DOI: 10.4274/jarem.galenos.2024.44153
J Acad Res Med 2024;14(3):106-14

The Effect of Post-Retirement Activity Status on Balance Functions and Quality-of-Life in Individuals Aged 65 and Over

Ahmet Alperen Akbulut[1], Gökçenur Tokgöz[2], Aslınur Taştepe[2], Simge Nur Baymaz[2], Cansel Keskin[2], Zahra Polat[1]

[1]University of Health Sciences Türkiye, Hamidiye Faculty of Health Sciences, Department of Audiology, İstanbul, Türkiye
[2]University of Health Sciences Türkiye, Hamidiye Faculty of Health Sciences, Department of Audiology, Undergraduate Program, İstanbul, Türkiye

Cite this article as: Akbulut AA, Tokgöz G, Taştepe A, Baymaz SN, Keskin C, Polat Z. The Effect of Post-retirement Activity Status on Balance Functions and Quality-of-Life in Individuals Aged 65 and Over. J Acad Res Med. 2024;14(3):106-14

ABSTRACT

Objective: This study aims to investigate the impact of working (or not working) in a job, as well as being interested in a job, exercise, sports, or other activities, on the physical conditions, balance functions, and social relations of people aged 65 and over.

Methods: A total of 64 people (mean= 68.34 years, standard deviation= 5.51) aged 65 years and older were included in this single center, cross-sectional study, with 32 in each of the active and inactive groups. After audiologic evaluation, the Physical Activity Scale for the Elderly (PASE), Short Form Health Questionnaire version-2.0 Turkish (SF-36v2), and International Falling Efficacy Scale (FES-I) were completed, followed by activities within the scope of the Senior Fitness Test (SFT) and Berg Balance Scale (BBS). Data were presented in detail and compared between the groups.

Results: Significant differences were observed between the groups in terms of PASE ($z=-5.03$, $p<0.001$), FES-I ($z=-3.12$, $p=0.002$) and BBS ($z=-2.69$, $p=0.007$) scores. There were significant differences between the groups in specific subdimensions of SF-36v2, all in favor of the active group ($p<0.05$). Furthermore, participants in the active group performed significantly better in all SFT areas, except SFT IV. The relationships between the BBS, PASE, FES-I, and subdimensions of SF-36v2 and SFT were analyzed and presented in detail.

Conclusion: Older adults who actively engage in a profession or occupation can maintain their balance abilities during the old age. In addition, their mental health may improve due to this active participation, which could help prevent social exclusion.

Keywords: Aging, postural balance, quality of life, accidental falls, daily activities

INTRODUCTION

The concept of "aging" is intricately linked to the inevitability of death and emerges as time progresses. Physical, biological, psychological, social, cultural, and behavioral changes all play a crucial role in it . Conversely, "elderliness" is characterized by the natural process of aging, during which vitality decreases and mortality increases. Individuals 65 years of age and older are commonly referred to as the "elderly population" in both Türkiye and worldwide (1).

An age-related challenge that often arises is difficulty in maintaining balance. Integrating the vestibular, visual, auditory, motor, and higher cerebral systems is necessary for maintaining balance. Balance issues related to aging might occur due to illnesses or as an unavoidable outcome of the normal aging process (2). Age-related degenerative changes in the peripheral and central vestibular systems lead to balance deficits, a primary concern associated with aging. Within this framework, falls and balance issues play a crucial role and necessitate the dissemination of knowledge to older adults (3).

Balance is defined as the ability to control one's center of gravity on the supporting surface in the current sensory environment. To attain the desired posture, balance necessitates not only the coordination and implementation of physical movements, but also the perception and integration of sensory information (4). Advanced neural networks and other complex systems, such as cognitive and musculoskeletal systems, can have diverse impacts on an individual's capacity to maintain balance and

ORCID IDs of the authors: A.A.A. 0000-0002-3273-6632; G.T. 0009-0004-5923-0780; A.T. 0009-0005-4670-899X; S.N.B. 0009-0008-8780-8753; C.K. 0009-0001-7022-4371; Z.P 0000-0001-8384-4302.

Corresponding Author: Ahmet Alperen Akbulut,
E-mail: a.alperenakbulut1@gmail.com

Received Date: 09.06.2024 **Accepted Date:** 11.12.2024

physical functioning (PF). Several studies have documented a decrease in vestibulo-ocular reflex function and postural stability as individuals age. Balance dysfunction is a primary contributor to reduced mobility and postural control in older individuals. It affects the capacity to sustain gait and retain control over balance during everyday tasks (5). Research has indicated that dizziness hampers daily tasks in 30% of individuals aged 70 years. Approximately 30% of elderly individuals experience at least one fall annually, whereas 15% have two or more falls. The annual fall rate for individuals aged 70 years ranged from 32% to 42%. However, for individuals aged 80 years, this rate escalates to 50% (6). Balance difficulties in older individuals can lead to serious morbidity and even mortality due to fall-related injuries, such as hip fractures. Similarly, balance problems have been linked to factors such as reduced self-confidence, reduced social interaction, and feelings of loneliness, anxiety, and embarrassment in older people (7).

Older people who regularly participate in moderate-intensity physical activity are more physically active and healthier than their sedentary counterparts in the elderly population (8). A previous study showed that older people who engage in regular physical activity at a younger age exhibit significantly greater lower body strength and dynamic balance compared to older adults who do not (9). It was also reported that elderly individuals who were physically active showed better body awareness than those who were not physically active (10).

This study specifically examines two theories: disengagement and activity. According to activity theory, an individual's aging process can be improved by replacing and maintaining relationships, responsibilities, and activities that were acquired in middle life but were lost in old age. According to this philosophy, social connections and activities are considered fundamental to life (11). The theory of disengagement, conversely, refers to the phenomenon of individuals becoming detached from society upon retirement. This process should be acknowledged as a typical occurrence that mirrors the natural progression of life (12).

This study aimed to examine the impact of daily activity, employment status after retirement, engagement in an occupation, and interest in sports and exercise on the functionality of the balance system and somatosensory functions in individuals aged 65 years and older. The objective of this study is to examine the impact of engaging in or refraining from activities in daily life on the vestibular system, drawing from the principles of activity and disengagement theories. Additionally, our goal is to examine how these individuals perceive the process of aging, the quality of their social interactions, and the level of satisfaction they derive from these interactions based on their level of activity. The hypothesis of our study posits a correlation between post-retirement employment and/or interest in a vocation and the functionality of the balancing system, as well as the endurance and integrity of the lower and upper extremities in individuals aged 65 and above. Another hypothesis in our study is that working or engaging in an activity after retirement would improve the quality of life (QoL) by promoting healthier social relationships among people aged 65 years and older.

METHODS

Participants

A total of 64 individuals participated in the study, including 21 males and 11 females in the active group [mean (M)=68.0 years, standard deviation (SD)=±5.16] and 13 males and 19 females in the inactive group (M=68.6 years, SD=±5.81) aged 65 years or older. For all participants, being 65 years of age or older, having a standardized mini-mental test score of 24 or higher, having no known or diagnosed neurological or musculoskeletal problems affecting walking and balance, having no diagnosis of hearing and balance problems, and having the physical ability to complete the scales were considered. The study excluded individuals with documented neurological diseases, physical disabilities, visual impairments, a history of orthopedic or ear-related surgeries, vestibular disease or vertigo, communication difficulties caused by psychological problems, and those who lacked the necessary coordination and cooperation to complete the scales. If any item on the scales and/or questionnaires used was left blank or incomplete, the data of those individuals were excluded. Participants were also excluded if they had pure tone average (0.5-1-2-4 kHz) of 25 dB or higher, if there was a significant decrease in hearing thresholds up to 8 kHz, if their speech discrimination score was lower than 88% in either ear, if their tympanogram showed a different type than type A, or if they had eustachian tube dysfunction.

Hearing loss was excluded as a criterion because of its association with balance problems, as highlighted in the literature. Research indicates that hearing loss, particularly sensorineural hearing loss, is linked to increased postural sway, balance impairment, and fall risk (13,14). Excluding individuals with hearing loss ensured that balance-related outcomes in this study were not influenced by auditory-vestibular system dysfunction, allowing us to isolate the effects of activity and inactivity on balance skills in the elderly population.

Table 1 provides comprehensive participant information. The study sample size was calculated using G*Power. Upon determining the power of the study to be 0.80 for a significance level of $p<0.05$, it was concluded that a minimum of 32 individuals should be included in each group.

This study has been supported within the scope of the 2209-A Program conducted by TÜBİTAK, The Department of Science Fellowships and Grant Programs (Project No: 1919B012202667). All procedures in this study were approved by the Ethics Committee of the University of Health Sciences Türkiye, Hamidiye Faculty of Health Sciences (decision No: 25/22, date: 18.11.2022). All participants signed a consent form indicating their voluntary participation. All procedures were conducted in accordance with the Helsinki Declaration (as revised in 2008).

Procedures

This study had a single center, cross-sectional design. After the main researcher provided a brief explanation of the study, the eligibility criteria for individuals who wanted to voluntarily participate in the study were reviewed by all researchers. The participants in the study were divided into two groups, "active" and "inactive," according to their scores on the Physical Activity Scale for the Elderly (PASE) scale, which assesses daily physical activity status, and the information they provided about having a job or a hobby in their daily lives. Participants who reported working or volunteering for primarily sedentary tasks requiring minimal physical effort (e.g., sitting with slight arm movements) were classified as "inactive". In contrast, those whose work or volunteer activities required moderate to high levels of physical effort were classified as "active". Additionally, the average daily work hours were calculated by dividing the total work hours in the previous week by seven to standardize the evaluation of activity levels. This approach ensured a systematic and reproducible classification of physical activity status.

Collection of Data

An information form was designed to gather demographic and descriptive data, including gender, age, height, body weight, body mass index, past physical activity, employment history, current job/occupation, hours spent on the job/occupation, and daily time allocation. The Mini-Mental State Examination tool was used to assess the global cognitive functioning of the participants, and scores of 24 and above were considered normal (15). Acoustic immitancemetry, pure tone audiometry, and speech audiometry were performed to evaluate and confirm normal hearing in all participants. All participants were then asked to complete the questionnaires after audiologic evaluation, followed by activities included in the Senior Fitness Test (SFT) and Berg Balance Scale (BBS).

Pure Tone and Speech Audiometry

Using a clinical audiometer (Madsen Astera2, Otometrics; Denmark) and TDH 39 earphones (Telephonics, Farmingdale, NY), audiometric testing was conducted between 125 and 8000 Hz in a quiet room at IAC standards. The live voice was used to determine the speech discrimination score and speech reception threshold.

Acoustic Immitancemetry

A clinical tympanometry (Clarinet, Inventis; Italy) was used to perform tympanometric examination using a 226-Hz probing tone and acoustic reflex measurements.

Physical Activity Scale for the Elderly

PASE was designed to assess leisure time, housework, and work-related activities among older people (16). The validity and reliability study and cultural adaptation of the Turkish version of the scale were conducted in 2017, demonstrating its applicability to the Turkish elderly population (17). The scale consists of 12 items that evaluate the frequency, duration, and intensity of physical activities over the previous 7 days. Participation in leisure time and strengthening activities is scored based on frequency (e.g., never, 1-2 days/week, 3-4 days/week, or 5-7 days/week) and duration (e.g., less than 1 hour, 1-2 hours, 2-4 hours, or more than 4 hours). Household and work-related activities were scored as yes/no questions, while work-related activities were further quantified in terms of hours per week (16).

Table 1. Characteristics of the study groups

Characteristic		M ± SD (min-max)		Number (percentage)	
		Active group	Inactive group	Active group	Inactive group
Age (year)		68.0±5.16 (60-78)	68.6±5.81 (62-85)		
Body mass index (kg/m^2)		28.3±36.9-20.2 (3.78)	30.21±38.6-25.0 (3.52)		
Sex	Male			21 (65.6)	13 (40.6)
	Female			11 (34.4)	19 (59.4)
Education	Non-literate			2 (6.3)	7 (21.9)
	Primary school			13 (40.6)	11 (34.4)
	Middle school			7 (21.9)	4 (12.5)
	High school			6 (18.7)	5 (15.6)
	College			4 (12.5)	5 (15.6)
Chronic health status	0			17 (53.1)	14 (43.7)
	1			7 (21.9)	8 (25.0)
	2			5 (15.6)	7 (21.9)
	3			3 (9.4)	3 (9.4)
Fall status in the previous 12 months due to dizziness/vertigo	Yes			3 (9.4)	6 (18.7)
	No			29 (90.6)	26 (81.3)

M: mean, SD: standard deviation, min-max: minimum-maximum

J Acad Res Med 2024;14(3):106-14

The PASE score was calculated by multiplying the time spent on each activity or participation in an activity by empirically derived weights and summing these values across all activities. The final score ranged from 0 to 400 or more, with higher scores indicating greater physical activity levels (16).

The primary purpose of the present study was to assess work-related activities in individuals aged 65 years and older. The secondary aim was to question the participants' remaining daily activities to determine the extent of their daily physical activity using a valid scale.

Short Form Health Survey version 2.0

The SF-36v2 was used to assess the relationship between physical and mental health. The survey includes items on perceptions of change in health over the last four weeks and in the last week. A validity and reliability study of the Turkish version was conducted in 1999 (18). SF-36v2 is a survey consisting of 36 questions measuring 8 sub-dimensions of health: PF, role physical (RP), bodily pain (BP), general health (GH), vitality, social functioning (SF), role emotional (RE), and mental health. Each subdimension is rated on a scale of 0-100, with 0 indicating poor health and the lowest possible QoL score and 100 indicating good health and the highest possible QoL (19). The SF-36v2 data were analyzed using the Optum Pro Core program, which was designed to calculate the SF-36v2 survey results.

Falls Efficacy Scale International Questionnaire

The questionnaire, which was first aimed at the American public because of the region in which it was developed, was updated as FES-I to become an international questionnaire and transformed into a scale with outdoor questions (20). A Turkish validity and reliability study was conducted by Ulus et al.(21) in 2012. Questions about fear of falling (FoF) in daily activities were included in the FES-I questionnaire. In the 16-item questionnaire, the participant is expected to self-report each activity by scoring one to four on a scale from "not at all worried" (1 point) to "very worried" (4 points) (20). The FES-I questionnaire was used to investigate the effect of individuals' FoF on their active lives.

Senior Fitness Test

The SFT, developed by Rikli and Jones (22) in 1999 and first published in 2001, is a widely validated tool for assessing the physical fitness of individuals aged 60 years and older.

The assessment evaluates the critical components of functional fitness, including strength, endurance, flexibility, agility, and dynamic balance, which are essential for maintaining independence in daily activities. The SFT consists of six specific tests, each designed to measure a particular aspect of physical fitness. Lower body strength was assessed using the 30-s chair stand test, in which participants repeatedly rose from and sat down on a chair within 30 s. Upper body strength was evaluated using the 30-s arm curl test, which counts the number of bicep curls completed with weights of 5 lb (2.27 kg) for women and 8 lb (3.63 kg) for men. Aerobic endurance was measured using either the 2-min step test, which recorded the number of steps completed, or the 6-min walk test, which measured the total distance walked. Flexibility was assessed using the chair sit-and-reach test for lower body flexibility and the back scratch test for upper body flexibility. Finally, agility and dynamic balance were measured using the 8-foot up-and-go test, in which participants were required to stand up from a seated position, walk 8 feet, and return to the chair (22).

Each component of the SFT was scored individually, and normative data derived from extensive studies provided benchmarks for interpreting the results according to age and gender. The SFT is practical for both research and clinical settings, requires minimal equipment and expertise, and is well-suited for use with older adults, including those with mild cognitive impairment (22).

In this study, the SFT was used to assess how an active or inactive lifestyle impacts the physical fitness parameters of individuals aged 65 years and older, offering valuable insights into their functional abilities. The tests used to assess these parameters and included in the SFT are: 30-second chair stand test (SFT-I), 30-s arm curl test (SFT-II), 2-min step test (SFT-III), chair sit and reach test (SFT-IV), back scratch test (SFT-V), and foot up and go test (SFT-VI) (22).

Berg Balance Scale

BBS was developed to measure balance performance in the geriatric population and is often used in clinical trials to assess postural control and predict fall risk (23). Therefore, the BBS scale was used to assess the balance performance of the participants according to their lifestyle. The validity and reliability of the BBS, which has been used in many studies related to balance and falls in the elderly, was evaluated in 2008 (24). In this scale, patients are asked to perform certain activities, and the duration and/or number of repetitions are recorded. The scale consists of 14 items that are scored from 0 to 4 and sum to a total score of 0 to 56, with higher scores indicating better balance. Studies have found that low BBS scores predict the onset of the inability to perform important activities of daily living, and patients with a score of 40 or less are at high risk of falling and require appropriate referral (25).

Statistical Analysis

Statistical analyses were performed using IBM SPSS 24.0 (SPSS Inc., Chicago, IL). The descriptive statistics are reported as means and SDs for normally distributed variables and as medians and interquartile ranges for non-normally distributed variables, along with numbers and frequencies. The Shapiro-Wilk test was performed using the 95% confidence interval to test the normal distribution of the groups. The independent group t-test was used to compare normally distributed data, and the Mann-Whitney U Test was used to compare non-normally distributed data. To account for multiple comparisons in analyses involving SF-36 subscales and SFT subtests, Bonferroni correction was applied. The significance thresholds were adjusted accordingly to reduce the risk of type 1 errors. The results were considered

J Acad Res Med 2024;14(3):106-14

significant when the p-values were below the corrected threshold. The FES-I, PASE, and BBS scores were not normally distributed in the normality test; thus, correlation coefficients and statistical significance were calculated using Spearman's correlation analysis. The results were considered significant when p-0.05.

RESULTS

Participant Characteristics

The t-test revealed no significant differences in age (p>0.05) or body mass index (p>0.05) between the active and inactive groups. The chi-square test was conducted to assess whether the groups were homogeneous in terms of sex. The results did not indicate a significant difference between the groups [χ^2(1, N=64)=3.07, p=0.080], suggesting that the groups were homogeneous with respect to sex.

Physical Activity and Balance Performance

According to Mann-Whitney U test, significant differences were observed between the active and inactive groups in terms of PASE (z=-5.03, p<0.001), FES-I (z=-3.12, p=0.002) and BBS (z=-2.69, p=0.007) scores (Table 2). These results remained significant after the Bonferroni correction.

Quality of Life Outcomes

To determine any group differences in SF-36v2 scores, a Mann-Whitney U test was performed. The SF-36v2 PF (z=-2.93, p=0.003), SF-36v2 RP (z=-2.67, p=0.008), and SF-36v2 BP (z=-2.98, p=0.003) showed significant differences between the active and inactive groups after Bonferroni correction (adjusted threshold: p<0.0125). However, the SF-36v2 RE subscale (z=-2.05, p=0.040) did not remain significant after correction (Table 3).

Table 2. Comparison of the active and inactive groups on the PASE, FES-I, and BBS scales

		Median (IQR)	Min;Max	Mean rank	Z-value	p-value
PASE	Active group (n=32)	224.00 (147.00)	66.00-522.00	40.17	-5.029	0.000
	Inactive group (n=32)	104.50 (60.00)	2.00-196.00	18.36		
FES-I	Active group (n=32)	17 (2.00)	16-22	18.95	-3.119	0.002
	Inactive group (n=32)	19 (4.25)	16-35	32.28		
BBS	Active group (n=32)	55.00 (4.00)	44-56	34.00	-2.690	0.007
	Inactive group (n=32)	51.00 (6.75)	21-56	22.41		

PASE: Physical Activity Scale for the Elderly, FES-I: Falls Efficacy Scale International Questionnaire; BBS: Berg Balance Scale, IQR: interquartile range
Note: Bonferroni correction was applied to account for multiple comparisons among the PASE, FES-I, and BBS scales. The corrected significance value was set as p<0.017 (α=0.05/3=0.017)

Table 3. Comparison of 8 sub-dimensions of SF-36v2 between active (n=32) and inactive (n=32) groups

		Median (IQR)	Min;Max	Mean rank	Z-value	p-value
PF	Active group	95.00 (15.00)	40.00-100.00	34.60	-2.92	0.003
	Inactive group	80.00 (30.00)	30.00-100.00	22.02		
RP	Active group	100.00 (0.00)	0.00-100.00	33.24	-2.67	0.008
	Inactive group	75.00 (75.00)	0.00-100.00	22.91		
BP	Active group	90.00 (10.00)	60.00-100.00	34.74	-2.98	0.003
	Inactive group	58.00 (55.00)	10.00-100.00	21.92		
GH	Active group	75.00 (25.00)	25.00-100.00	31.43	-1.69	0.090
	Inactive group	60.00 (37.50)	5.00-100.00	24.09		
VT	Active group	65.00 (40.00)	0.00-100.00	31.88	-1.86	0.062
	Inactive group	45.00 (47.50)	0.00-95.00	23.80		
SF	Active group	100.00 (12.00)	63.00-100.00	31.24	-1.79	0.073
	Inactive group	94.00 (37.00)	0.00-100.00	24.22		
RE	Active group	100.00 (33.00)	0.00-100.00	31.83	-2.05	0.040
	Inactive group	67.00 (75.25)	0.00-100.00	23.83		
MH	Active group	80.00 (24.00)	12.00-100.00	31.05	-1.55	0.121
	Inactive group	68.00 (25.00)	4.00-96.00	24.34		

PF: physical functioning, RP: physical role, BP: bodily pain, GH: general health, VT: vitality, SF: social functioning, RE: emotional role, MH, mental health, IQR: interquartile range
Note: Bonferroni correction was applied to account for multiple comparisons across the eight subdimensions of the SF-36v2 (PF, RP, BP, GH, VT, SF, RE, MH). The corrected significance value was set as p<0.0125 (α=0.05/4=0.0125) for the four subdimensions showing significant p-values before correction

J Acad Res Med 2024;14(3):106-14

Senior Fitness Test Results

A Mann-Whitney U test was conducted to determine any differences in SFT scores between the groups. Results showed that SFT I (z=-3.22, p=0.001), SFT III (z=-2.74, p=0.006), and SFT VI (z=-2.81, p=0.005) remained significant after Bonferroni correction (adjusted threshold: p<0.010). However, SFT II (z=-2.08, p=0.038) and SFT V (z=-2.13, p=0.032) were no longer significant (Table 4).

Gender-Based Differences

A Mann-Whitney U test was performed to determine whether the scores differed between sexes. The results indicated significant differences between male and female participants in terms of FES-I (z=-3.28, p=0.001), BBS (z=-3.82, p<0.001), PASE (z=-2.65, p=0.008), SF36 PF (z=-3.34, p<0.001), and SFT VI (z=-2.18, p=0.029), all in favor of male participants. These differences remained significant after the Bonferroni correction.

Correlation Analysis

The relationships between the BBS, PASE, FES-I, and subdimensions of SF-36v2 and SFT were analyzed, and the results are shown in Table 5. The results indicate a moderate negative correlation between FES-I and BBS (r=-0.449, p<0.01), and strong negative correlations between FES-I and the SF-36v2 sub-dimensions PF (r=-0.516, p<0.001) and GH (r=-0.560, p<0.001). Additionally, a strong positive correlation was found between BBS and PASE (r=0.504, p<0.001), while very strong positive correlations were observed between BBS and SF-36v2 subdimensions PF (r=0.638, p<0.001) and BP (r=0.476, p<0.001). Furthermore, SFT subdimensions I, II, and III showed moderate to strong positive correlations with BBS, ranging from 0.423 to 0.531, all at p<0.001. Moderate to strong correlations remained significant after Bonferroni correction.

DISCUSSION

This study investigated the effects of employment status and engagement in activities such as job involvement, exercise, and sports on the physical well-being and balance systems of adults aged 65 years and above. By incorporating the principles of activity and disengagement theories, we aimed to investigate the correlation between these elements and their impact on individuals' involvement with society and social connections, particularly in respect to the significance of maintaining an active lifestyle.

The results of our study suggest that adults aged 65 years who engage in physical activity have better balance, strength, and overall QoL compared with those who are inactive. These findings align with previous research that demonstrated the beneficial effects of physical activity on balance, muscle strength, and overall QoL in older individuals (26).

In this study, we discovered a statistically significant negative correlation between FES-I scores and SF-36v2 scores among individuals 65 years of age and older. This finding is consistent with those of earlier studies and implies that a higher FoF may be linked to a lower QoL in older people. This evidence, in our opinion, supports the theory that FoF not only causes physical restrictions but also has a significant negative influence on psychological well-being, which is crucial for overall QoL. In addition, prior studies corroborate our findings and demonstrate that FoF among older individuals has a significant influence on their emotional and physical well-being (27). Additionally, we discovered that there might be a persistent trend independent of the cultural environment when we compared our findings with those of other studies. A study conducted in Norway discovered a similar association between FoF and lower self-reported health, suggesting that this phenomenon may be prevalent

Table 4. Comparison of SFT sub-tests between active (n=32) and inactive (n=32) groups

		Median (IQR)	Min;Max	Mean rank	Z-value	p-value
SFT-I	Active group	13.00 (6.00)	7.00-21.00	35.38	-3.215	0.001
	Inactive group	9.00 (3.25)	5.00-20.00	21.50		
SFT-II	Active group	16.00 (6.00)	7.00-24.00	32.43	-2.080	0.038
	Inactive group	14.00 (5.25)	4.00-20.00	23.44		
SFT-III	Active group	186.00 (123.00)	77.00-329.00	34.19	-2.746	0.006
	Inactive group	113.50 (84.75)	0.00-274.00	22.28		
SFT-IV	Active group	-4.00 (9.00)	-16.00-0.00	28.52	-0.594	0.553
	Inactive group	-6.00 (14.62)	-29.00-0.00	26.00		
SFT-V	Active group	-12.00 (10.00)	-34.00-0.00	32.60	-2.139	0.032
	Inactive group	-18.25 (15.25)	-38.50--6.00	23.33		
SFT-VI	Active group	7.83 (1.63)	4.40-15.31	19.62	-2.819	0.005
	Inactive group	9.68 (3.23)	6.90-21.30	31.84		

SFT-I: 30-second chair stand test, SFT-II: 30-second arm curl test, SFT-III: 2-minute step test, SFT-IV: chair sit and reach test, SFT-V: back scratch test, SFT-VI: foot up and go test, IQR: interquartile range
Note: Bonferroni correction was applied to account for multiple comparisons across the six SFT sub-tests (SFT-I, SFT-II, SFT-III, SFT-IV, SFT-V, SFT-VI). The corrected significance value was set as p<0.010 (α=0.05/5=0.010) for the five sub-tests with p-values below 0.05 before correction

Table 5. Correlation analysis of the BBS, PASE, FES-I, SF-36v2 and SFT

Variables		FES-I	BBS	SFT						PASE
				I	II	III	IV	V	VI	
BBS		-0.449**	-	0.434**	0.423**	0.531***	0.120	0.266	-0.681***	0.504***
SF-36v2	PF	-0.516***	0.638***	0.557***	0.506***	0.603***	0.438***	0.184	-0.568***	0.324*
	RP	-0.451**	0.284*	0.304*	0.424**	0.422**	0.217	0.167	-0.333*	0.322*
	RE	-0.372**	0.187	0.308*	0.256	0.359**	0.258	0.078	-0.292*	0.241
	VT	-0.453**	0.436**	0.171	0.227	0.407**	0.389**	0.144	-0.354**	0.330*
	MH	-0.358**	0.388**	0.153	0.208	0.349*	0.343*	-0.032	-0.220	0.222
	SF	-0.371**	0.289*	0.315*	0.301*	0.388**	0.356**	0.152	-0.379**	0.277*
	BP	-0.461**	0.476***	0.463***	0.423**	0.503***	0.409**	0.071	-0.435**	0.339*
	GH	-0.560***	0.366**	0.256	0.232	0.269	0.204	0.119	-0.312*	0.270
PASE		-0.309*	0.504***	0.300*	0.363**	0.365*	0.044	0.435**	-0.424**	-
FES-I		-	-0.446**	-0.321*	-0.224	-0.476***	-0.178	0.028	0.385**	-0.309*

PF: physical functioning, RP: role physical, BP: bodily pain, GH: general health, VT: vitality, SF: social functioning, RE: role emotional, MH: mental health, SFT-I: 30-second chair stand test, SFT-II: 30-second arm curl test, SFT-III: 2-minute step test, SFT-IV: chair sit and reach test, SFT-V: back scratch test, SFT-VI: foot up and go test, PASE: Physical Activity Scale for the Elderly, FES-I: Falls Efficacy Scale International Questionnaire; BBS: Berg Balance Scale, SF-36v2: Short Form Health Survey version-2.0 Turkish.
Note: Bonferroni correction was applied to account for multiple correlation analyses among the BBS, PASE, FES-I, SF-36v2 sub-dimensions, and SFT sub-tests. The corrected significance values were adjusted based on the total number of pairwise correlations tested.
*p<0.05, **p<0.01, ***p<0.001

among the senior population and goes beyond national and cultural boundaries (28). We believe that this link, which has been demonstrated in the elderly Turkish population, is present in a variety of social norms and health systems.

Our study revealed a significant negative correlation between the FES-I and specific SFT items, such as the 2-minute walk test and the 30-second chair stand test. Conversely, a positive association appears to exist between the stand-and-reach test and the FES-I. These results are in line with those of Donat Tuna et al., (29) who showed that higher levels of physical activity are associated with better lower body strength and dynamics in the younger elderly population (29). Similar to Donat Tuna et al.'s (29) study on the effects of exercise on physical activity levels and lower body function, our findings suggest that an active lifestyle may have a protective effect against FoF by preserving flexibility and endurance in the lower body. These abilities are crucial for maintaining balance and physical mobility, and they may reduce the likelihood of falls and associated fear. Our research indicates that SFT not only represents physical abilities but also encompasses a psychological aspect associated with FoF. Therefore, older people who participate in physical activities may experience improvements in balance and muscle functions, which may ultimately lessen their FoF and possibly create a positive feedback cycle that encourages them to engage in activities and feel confident in their physical abilities.

Our research revealed notable relationships among PASE, FES-I, and BBS. These results support the idea that regular physical activity is linked to improved balance and reduced FoF.

The analyses of our study revealed a notable negative relationship between BBS scores and FES-I among participants in the active group. This result can be attributed to the notion that individuals who frequently participate in physical activities tend to exhibit improved muscle function and balance, thereby reducing their FoF. This implies a clear correlation between enhanced balance and decreased FoF. People who scored higher on the BBS, which evaluates balance functions, expressed less FoF. This finding is consistent with other research that emphasizes the importance of balance abilities in influencing psychological FoF (30). The enhanced proprioception, muscle strength, and reaction times of the active group may have been a result of their active lifestyle, all of which are essential components of balance maintenance. By reducing the FoF, we not only prevent actual falls but also enhance QoL. This is crucial because fear can lead to limitations in physical activities and social disengagement.

The results indicate significant disparities between the SF-36v2 and BBS scores of the active and inactive groups. This finding supports the concept that physically active elderly adults possess more robust balance systems, thereby enhancing their overall QoL. Our results are consistent with those of previous studies showing a link between increased physical activity and higher BBS scores, indicating better balance control in the elderly (31). Additionally, our findings align with research suggesting that an active lifestyle is directly related to improvements in health-related QoL, as measured by the SF-36v2 (32). Therefore, consistent with prior studies, our findings suggest that engaging in physical activity provides several health benefits that encompass various aspects of an individual's life and improves both mental and physical well-being.

J Acad Res Med 2024;14(3):106-14

Study Limitations

Our study primarily relied on BBS and questionnaires, such as PASE and FES-I, for balance assessment. While useful, these tools are subjective and may not capture the full extent of variations in balance function among elderly individuals. The inclusion of objective balance assessment methods, such as video head impulse test, videonystagmography, positional tests, and caloric tests, would have strengthened the study by providing more comprehensive and precise evaluations of the participants' balance functions.

The study population was relatively homogeneous in terms of age and health status, excluding individuals with significant neurological, musculoskeletal, or balance disorders. While necessary to control for confounding factors, this selection criterion may limit the applicability of the findings to the general elderly population. Future research should include a more diverse sample to enhance the external validity of the results.

Although the PASE provided an overview of the participants' physical activity levels, detailed information on the specific types and intensities of activities was not collected. Gaining insight into the activities that have the greatest impact on enhancing balance and QoL would be valuable. Furthermore, the potential influence of culturally specific activities, such as religious practices, cycling, and rural living, which may indirectly support physical activity, was not evaluated. Including these factors in future research could provide clearer insights into their role, particularly within the Turkish population. Future studies should also include detailed activity logs or use wearable technology to monitor and analyze activity patterns more precisely.

Additionally, the cross-sectional design of this study limits the ability to establish causal relationships between physical activity, balance, QoL, and FoF. Longitudinal studies are needed to assess the effects of changes in physical activity over time on these outcomes and to better understand the mechanisms underlying these outcomes.

By addressing these limitations, future research can build on the current study's findings, providing more robust evidence and deeper insights into the impact of physical activity on balance and QoL in elderly individuals.

CONCLUSION

Our findings suggest that elderly people who remain actively employed in a profession or occupation may be able to preserve their balancing abilities as they age. To counteract the decline associated with aging, preventive measures should be adopted, such as participating in regular physical activity programs, acquiring knowledge about health concerns, receiving nutritional assistance, implementing fall prevention techniques, enhancing social engagement, and undergoing regular health screenings. Furthermore, these measures can significantly contribute to improving balance and, consequently, the overall QoL of this population. Consequently, this could lead to reduced healthcare costs and diminished societal impact associated with balance-related conditions.

Validated instruments and questionnaires for assessing activities of daily living, hearing, balance, and cognition are an important part of geriatric assessment . Implementing a multifactor risk assessment, providing treatment for hearing impairments, engaging in regular exercise, and creating an appropriate home environment can effectively decrease the occurrence of falls resulting from unsteadiness.

Ethics

Ethics Committee Approval: All procedures in this study were approved by the Ethics Committee of the University of Health Sciences Türkiye, Hamidiye Faculty of Health Sciences (decision No: 25/22, date: 18.11.2022).

Informed Consent: All participants signed a consent form indicating their voluntary participation.

Footnotes

Author Contributions: Concept - A.A.A.; G.T.; A.T.; Design - A.A.A.; G.T.; Z.P; Data Collection and/or Processing - G.T.; A.T.; S.N.B.; C.K.; Analysis and/or Interpretation - A.A.A.; Z.P; Literature Search - A.A.A.; G.T.; A.T.; S.N.B.; C.K.; Writing - A.A.A.

Conflict of Interest: The authors have no conflict of interest to declare.

Financial Disclosure: This study has been supported within the scope of the 2209-A Program conducted by TÜBİTAK, The Department of Science Fellowships and Grant Programs (Project No: 1919B012202667).

REFERENCES

1. Rudnicka E, Napierała P, Podfigurna A, Męczekalski B, Smolarczyk R, Grymowicz M. The World Health Organization (WHO) approach to healthy ageing. Maturitas. 2020; 139: 6-11.
2. Özsoy G, Özsoy İ, İlçin N, Tekin N, Savcı S. Yaşlı bireylerde denge, fonksiyonel egzersiz kapasitesi ve periferal kas kuvveti arasındaki ilişki. SDÜ Sağlık Bilimleri Dergisi. 2017; 8: 28-32.
3. Gencer G, Yagmur G, İpek L, Kara DS, Uzun F, Çetin SY. Türkiye'de yaşlılarda düşme ve denge ile ilgili yapılmış çalışmaların incelenmesi. Yaşlı Sorunları Araştırma Dergisi. 2021; 14: 70-83.
4. Horak FB. Clinical assessment of balance disorders. Gait & Posture. 1997; 6: 76-84.
5. Agrawal Y, Merfeld DM, Horak FB, Redfern MS, Manor B, Westlake KP, et al. Aging, vestibular function, and balance: proceedings of a national institute on aging/national institute on deafness and other communication disorders workshop. J Gerontol A Biol Sci Med Sci. 2020; 75: 2471-80.
6. Jahn K. The aging vestibular system: dizziness and imbalance in the elderly. Adv Otorhinolaryngol. 2019; 82: 143-9.
7. Newsted D, Bale D, Armstrong M, Beyea MM, Simpson MTW, Gill SS, et al. How to identify balance disorders and reduce fall risk. J Fam Pract. 2022; 71: 20-30.
8. Raipure A, Kasatwar P. The effects of nintendo wii fit on postural balance control training in the geriatric population: a review. Cureus. 2022; 14: e31420. Published 2022 Nov 12.
9. Sarto F, Pizzichemi M, Chiossi F, Bisiacchi PS, Franchi MV, Narici MV, et al. Physical active lifestyle promotes static and dynamic balance performance in young and older adults. Front Physiol. 2022; 13: 986881. Published 2022 Aug 17.
10. Vatansever ÖM. Farklı fiziksel aktivite düzeylerindeki sağlıklı bireylerde vücut farkındalığı ile denge ve postür arasındaki ilişkinin incelenmesi: Sağlık Bilimleri Enstitüsü; 2018.
11. Havighurst RJ, Albrecht R. Older people. New York: Longmans, Green; 1953.

12. Coleman P. Cumming E, Henry W. Growing old: the process of disengagement. Basic Books, New York, 1961. (Reprint: Arno, New York, 1979, ISBN 0405 118147.). Ageing and Society. 2008; 11: 217-20.
13. Horowitz G, Ungar OJ, Levit Y, Himmelfarb M, Handzel O. The impact of conductive hearing loss on balance. Clin Otolaryngol. 2020; 45: 106-10.
14. Ciquinato DSA, Doi MY, Silva RAD, Oliveira MR, Gil AWO, Marchiori LLM. Posturographic analysis in the elderly with and without sensorineural hearing loss. Int Arch Otorhinolaryngol. 2020; 24: e496-502.
15. Güngen C, Ertan T, Eker E, Yaşar R, Engin F. Reliability and validity of the standardized Mini Mental State Examination in the diagnosis of mild dementia in Turkish population. Turk Psikiyatri Derg. 2002; 13:273-81.
16. Washburn RA, Smith KW, Jette AM, Janney CA. The Physical Activity Scale For the Elderly (PASE): development and evaluation. J Clin Epidemiol. 1993; 46: 153-62.
17. Ayvat E, Kilinç M, Kirdi N. The Turkish version of the Physical Activity Scale For the Elderly (PASE): its cultural adaptation, validation, and reliability. Turkish Journal of Medical Sciences. 2017; 47: 908-15.
18. Koçyiğit H, Aydemir Ö, Fişek G, Ölmez N, Memiş AK. Form-36 (KF-36)'nın Türkçe versiyonunun güvenilirliği ve geçerliliği. Ilaç ve tedavi dergisi. 1999; 12: 102-6.
19. Je W, Snow K, Kosinski M. SF-36 health survey: manual and interpretation guide Boston. MA, The Health Institute, New England Medical Center; 1993.
20. Yardley L, Beyer N, Hauer K, Kempen G, Piot-Ziegler C, Todd C. Development and initial validation of the Falls Efficacy Scale-International (FES-I). Age Ageing. 2005; 34: 614-9.
21. Ulus Y, Durmus D, Akyol Y, Terzi Y, Bilgici A, Kuru O. Reliability and validity of the Turkish version of the Falls Efficacy Scale International (FES-I) in community-dwelling older persons. Arch Gerontol Geriatr. 2012; 54: 429-33.
22. Rikli RE, Jones CJ. Senior fitness test manual. Human kinetics; 2013.
23. Berg K, Wood-Dauphinee S, Williams JI. The Balance Scale: reliability assessment with elderly residents and patients with an acute stroke. Scand J Rehabil Med. 1995; 27: 27-36.
24. Sahin F, Yilmaz F, Ozmaden A, Kotevoglu N, Sahin T, Kuran B. Reliability and validity of the Turkish version of the Berg Balance Scale. J Geriatr Phys Ther. 2008; 31: 32-7.
25. Downs S. The Berg Balance Scale. J Physiother. 2015; 61: 46.
26. Gerards M, Marcellis R, Senden R, Poeze M, de Bie R, Meijer K, et al. The effect of perturbation-based balance training on balance control and fear of falling in older adults: a single-blind randomised controlled trial. BMC Geriatr. 2023; 23: 305.
27. Schoene D, Heller C, Aung YN, Sieber CC, Kemmler W, Freiberger E. A systematic review on the influence of fear of falling on quality of life in older people: is there a role for falls? Clin Interv Aging. 2019; 14: 701-19. Published 2019 Apr 24.
28. Bjerk M, Brovold T, Skelton DA, Bergland A. Associations between health-related quality of life, physical function and fear of falling in older fallers receiving home care. BMC Geriatr. 2018; 18: 253. Published 2018 Oct 22.
29. Donat Tuna H, Ozcan Edeer A, Malkoc M, Aksakoglu G. Effect of age and physical activity level on functional fitness in older adults. European Review of Aging and Physical Activity. 2009; 6: 99-106.
30. Ulus Y, Akyol Y, Tander B, Durmuş D, Bilgici A, Kuru O. The relationship between fear of falling and balance in community-dwelling older people. Türk Geriatri Dergisi. 2013; 16: 260-5.
31. Dunsky A. The effect of balance and coordination exercises on quality of life in older adults: a mini-review. Front Aging Neurosci. 2019; 11: 318. Published 2019 Nov 15.
32. Aung TNN, Moolphate S, Koyanagi Y, Angkurawaranon C, Supakankunti S, Yuasa M, et al. Determinants of health-related quality of life among community-dwelling Thai older adults in Chiang Mai, Northern Thailand. Risk Manag Healthc Policy. 2022; 15: 1761-74. Published 2022 Sep 20.