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Original Article

Difference and relation between balance, physical fitness and quality of life in retired people living in different geographical regions of Turkey

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Abstract

Aim: The aim of this study was to investigate the relationship and difference between balance, physical fitness and the quality of life in retired people living in different geographical regions of Turkey.

Material and Methods: For balance evaluation Berg Balance Scale, for physical fitness evaluation Senior Fitness Test (Chair Stand Test, Arm Curl Test, 2-Minute Step Test, Chair Sit-and-Reach Test, Back Scratch Test and 8-foot Up-and-Go Test) for quality of life evaluation Short Form (36) Health Survey were administered to 155 retired individuals from seven geographical regions of Turkey (Antalya, Gaziantep, Elazığ, Eskişehir, İstanbul, İzmir, Samsun) For statistical analysis, one-way analysis of variance and Spearman's correlation analysis were used.

Results: A total of 155 individuals aged between 55 and over were included in the study. The mean age of the individuals was 64.23±5.86 years. The results of Berg Balance Scale showed statistically significant differences ($p<0.05$) both between balance score and 8-foot Up-and-Go Test scores in Eskişehir and between the balance score and the results of the Arm Curl Test in Antalya ($p<0.05$). There were no significant differences between regions in the results of the SF-36 assessment of quality of life. A significant positive correlation between Berg Balance Scale score and the scores of Chair Stand, Arm Curl and 2-Minute Step Tests was recorded. Furthermore, Berg Balance Score and 8-foot Up-and-Go score were found to present a negative correlation.

Conclusion: Aging and differences between geographic regions in which individuals live cause deterioration in balance and this situation effects physical fitness. Although participants had different lifestyles, the fact that our evaluation indicated a lack of difference in the quality of life assessment results was pleasing.

Keywords: Aging; balance; physical fitness; quality of life.

INTRODUCTION

Aging is a basic biological process in all living organisms. Over time, there is a gradual decrease in the ability of an organism to adapt to its environment and establish an appropriate balance between the internal and external factors of cell functions. Aging can be examined from two different perspectives. Biological aging is the process of losing the capacity to fulfil basic functions and vitality of the body with age, while demographic aging can be defined as an increase in the proportion of the elderly population within the whole population (1, 2). Retirement age is adopted as the limit of old age due to the emphasis on the economic effects of aging (3). Extensive research evidence indicates that health status plays important role in retirement process. With aging typically brings with it an increasing number of health risks in retired people. Health problems may also deteriorate balance, physical fitness, daily life activities and quality of life in retirees (4).

Balance is the postural adjustment to hold the center of gravity on the support surface during rest and activity. Postural control and balance deteriorate with aging because of changes in the vestibular system, visual

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system and the somatosensory system, making the risk of falls one of the most important causes of the increase in morbidity and mortality in the elderly (5).

Physical fitness includes cardiovascular endurance, muscular endurance, muscle strength, speed, flexibility, agility, balance, reaction time and body composition. Low physical fitness is a risk factor for cardiovascular disorders, osteoporosis, decrease in muscle mass and falls. Improving components such as muscle strength, endurance and flexibility enable the elderly individuals to continue functional movement and provide more active lifestyle and improve quality of life (6,7). To maintain physical function and quality of life, it is important to understand the contribution of aging to functional performance with regard to muscle strength, motor coordination and flexibility. An examination of the literature reveals that there are various studies on the components of physical fitness, especially endurance, strength, balance and flexibility (8,9).

Balance, which is required to preserve the level of physical activity, is related to health parameters such as physical fitness as well as being related to demographic, biological, psychological, social, cultural and physical environment. (10). In all countries, most of the population lives in urban areas with a much smaller proportion living in rural areas. Demographic projections for the year 2025 suggest that 82% of the population of developed countries will live in cities. Majority of the elderly in developed countries live in cities, whereas more than half of the elderly in developing countries live in rural areas. There are significant differences between the living conditions of the elderly living in developed cities and of those residing in rural areas.

Living in different geographical regions, environmental and climatic conditions creates differences in the lives of elderly people, with specific problems arising in physical, biological, social and environmental elements. While numerous studies aiming to evaluate balance, physical fitness and quality of life in elderly individuals can be found in the literature, the number of studies examining the effects of different climactic conditions, various factors regarding physical, biological, physical and social environments, and different geographical regions on balance, physical fitness and quality of life is insufficient. The aim of our study is to investigate the relationship and difference between balance, physical fitness and the quality of life of retired people living in different geographical regions.

MATERIALS and METHODS

We recruited 155 healthy volunteers aged 55 and over, all of whom retired and members of the Turkey Retired Association, living in seven different cities from seven geographical regions of Turkey: Antalya, İzmir, Elazığ, Samsun, Gaziantep, İstanbul and Eskişehir. The sample was determined with simple, random, systematic and stratified sampling methods. The cities were drawn by lot. In order to eliminate perception problems and allow objective interpretation of the results, the Mini Mental State Examination (11,12). was administered to prospective volunteers, and those that had a score lower than 23 were not included (13).

Further exclusion criteria included the use of psychoactive drugs, having orthopaedic or neurological conditions, suffering from serious cardiopulmonary diseases or uncontrollable metabolic problems, or severe vision, hearing or speech disorders (14). The study was approved by the University Ethical Committee (Hacettepe University Medical Research Ethical Committee; chairperson E. Rüştü Onur, MD, Prof.; protocol number LUT 09/39-15; date of approval 15/6/2009), and all participants gave written informed consent.

The Berg Balance Scale (BBS) was developed to assess balance in older adults with functional loss and helps predict the risk of falling. The scale includes 14 general activities and can be administered within approximately 15 - 20 minutes. After the activities are completed, a five-point rating scale, from 0 (unable) to 4 (independent), is used. Each parameter is explained to the individual, who is requested to do every activity. The total score is in the range 0 - 56 and is obtained by summing the scores for all the activities. Higher scores indicate better performance (15).

To determine the level of physical fitness, the *Senior Fitness Test* protocol was used. The *Senior Fitness Test* was developed by Rikli and Jones (16) and consists of a battery of six tests: Chair Stand Test, Arm Curl Test, 2-Minute Step Test, Chair Sit-and-Reach Test, Back Scratch Test and 8-foot Up-and-Go Test.

Chair Stand Test: This test is used to assess lower extremity strength. The subject sits in the middle of the seat, with their feet shoulder width apart, flat on the floor. The arms are to be crossed at the wrists and held close to the chest. From the sitting position, the subject stands completely up, then completely back down, and this is repeated for 30 seconds. The number of complete chair stands (each up and down equaling one stand) is counted.

Arm Curl Test: This test is used to assess upper body strength. There is a slight difference in the weights used for women and men, with women lifting 2.27 kg weights, and men lifting 3.63 kg weights for 30 seconds with their dominant arm side (or stronger side.) Total number of controlled arm curls are counted for scoring.

2-Minute Step Test: This test measures aerobic endurance. The step count in 2 minutes is used for scoring. The subject stands up straight next to the wall while a mark is placed on the wall at the level corresponding to midway between the patella (kneecap) and iliac crest (top of the hip bone). The subject then marches in place for two minutes, lifting the knees to the height of the mark on the wall. Resting and holding onto the wall or a stable chair is allowed.

Chair Sit and Reach Test: This test measures lower body flexibility. The subject sits on the edge a chair (placed

against a wall for safety). One foot must remain flat on the floor. The other leg is extended forward with the knee straight, heel on the floor, and ankle bent at 90°. The subject then is instructed to reach forward toward the toes by bending at the hip. The subject should avoid bouncing or quick movements and never stretch to the point of pain. The distance reached is used for scoring.

Back Scratch Test: This test measures general shoulder range of motion and upper extremity flexibility. This test is done in the standing position. The subjects place one hand behind the head and back over the shoulder, and reach as far as possible down the middle of their back, with their palm touching their body and the fingers directed downwards, while placing the other arm behind their back, palm facing outward and fingers upward and reach up as far as possible attempting to touch or overlap the middle fingers of both hands. The distance of middle fingers from each other, or how much the middle fingers overlap determines the score.

Eight foot Up and Go test: This test measures speed, agility and balance while moving. The subject starts in a chair, and on the command, stands and starts walking steps towards and around the marker and comes back to sit down. The best time out of two trials is used for scoring. (17).

The Short Form (36) Health Survey (SF-36) has been validated and is commonly used for the evaluation of quality of life independent of age, disease or treatment group. The survey includes 36 items that cover eight subscales: physical functioning, physical role limitation, emotional role limitation, bodily pain, social role functioning, mental health, vitality and general health. Along with the overall score, SF-36 also provides two summary scores: The Physical Component and the Mental Component Scores, each comprising of the relevant subscale scores (18, 19).

Statistical Analysis

Statistical analysis was performed using SPSS 23.0 software. The conformity of the variables to normal distribution was analysed by visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). The continuous variables in descriptive analysis were expressed using mean and standard deviation. One-way ANOVA (analysis of variance) test was used to determine whether there were differences between the regions. In order to determine the region that caused the difference according to the analysis of variance results, an independent sample t-test was used. Spearman's correlation analysis was used to evaluate correlations between the variables. Statistical significance was taken as $p<0.05$ (20).

Table 1. Evaluation results of individuals according to regions

	ANTALYA (n=27) Mean±SD	GAZİANTEP (n=24) Mean±SD	ELAZIĞ (n=19) Mean±SD	ESKİŞEHİR (n=20) Mean±SD	İSTANBUL (n=18) Mean±SD	İZMİR (n=27) Mean±SD	SAMSUN (n=20) Mean±SD	F	p
Age (year)	61.88±5.03	61.58±5.12	63.95±5.78	66.75±7.58	66.78±7.77	65.07±5.11	63.65±5.22	2.269	0.140
Height (m)	1.66±0.08	1.64±0.83	1.66±0.05	1.67±0.07	1.66±0.06	1.67±0.07	1.72±0.07	2.135	0.053
Weight (kg)	80.14±11.50	75.13±10.44	74.16±9.02	76.25±13.30	77.78±11.33	73.67±10.54	78.95±11.07	1.018	0.416
Chair Stand (no of stands)	11.44±2.42	10.17±3.52	10.16±2.34	9.75±2.73	10.35±1.83	10.81±3.90	9.65±3.28	0.659	0.683
Arm Curl (no of reps)	12.33±3.14**	8.26±2.49	7.63±2.60	7.15±2.73	7.56±1.67	10.33±3.40	7.58±2.47	11.401	<0.01
2-minute Step Test (no of steps)	31.18±13.36	36.83±18.93	25.68±16.06	28.33±8.78	31.53±8.59	32.74±20.48	35.58±15.01	1.348	0.240
Chair Sit- and-Reach (cm)	-9.48±12.77	-9.17±11.72	-12.63±9.36	-6.60±9.05	-9.06±11.80	-12.04±11.00	-12.20±10.22	0.672	0.672
Back Scratch (cm)	-12.59±13.81	-16.46±10.86	-20.37±11.70	-16.20±12.25	-12.61±6.70	-19.37±12.57	-15.79±9.94	1.302	0.260
8-foot Up-and-Go (sec)	0.80±0.13	0.99±0.23	0.94±0.17	1.06±0.11**	0.90±0.20	0.83±0.16	0.94±0.25	5.548	<0.01
Berg Balance Scale (score)	48.14±2.64	45±3.78	45.79±3.42	41.65±3.66**	43.72±7.45	48.67±2.33	45.20±6.41	9.952	<0.01
SF-36 Mental (score)	59.22±4.67	55.58±4.68	57.26±4.79	58.40±3.66	56.50±5.12	58.33±4.17	56.50±5.47	2.015	0,068
SF-36 Physical (score)	41.29±5.27	39.13±3.87	38.95±3.86	40.55±2.96	39.61±2.89	39.26±3.80	40.85±4.82	1.043	0.400

* p<0.05

RESULTS

A total of 155 individuals aged between 55 and over were included in the study. The mean age of the individuals was 64.23±5.86 years. It was found that there was no statistically significant difference between the groups in terms of age (p>0.05). The results of BBS showed statistically significant differences (p<0.05) in balance and 8-foot up-and-go test scores in Eskişehir as well as arm curl test scores in Antalya (p<0.05). There were no significant differences between regions in the results of the SF-36 assessment of quality of life. The evaluation results of the individuals are shown in Table 1.

There were significant positive correlations between BBS balance score and the score of chair stand, arm curl and 2-minute step tests. A negative correlation between balance score and SFT 8-foot up-and-go test score was also recorded. The correlation results of the parameters are shown in Table 2.

Table 2. The Correlation Analyses of Berg Balance Scale and Senior Fitness Test

	Berg Balance Scale(score)		
	N	Spearman's correlation test	
		r	p
Chair Stand (no of stands)	155	0.542**	<0.01
Arm Curl (no of reps)	155	0.608**	<0.01
2-minute Step Test (no of steps)	155	0.378**	<0.01
Chair Sit-and-Reach (cm)	155	-0.03	0.711
Back Scratch (cm)	155	0.223	0.006
8-foot Up-and-Go (sec)	155	-0.665**	<0.01
SF-36 Mental (score)	155	-0.076	0.348
SF-36 Physical (score)	155	-0.019	0.811

DISCUSSION

In the present study, we investigated the relationship and difference between balance, physical fitness and quality of life among retired people living in different geographical regions of Turkey. As a result of the present study, it was determined that the retired people in Eskişehir have better balance (BBS) and gait (8-foot Up-and-Go Test) performance and in Antalya have better upper extremity muscle strength (Arm curl test) compared to the other regions. In our study, when the quality of life scores were compared, it was seen that there is no difference between regions.

In Turkey, where more than a third of the population lives in rural settlements, the population constitutes a significant portion of our potential. There are important differences between geographical regions in Turkey in terms of the population density of older people. Physical factors (such as climate, landform, sand and soil characteristics) and human factors (such as industrialization, agriculture, natural resources, tourism and transport) play important roles in the formation of these differences. Since the elderly live in different geographical regions with varying environmental and climatic conditions, their quality of life and physical activity levels vary. The difference in the provision of health and social services, education and income levels also contribute to the difference in the aforementioned levels (21). Along with the physiological and biological changes that take place with aging in elderly individuals, a sedentary lifestyle, in addition to an irregular and unbalanced diet and lack of exercise, can lead to a reduction in physical activity levels and functional capacity (22).

Morala et al.(23) have found strong correlation between functional status and place of geographical residence. They found that elderly people living in urban areas have a higher level of physical function and they cited that socio-demographic and environmental factors might explain these effects. In our study significant difference was found in Eskişehir and Antalya.

Balance is the ability to collect sensory an proprioceptive signals related to a person's position in space and to produce the appropriate motor responses to control body movement. Due to the normal aging process this ability deteriorates(24). With aging, insufficient physical fitness occurs due to muscle weakness, decreased muscle mass, poor balance, all causing walking difficulties (25).

Toraman and Yıldırım (26) assessed 60 retired people to investigate the correlation between the level of physical fitness and the risk of falls. The study evaluated cognitive function using the Mini Mental State Examination, balance and falling risk with the Berg Balance Scale, and physical fitness with the Senior Fitness Test. Significant correlations were found between fall risk, muscle strength, aerobic endurance and dynamic balance. Muscle strength and dynamic balance were found to be affected by aging and it was reported that there was correlation between these two factors and aerobic endurance.

Assessing 637 elderly individuals who lived along the Amazon River, Maia Ribeiro et al. (27) investigated the relationship between socioeconomic status, balance and physical fitness. Elderly individuals were divided into two groups according to whether they had a history of falling in the months prior to the study. The researchers evaluated socio-demographic characteristics, body composition, grip strength, physical fitness (using the Senior Fitness Test) and balance (using the Berg Balance Scale). They found little relationship between balance, physical fitness and history of falling. They concluded that the active lifestyles of the evaluated elderly individuals, who lived along the Amazon River, used boats for transportation and took part in physical activities such as fishing and long walks beside the river, contributed to the results of their study. In our study, the results of BBS showed

statistically significant differences in balance scores and 8-foot Up-and-Go test in Eskişehir, and the Arm Curl test in Antalya. It was recorded that retired people in Eskişehir used bicycles for transportation at short distances. It has been determined that balance and coordination of the elderly people in Eskişehir were affected by their choice of transportation positively. The elderly in Antalya stated that they, due to the proximity to the sea, went fishing as a physical exercise, pastime activity and as a means to contribute to their home budget. Therefore, it was concluded that their active daily life contributed to the test results in our study.

In the study performed by Zhao et al. (28) was identified the differences in functional fitness between older adults who were at risk of falling and those were not. 104 older adults aged 65-74 years were included. They were independent older adults without a history of falls in the preceding 12 months. Fall risk status was assessed using the Fall Risk Test. Functional fitness with seven test parameters were evaluated by the Senior Fitness Test. It was emphasized that older adults who are at the early stage of risk of falling have an overall reduced functional fitness capacity, especially in agility and balance, aerobic endurance an upper limb muscle strength. In the 8-foot up test, older adults with deteriorating agility and dynamic balance would indicate a higher probability of falling. Similar to the literature, in our study, there were significant positive correlations between BBS balance score and the score of chair stand, arm curl and 2-minute step tests. A negative correlation between balance score and SFT 8-foot up-and-go test score was also recorded. This result showed that agility and dynamic balance capacity deteriorate with increasing age. In addition, the three significantly reduced physical capacities as found in this study, interventions aimed to improve agility and dynamic balance, aerobic endurance and muscle strength among older adults.

Studies in the literature have reported that the quality of life of elderly people living in different geopraphical area was different. Researchers attributed this difference to causes such as physical function, socio-demographic, environmental factors, education level, economoic level. Wallace et al. (29) reported that elderly living in urban areas better in the physical dimension, but worse in the mental dimensions of the quality of life scale in their study that compared elderly people living in rural and urban areas. Also, other studies have reported physical fitness has similarly been found to be associated with quality of life (30).

Takata et al. (31) evaluated 207 individuals aged 80 years and 85 years to assess differences between quality of life and physical fitness. Quality of life was assessed with SF-36, and physical fitness was evaluated through grip strength, quadriceps force, single leg stance time and walking speed tests. They reported that the level of physical fitness was a stronger factor in predicting the quality of life for 80-year-old individuals than for 85-year-olds. They concluded that if 80-year-old individuals were to follow a program of regular exercise, it would increase not only their level of physical fitness but also their quality of life for five years.

In our study, we assessed quality of life using SF-36; however, our results did not show any significant differences between regions. No difference between the quality of life scores was seen as a satisfactory result. One reason thought to contribute to the lack of difference in these results is that the active members of the Turkey Association of Retirees were included in the study and these individuals actively participated in various activities organized by the aforementioned association. Moreover, it is thought that the age range being 55 - 85 and the number of participants not being equal across the cities led to the result.

We believe that we could obtain more significant results if we could include more individuals in the study as well as more members of other retirement associations for specific occupations, making it easier to represent a larger population of retired individuals.

The differences in the lifestyles in different geographical regions in Turkey affect the physical activity levels of the individuals either positively or negatively. In addition, chronic diseases, functional decline due to age, and inefficiency of activities lead elderly people to a sedentary life. In Turkey, during the retirement period, the lifestyles of individuals show differences depending on the geographical regions. It is very important to determine the level of physical activity in the elderly by taking these differences into account. In order to provide the elderly with a continued independence in their daily lives, an active lifestyle engagement should be encouraged. Providing physiological, psychological and social benefits, such an engagement would lead to a process of aging that is healthier and of a higher quality.

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