5.90	1.44
Pull open drawer	5.40	1.42	5.70	1.33	5.80	1.39	5.80	1.39
Get in and out of a tub	5.50	1.43	5.70	1.15	5.20	1.47	5.20	1.22
Bathe without help	5.60	1.50	6.20	0.91	5.60	1.34	5.70	1.41
Carry items that weighs more than 5 Ib	5.30	1.56	5.70	1.33	5.10	1.52	5.10	1.52
Get up and down from a couch or recliner	5.40	1.50	5.40	1.50	5.00	1.41	5.00	1.41

Discussion and Conclusions

The above-presented results reveal that the outdoor training program applied to the sedentary elderly produced significant improvements for the most part of the 20 ADLs variables. The statistical difference between the initial and final measurements for the experimental group show us that even a 12 week program is capable of producing significant changes to basic activities of daily living such as the ones selected for the present study. Furthermore, the lack of improvement for the subjects of the control group gives additional support to the idea that the program applied was responsible for the improvement of the exercising group.

According to Frandin et al. (1992), no significant changes to physiological parameters were found for elderly people participating in an intervening exercise program in its duration. Frandin et al. (1992) found that participants themselves considered their level of health and fitness satisfactory, due to their general involvement with physical activities. Thus, although the effects of exercise on the physiological parameters are not always apparent, significant correlation can be ascertained between the level of physical activity of elderly people and health in general. Furthermore, a low level of constant physical activity for the elderly, according to the research results of Avlund et al. (1994), improves their ability to successfully deal with their everyday activities.

As for the degree of performance improvement for the group that exercised twice a week in an outdoor setting, the findings of the present research are in complete agreement with the research of Parkatti et al. (1994), which proved significant correlations between strength level and everyday activity for people aged 60-68. After a period of intervening exercise programs that lasted 7 weeks, with a frequency of 3 times a week, there was considerable improvement in the maximum isometric strength. Similar

improvement was noted in the same research, on groups of people who exercised twice a week. The increased strength levels eased the subjects' everyday life considerably - in respect to walking speed and ability to climb a flight of stairs more easily and safely. Similar results were recorded by Nichols et al. (1993) who found that elderly people with high strength levels climbed stairs faster. Furthermore, the considerable improvement of the maximum strength of the trunk and upper limbs as noted by Mihalko et al. (1996), positively affects the subjects' ability to cope with everyday life as well as reducing feeling of fatigue. Additionally, in a total of 405 people with an average age of 75, a significant correlation was noted between the strength of the quadricipital muscles, the thigh biceps and the biceps and triceps of the upper limbs, and the level of their ability to manage daily activities (Avlund et al., 1994). The elderly people with high levels of maximum strength in the above muscle groups dealt more efficiently with their everyday needs, such as getting dressed and undressed, opening and closing doors and using the lavatory.

In conclusion, a 12 week outdoor recreational exercise program is one of the major factors in the improvement of the most important activities of daily living among the elderly women. Moreover a well-designed exercise regimen with various activities enjoyable to older people provides an avenue to examine the spectrum of physical activity participation and the interaction between these components, thus allowing for a more complete understanding of the relationship between aging, physical activity and ADLs. It is recommended that future studies consider including components of physical fitness and wellbeing in outdoor exercising environment thus enhancing the probability of aged individuals to achieve overall health and physical fitness gains.

References

Agre, J.C., Pierce, L.E., Raad, D.M., McAdam, M., & Smith, E.L. (1988). "Light Resistance and Stretching Exercise in Elderly Women: Effect upon strength" Archives of Physical Medicine and Rehabiliation, 69, 273-276.

American Association of Retired Persons. (1992). A profile of older Americans: 1992 (Brochure). Washington, DC: Program Resource Department, CARP.

Astrand, P. (1992). Why exercise; Medicine and Science in Sports and Exercise, 24, 153-162.

Avlund K., Schroll M., Davinsen M., Lovborg B., & Rantanen T. (1994). "Maximal isometric muscle strength and functional ability in daily activities among 75-years-

old men and women" Scandinavian Journal of Medicine and Science in Sports, 4, 32-40.

Bassay E.J., Fiatarone M.A., O'Neill E.F., Kelly M., Evans W.J., & Lipsitz L.A. (1992). "Leg extensor power and functional performance in very old men and women" Clinical Science, 82, 321-327.

Ecclestone NC, Tubor-Locke DA, Meyers Lazowski A. 1995. Programming and evaluation insights into physical activity for special older populations. International Conference on Aging and Physical Activity, Colorado Springs, Colorado, October 1995. Abs.Pub. Int J. Aging Physic Act, 3, 424-25.

Fiatarone M.A. (1996). "Physical Activity and Functional Independence in Aging" Research Quarterly for Exercise and Sport, 67, S-70.

Fiatarone, M.A., Marks, E.C., Ryan, N.D., Meredith, C.N., Lipsitz, L.A., & Evans, W.J. (1990). "High-intensity strength training in nonagenarians: Effects on skeletal muscle" Journal of the American Medical Association, 262, 3029-3034

Frandin, K., Johannesson, K., & Grimby, G. (1992). Physical activity as part of an intervention program for elderly persons in Goteborg. Scandinavian Journal of Medicine and Science in Sports, 2, 218-224

Horton, J.A. (1992). The women's health databook: A profile of women's health in the United States. Washington, DC: Elsevier Science Publishing Company.

Hurley, M.V., Rees, J., & Newham, D.J. (1998). Quadriceps function, proprioceptive acuity and functional performance in healthy young, middle-aged and elderly subjects. Age and Ageing, 27, 55-62.

Judge J.O., Underwood M., & Gennosa T. (1993). "Exercise to improve Gait Velocity in Older Persons" Archives of Physical Medicine and Rehabilitation, 74, 400-406

Lawton, M.P., & Brody, E.M. (1991). Assessment of the older people: Self-maintaining and instrumental activities of daily living. The Gerontologist, 31, 179-186.

Martin L, Preston S. 1994. Demography of aging. Washington, DC: National Academic Press.

McAULEY, E., & RUDOLF, E. (1995) Physical activity, aging and psychological well-being. Journal of Aging and Physical Activity, 3, 67-96.

McPherson B.1999. Population aging and leisure in a global context: factors influencing inclusion and exclusion within and across culture. World Leisure & Recreation, 41, 5-10.

Matsouka, O., Kabitsis, C., Harahousou I., Trigonis, I. (2003). Effects of a Physical Activity Program: The Study of Selected Physical Abilities Among Elderly Women. Journal of Gerontological Nursing, 29, 50-55.

Matsouka, O., Kabitsis, C., Harahousou I., Trigonis, I. (2001) Recording and description of recreational programs and physical activities for the Elderly in the Public Care Institutes for the Elderly. Health and Sport Performance, 4, 332-342.

Meyer, R.D., Goggin N.L., & Jackosn, A.W. (1995). A Comparison of Grip Strength and Selected Psychomotor Performance Measures in Healthy and Frail Elderly Females. Research Quarterly for Exercise and Sport, 66, 1-8.

Mihalko, S.L., & McAuley, E. (1996). "Strength Training Effects on Subjective Well-Being and Physical Function in the Elderly" Journal of Aging and Physical Activity, 4, 56-68.

Nichols J.D., Omizo D.K., Peterson K.K., & Nelson K.P. (1993). "Efficacy of heavy-resistance training for active women over sixty: Muscular strength, body composition, and program adherence" Journal of the American Geriatric Society, 41, 205-210.

Nichols, J. D., Hitzberger, L.M., Sherman, J.G., & Patterson, P. (1995). "Effects of resistance training on muscular strength and functional abilities of community dwelling older adults" Journal of Aging and Physical Activity, 3, 238-250

Osness, W.H., Adrian, M., Clark, B., Hoeger, W., Raab, D., & Wisnell, R. (1990). Functional fitness assessment for adults over 60 years (a field based assessment). Reston, VA: American Alliance for Health. Physical Education Recreation and Dance.

Parkatti, T., Rantanen, T., & Hartkka, K. (1994). The Effect of an Intensive Physical Activity Training Program on Functional Ability Among Frail Elderly People. Physical Activity And Health In The Elderly, Scotland.

Raad D.M., Agre J.C., McAdam M., & Smith E.L. (1988). "Light Resistance and Stretching Exercise in Elderly Women: Effect upon Flexibility" Archives of Physical Medicine and Rehabilitation, 69, 268-272.

Rikli R.E., & Busch S. (1986). "Motor performance of women as a function of age and physical activity level" Journal of Gerontology, 41, 645-649.

Rikli R.E., & Edwards D.J. (1991). "Effects of a Tree-Year Exercise Program on Motor Function and Cognitive Processing in Older Women" Research Quarterly for Exercise and Sport, 62, 61-67.

Spirduso, W.W., & MacRae P.G. (1990). Motor performance and aging. In J. E. Birren & K.W. Schaie (Eds.), Handbook of the psychology of aging (pp. 183-220). New York: Academic Press.

Statistical Yearbook. 1983. Statistical year BOOK. Athens, Greece: Hellenic Republic,National Statistical Service of Greece.

Thomas, S., Reading, J., & Shephard, R.J. (1992). Revision of the Physical Activity Readiness Questionnaire (PAR-Q). Canadian Journal of Sport Science, 17, 338-345.

Valliant PM, Asu ME. (1985). Exercise and its effects on cognition and physiology in older adults. Perceptual and Motors Skills, 61, 1031-8.gram.

Vuori I. (1995). Exercise and physical health: Musculoskeletal health and functional capabilities. Research Quarterly for Exercise and Sport, 66, 276-285.

Wolfson, L., Whipple, R., Derby, C., Judge, J., King, M., Amerman, P., Schmidt, J., & Smyers D. (1996). Balance and Strength training in older adults: intervention gains and tai chi maintenance. Journal of American Geriatric Society, 44, 498-506.

Wong AM, Lin Y-C, Chou S-W, Tang F-T, Wong P-Y. (2001). Coordination exercise and postural stability in elderly people: effect of Tai Chi Chuan. Arch Phys Med Rehabil, 82, 608-12.