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THE EFFECT OF GENDER AND LIVING PLACE ON THE NUMBER OF FALLS, THE RISK OF FALLING, THE FEAR OF FALLING AND BALANCE OVER 65 YEARS OF AGE

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Abstract: This study was carried out to investigate the effect of gender and living place on the number of falls, the risk of falling, the fear of falling, and balance of older people. A total of 148 volunter elderly individuals (59 women and 89 men living in a nursing home and home) participated in this study. According to the 2X2 ANOVA analysis results; gender showed a statistically significant effect on the number of falls (df = (1, 140), F = 5,777, p = .018), fear of falling (df= (1, 140), F=4,609, p=.034), risk of falling (df= (1, 140), F=5,999, p=.016), functional reach test scores (df= (1, 140), F=10,866, p=.001). Older women were more likely to fall than older men, had a higher risk of falling, fear of falling, and a poorer balance. Living place was showed statistically significant effect on fear of falling (df= (1, 140), F=36,854, p=.000), risk of falling (1, 140), F=5,750, p=.018). While elderly people living in the house had more fear of falling than the elderly living in the nursing home, the older people living in the nursing home had a higher risk of falling than those living at home. Gender*living place interaction had a significant effect on fear of falling (df= (1,140), F=12,056, p=.001). It was observed that both older men and women living at home had more fear of falling than older men and women living at nursing homes. According to Independent Sample t test; Functional reach test scores (balance skills) were found to be higher in the elderly who had a low fall risk. In conlusion; to prevent falls and to take precautions, the risk of falls, fear of falling and balance skills of the elderly should be monitored on a regular basis.

Keywords: Aging, Fall-Risk, Fear of Falling, Balance, Gender, Living Place.

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INTRODUCTION

Old age is a concept that involves age-related changes different systems of the body. Even in a natural process, as a result of changes in age, people are faced with problems and risks that are different and higher than in the young age group. One of the most important of these is the falls, which are also the cause of high mortality and morbidity for this age group (Karatas and Maral, 2001).

Falls are common in the elderly. 30% of individuals over 65 years of age and 50% of individuals over 80 years of age are likely to fall. Falls are the fifth leading cause of elderly deaths (Paul, 2018). Falls occur every year in 30-60% of adults, and 10-20% of them result in injury, hospitalization and death (Rubenstein, 2006). Five percent of fallen elders has large injuries such as femur neck fracture, subdural hematoma etc. (Paul, 2018).

Some physical, emotional and social problems caused by aging lead to an increase in the frequency of falls. In addition to personal factors such as muscle weakness with ageing, gait disturbances, visual disturbances and imbalances, environmental factors such as poor lighting, slippery surfaces and staircases also contribute to falling (T.C. Saglik Bakanligi Temel Saglik Hizmetleri Genel Mudurlugu, 2011). Rubenstein and Josephson (2002) investigated sixteen articles in literature and found that lower extremity weakness, previous falls, walking loss, balance loss, assistive device use, visual loss, arthritis, deterioration in daily activities, depression, cognitive impairment and age over 80 were risk factors for falls (Rubenstein ve Josephson, 2002). Sampaio et al. (2013) reported that increased waist circumference may be

considered an important risk factor for falls in elderly adults in Brazil. It also suggests that hand grip strength is used as potential screening tools for falling in Japanese older adults. Smee et al. (2012) reported that decreases in physiological characteristics such as muscle strength with ageing may increase the risk of falls. After the fall, 30-40% of fallen elders have a fear of falling and restrict their activities (Paul, 2018). The study was shown that most of older people living in a society with or without previous falls had a fear of falling (Jung, 2008; Abyad and Hammami, 2017). Fear of falling causes physical and psychological problems. Even though there are a large number of older adults who have suffered severe consequences of fear of falling, the definiton of fear of falling is still unclear and needs clarification (Abyad and Hammami, 2017).

The fear of falling, characterized by walking related to anxiety and the concern of the individuals being able to fall, is usually a common result of falling or weak balance. Fear of falling leads to restrictions on certain forms of activity, loss of fitness, loss of movement. Fear of falling and falls are an important threat to socialization, independence, morbidity and mortality. Identification of persons under the risk of falling also determines persons who have fear of falling (Harding and Gardner, 2009). Tinetti et al. (1990) conceptualized the fear of falling as a low self-efficacy perception in avoidance of falls during essential non-hazardous activities in everyday life. Young and Williams (2015) claimed that the effect of fear of falling on the risk of falling was stem from the changes in the allocation of attention and changes in motor control. Hadjistavropoulos et al. (2011) contributed a new conceptualization of the relationship between falling and fear of falling. They reported that the fear of falling was originated from an individuals' belief about his/her own abilities to ensure balance in combination with other contributors such as falls history or beliefs. Fear of falling is one of the most common psychological consequences of falls, common among older people. It causes numerious advers effects (Hoang et al. 2017). Fear of falling for older people is a risk factor for falls (Gazibara et al. 2017). Besides, falls and recurrent falls can cause of fear of falling in the elderly. One of the greatest results of falls among the elderly is the reduction of self-efficacy in some daily activities (Irez, 2014). Falling reduces the quality of life for the elderly. As well as decreasing the functional independence, fear of falling and social isolation develops in fallen elders (Prata and Scheicher, 2017). Smee et al. (2012) suggested that falls were a destructive effect on quality of life and freedom. They also showed that falls led to inactivity, even greater reduction in functional capacity an more need for assisted living. Costa et al. (2012) have shown that 51.8% of older people who have a fear of falling and live alone restrict their activities. Curcio et al. (2009) conducted a study on 1668 physically active older people living in the community, they showed that 83.3% of older people had a fear of falling and 52.2% of them restricted their activities because of fear of falling. The older people who restricted their activities due to the fear of falling had significantly a higher probability of falling due to recurrent falls and injured falls.

Young and Williams (2015) reported that the fear of falling in the elderly had an adverse effect on balance performance. Another study, according to Thiamwong and Suwanno (2017) balance disorder is an important risk factor for falls and fear of falling. The older people with balance disorder had more than three quarts of fear of falling than those without balance disorder. As a result of examining the 12 studies in literature by Rubenstein and Josephson (2002) reported that balance disorders were the cause of the second significant fall in elderly individuals' falls. Another study was conducted by Tuunainen et al. (2014) found that vertigo and poor postural stability were the main causes of falls in active ages and also postural control in ageing process was shifted to open loop control (visual, prospective, extroception and vestibular) rather than closed loop control which was a factor causing the falls. Balance performance is usually

measured using a combination of tests involving different aspects of equilibrium while standing or walking (Vereeck et al. 2008). Standing balance is necessary to ensure everyday activities that can be carried out safely and efficiently. The Functional Reach Test (FRT), first described at the beginning of the 1990s (Duncan et al. 1990; Duncan et al. 1992), is one of the standing balance tests used in various pathologies and medical conditions for the elderly and adults (Bohannon et al. 2017). FRT evaluates forward stability by extending the arm as long as possible in the horizontal plane of an individual who stands by touching the ground with both feet (Duncan et al. 1990). The Functional Reach test, developed as a clinical equilibrium assessment tool, is widely used to assess balance function and fall risk in elderly people (Kamide et al. 2012).

Identification and improvement of risk factors for falls in the elderly significantly reduces the number of future falls (Rubenstein, 2006). Gazibara et al. (2017) stated that it is very important to determine the risk factors for falls in the planning of fall prevention programs. Given the destructive effect of the falls on the health and well-being of the elderly, the identification of risk factors for falls and a better understanding of potential gender differences provide important information in terms of guiding targeted prevention strategies (Chang and Do, 2015). The determination and comparison of the number of falls, fall-risk, fear of falling and balance performance of older people according to gender and living place are important contributions to prevent future falls and to improve these parameters. Therefore, this study is important. This study was conducted to investigate whether gender and living place (home and nursing home) have any effect on the number of falls, falling risk, fear of falling and balance performance.

MATERIAL VE METHODS

This is a cross-sectional design study. A total of 148 elderly volunteers (59 women, 89 men) who live in a home and nursing home in Muğla Province, who didn't have any neurological disease and didn't undergo a surgery before, participated in this study. Two groups attended in this study. While the first sample group consisting of elderly people living in the home consisted of elderly people residing in Kotekli and Yeniköy districts in Muğla, the second sample of the elderly living in the nursing home consisted of the elderly living in the Nursing Home Aged Care and Rehabilitation Center in Muğla.

The number of falls in the last 6 months of the elderly participating in the study was recorded by the question and answer method. Downton (1993) fall-risk index was used to determine to fall-risk of older people. For fear of falling, International Falling Effectiveness Questionnaire which was developed by Yardley et al. (2005), the Turkish reliability and validity of this questionnaire was carried out by Ulus et al. (2012), was used. Balance performance of older people was measured by Functional Reach Test.

Data Collection Tools

Body Weight and Height: The weights were measured with an electronic scale of 0.01 kg sensitivity, the heights were measured with a tape measure. The data were written on the information form as centimetres and kilogram (Gunay et al., 2013: 580). BMI was calculated as body mass in kilograms divided by height in meters squared (kg/m^2).

The number of Self-Reported Falls: The number of self-reported falls in the last 6 months of older people participating in the study were recorded. The elderly volunteers who participated

in the study responded to the question "Did you fall in the previous 6 months?" The elderly people who did not have any fall events gave a "0" answer to question. Fallen elders indicated the number (Gadelha et al. 2018).

The Downton Fall Risk Index: The Downton fall risk index is used as a useful tool for estimating falls among seniors (Rosendahl et al. 2003). This index contains detailed risk factors for falls and so, It has a good content validity. At the same time, It is also easy to implement older people. In this study, the fall risk index developed by Downton (1993) was used to determine the risk of falling elderly individuals. The index consists of evaluation sub-dimensions such as known prior falls, drug use status, sensory loss, mental status and walking style. The total score of the index items is between 0-11. People who have three or more scores have a high fall-risk (Downtown, 1993)

Fear of falling: International Falling Effectiveness Questionnaire which was developed by Yardley et al. (2005), the Turkish reliability and validity of this questionnaire was carried out by Ulus et al. (2012), was used. This questionnaire is a self-report questionnaire about the fear of falling during activities during daily life. The questionnaire consists of 16 items of 4 Likert type (1= no worrying, 4= worrying). The total score ranges from 16 (no worries) to 64 (extremely worried).

Functional Reach Test (FRT): FRT is a valid and reliable test developed by Duncan et al. (1990) that measures the ability to extend forward from a bilateral posture, used for clinical measurement of balance. This test only measures anterior and posterior dynamic stability. The inter-rater reliability of the test was 0.98, the intra-rater reliability of the test was 0.92, and the test-retest reliability was measured in healthy subjects (Duncan et al. 1990). The elderly individuals were asked to stand on the side of the wall and later, they were required to hold their arm 90 degrees in flexion close to the wall. In this position, the third finger alignment was marked on the wall. They were required to extend forward as far as possible without stepping, losing balance, protecting arm position without touching the wall. at the end point, the third finger alignment was re-marked. The distance between two marks was recorded in "centimetres". This measurement was repeated three times and the averages of the measurements were used for statistical analysis (Katz-Leurer et al., 2009).

Collection of Data

The data were collected by 3 graduate students and researchers. The measurements of the first and second group were performed in the nursing home and in their home, respectively. For the participants in both sample groups were firstly given detailed information about the content and methodological model of the study. Then, elderly individuals who wanted to participate voluntarily were identified. Firstly, height and body weight measurements of the volunteers were performed. Then, for the elderly living both at home and at a nursing home, the functional reach test measures were determined by a tape measure which was mounted on the wall. After the measurements were completed, the questionnaire forms were filled with face-to-face interview technique in a quiet and calm environment.

Analysis of Data

The obtained data from the study were recorded in SPSS (22.0) program. The Shapiro-Wilk test was used to determine whether the data showed a normal distribution or not. According to the Shapiro-Wilk test result, the data were found to be a normal distribution. A 2X2 ANOVA test was conducted to examine the effect of gender and living place on the number of falls, fear of falling, fall risk and functional reach test scores. Bonferroni test was used when there were pairwise comparisons. The frequency and percentage values were calculated to evaluate the fall

risk scores of the elderly according to the fall risk index developed by Downton (1993), and chi-square analysis was performed to find differences according to gender. In addition, the Independent Sample t test was used in evaluating the number of falls, the fear of falling, and the functional reach test scores according to the fall risk. The significance level was accepted as $p < 0.05$

RESULTS

Table 1. Age, body weight and height values of the older people living at home and nursing homes

Variables	Living place	N	Mean± S.D.
Age (years)	Nursing home	40	73.30±8.16
	Home	108	69.15±8.67
Body Weight (kg)	Nursing home	40	69.62±18.63
	Home	108	72.92±12.18
Height (cm)	Nursing home	40	155.57±10.69
	Home	108	164.92±7.99
Body Mass Index (kg/m^2)	Nursing home	40	29,08±9,20
	Home	108	26,81±4,17

Table 2. Gender x Living Place on Number of Falls

Gender	Living Place	Mean	S. D.	N
Women	Nursing home	,41	,79	18
	Home	,53	,91	41
	Total	,50	,87	59
Men	Nursing home	,18	,39	22
	Home	,15	,53	67
	Total	,15	,50	89
Total	Nursing home	,28	,60	40
	Home	,29	,71	108
	Total	,29	,68	148

As seen Table 2, gender had a statistically significant effect on the number of falls (df = (1, 140), F = 5,777, p = .018). As a result of the pairwise comparison for gender effect, women had more falls than men. It was observed that no significant effect on the number of falls in living place (df= (1, 140), F=.141, p=.708) and gender*living place interaction (df= (1,140), F=.374, p=.542). Corrected model= partial eta squared = .062.

Table 3. Gender x Living Place on Fear of falling

Gender	Living Place	Mean	S. D.	N
Women	Nursing home	22,82	6,32	18
	Home	46,02	15,82	41
	Total	38,98	17,33	59
Men	Nursing home	26,04	8,24	22
	Home	32,36	13,14	67
	Total	30,78	12,37	89
Total	Nursing home	24,64	7,55	40
	Home	37,43	15,60	108
	Total	33,97	14,99	148

Table 3 shows that gender had a statistically significant effect on fear of falling (df= (1, 140), F=4,609, p=.034). According to the pairwise comparison for gender effect; the scores of women were found to be higher than men. Living place (df= (1, 140), F=36,854, p=.000) and gender*living place interaction (df= (1,140), F=12,056, p=.001) had a significant effect on fear of falling. According to the pairwise comparison for living place effect; -elderly people living at home had more fear of falling than elderly people living nursing home. As a result of Gender x Living place intereaction effect, it was observed that both women and men living at home had more fear of falling than men and women living in nursing homes. Corrected model= partial eta squared = .290

Table 4. Gender x Living Place on Fall-Risk

Gender	Living Place	Mean	S. D.	N
Women	Nursing home	4,05	1,47	18
	Home	3,51	1,27	41
	Total	3,67	1,34	59
Men	Nursing home	3,50	1,33	22
	Home	2,84	1,27	67
	Total	3,01	1,31	89
Total	Nursing home	3,74	1,40	40
	Home	3,09	1,31	108
	Total	3,27	1,36	148

Table 4 shows that gender (df= (1, 140), F=5,999, p=.016) and living place (df= (1, 140), F=5,750, p=.018) had a statistically significant effect on fall-risk, respectively. The scores of fall-risks in older women were found to be higher than older men. It was found that older people living at nursing home had a greater risk of falling than older people living at home. No significant Gender x Living Place interaction effect was found in Fall-Risk (df= (1,140), F=.045, p=.833). Corrected model= partial eta squared = .097.

Table 5. Gender x Living Place on Functional Reach Test Scores

Gender	Living Place	Mean	S. D.	N
Women	Nursing home	25,05	8,09	18
	Home	26,10	7,21	41
	Total	25,78	7,43	59
Men	Nursing home	31,52	9,03	22
	Home	29,75	8,18	67
	Total	30,19	8,38	89
Total	Nursing home	28,70	9,12	40
	Home	28,40	8,00	108
	Total	28,48	8,28	148

As seen in Table 5, It was found that gender had a significant effect on functional reach test scores (df= (1, 140), F=10,866, p=.001). According to the Bonferroni test, the functional reach test scores of older men were found to be higher as compaired with older women. No significant Living Place (df= (1, 140), F=,055, p=.815) and Gender x Living Place interaction (df= (1,140), F=.837, p=.362) effect was found in Functional Reach Test Scores. Corrected model= partial eta squared = .055.

Table 6. Frequency, Percentage values and Chi-square results in older people's fall risk according to gender and Downton Fall Risk Index

		Gender		Total
		Women	Men	
High Risk	f	48	55	103
	%	46,6%	53,4%	100,0%
Low Risk	f	11	34	45
	%	24,4%	75,6%	100,0%
Total	f	59	89	148
	%	39,9%	60,1%	100,0%

X^2=6,414, df=1, p=.009

As shown in Table 6, It was found that relationship was found between the assessment result of the risk of falls according to Downton (1993) and gender (X^2=6,414, df=1, p=.009). 46,60% of older women and 53,40% of older men had a high risk of falling while 24,40% of older women and 75,60% of older men had a low risk of falling.

Table 7. Comparision of the number of falls, fear of falling and functional reach test scores of older people according to fall risk

	Fall Risk	N	Mean	S.D.	t	p
Number of falls (adet)	High Risk	103	,30	,72	,835	,405
	Low Risk	45	,20	,54		
Fear of falling	High Risk	103	33,65	15,79	,374	,709
	Low Risk	45	32,62	14,38		
Functional Reach Test (cm)	High Risk	103	27,56	8,52	-2,035	,044*
	Low Risk	45	30,54	7,39		

As seen in Table 7, when the fear of falling and functional reach test scores of older people were evaluated according to fall risk, the statistically significant difference was only found in functional reach test scores ($p<0.05$). The older peole who had a low risk of falling had higher functional reach test score.

DISCUSSION

This study was conducted to examine the effect of gender and living place on a number of falls, fall risk, fear of falling and functional reach test scores. The results of the analysis, significant differences were found in the titles below.

Fear of falling and fall risk according to the living place

Falls are an important clinical problem affecting 30-40% of older people living in community aged 65 and over and 50% of older people living in the nursing home (Barban et al. 2017). According to the results of Family Structure Study (2016) was conducted by Turkey Statistical Institute in cooperation with the Ministry of Family and Social Policy, as the reason to prefer staying at nursing home, 20.2% of older people stated that the possibilities in the nursing homes were better and more comfortable. White et al. (2018) reported that having high body mass, low physical functioning, visual impairment, joint pain, and fatigue are significant risk factors for falls. Dhargave and Sendhilkumar (2016) have shown that the risk factors such as poor vision, chronic conditions, dizziness, dysbalance, fear of falling, and previous falls are significantly associated with falls.

According to the results of this study, it was observed that the living place had a significant effect on the risk of falling and the fear of falling ($p<0.05$). It was found that elderly people living at home had more fear of falling and risk of falling than elderly people living at a nursing home. In additon, the risk of falling of the elderly people living in the nursing home was found to be higher as compared with the elderly people who lived at home. Gender x Living place interaction had a statistically significant effect on fear of falling. According to pairwise comparision, it was observed that both older women and older men living at home had more fear of falling than older men and older women living in nursing homes.

The study was done by Zhou et al. (2018) on 1290 older people aged 60-98 years showed that living alone was associated with a greater number of falls in previous years. Soyuer et al. (2015) stated that fear of falling in the older people living at nursing home is an important health problem and also stated that there are many factors associated with fear of falling such as age, gender, use of assistive devices, activities of daily living, balance, mobility and depression (Soyuer et al. 2015). Costa et al. (2012) reported that elderly individuals living alone had more

fear of falling. The study was conducted by Gazibara et al. (2017) on 354 elderly people over 65 years of age, they found that 15.8% had fallen in the last 6 months, and 81.8% of fallen elders lived in an apartment with an average of two people. This study showed that older people living at nursing home had a higher fall risk than those living at home although they had a lower fear of falling. In this study, the Downton fall risk index, which was applied to the older people, includes the intrinsic factors from the fall risk factors. This fall index does not include factors that are extrinsic by falling risk factors. The older people who lived in the nursing home had a greater risk of falling and less fear of falling as compared with older people who lived the home. This can be explained by the having higher self-confidence level of the older people living in the nursing home.

Number of Falls, Fall Risk, Fear of Falling, Functional Reach Test according to Gender

According to the results of the study, there was a statistically significant gender effect on a number of falls, the risk of falling, fear of falling and functional reach test scores ($p<0.05$). As a result of the pairwise comparison for gender effect; older women had more fear of falling than older men, had a lower risk of falling, and had lower functional reach scores. In literature, there are studies in parallel with the results of this research (Suzuki et al. 1997; Yamagiwa et al. 2011; Chang and Do, 2015; Dhargave and Sendhilkumar 2016).

Horton (2007) examined gender and fall risk from a sociological point of view. He found that older men perceive themselves as "responsible"and "rational individual" in reducing the fall risk, while older women tend to blame themselves and the others for falls. He also emphasized that the perception of the elders about fall risk very important in preventing future falls. The study was conducted by Tran and Phan (2018) on 6553 women and 5442 men over 65 years of aged revealed that elderly women suffering from serious psychological distress have fallen in a higher proportion than men. He indicated that it is important to help elderly women cope with depression and stress to prevent falls. He also emphasized that mental health services and practices may be useful in preventing older women from falling. Jiang et al. (2016) stated that older men had more belief and confidence that they could do daily activities such as dressing, bathing, crossing the road as compared with older women. They stated that the reason for this was related to the genetic back ground, habitat, and life-style. They also found that older women had more depressive symptoms than older men. Tomita et al. (2018) stated that older women were more likely to fall than older men. They also showed that advanced age, the number of falls in previous years, pain were related to the fear of falling in Japan elderly adults. They reported that it is important to maintain physical functioning and pain management for older adults with having fear of falling. Kumar et al. (2014) conducted a study on 1088 elderly over 65 years of age, showed that older people with a having high risk of falling had a high fear of falling at the same time. Agudelo-Botero et al. (2018) reported that the percentage of falls were found to be higher in older women as compared with older men. They found a strong relationship between continual falls and being a woman. They also found a strong relationship between occassional falls and advanced age, poor perception of their health status, pain limiting activity, depression, limitations in basic activities in daily life. Soyuer et al. (2015) stated that 65-year-old male elderly residents had less fear of falling than male elderly residents while performing daily activities, and that they had more confidence in themselves. They also indicated that the reason why older women had more fear of falling was associated with the greater rate of falls. Costa et al. (2012) showed that women had a higher fear of falling than men, and therefore restricted their activities more. Gadelha et al. (2018) found that fear of falling scores of falling elders were 28.61 ± 7.10 and fear of falling scores of non-falling elders were 26.47 ± 7.53 in the 246 elderly women living in the community with a mean age of 68.1 ± 6.2 years. Muscle quality (strength per unit of muscle mass) was found to be lower in falling

elders as compared with non-falling elders. In addition, they also reported that muscle quality was associated with adverse outcomes of a falling risk and muscle quality might help other muscle indices in assessing the risk of falling. Irez (2014) investigated fear of falling of older people aged 60-85 years living in the community or at home and found that fear of falling of older women and men were 42.12±15.03 and 34.30±9.34, respectively. Jeon et al. (2017) and Gazibara et al. (2017) showed that fear of falling scores was found to be higher in falling elders. Gazibara et al. (2017) also found that fear of falling was higher in older women than older men. Aibar-Almazan et al. (2018) found a significant relationship between previous falls and fear of falling, the risk of falling, balance performance. They also reported that the fear of falling and the risk of falling were high in depressed older people. Duray and Genc (2017) reported that older people with higher levels of physical activity had less fear of falling than those with lower levels of physical activity while doing daily activities.

Balance Performance according to Gender

According to the results of this research; it was found that gender had a significant effect on the functional reach test score ($p < 0.05$). The functional reach test score of older men (30,19 ± 8,38 cm) was found to be significantly higher as compared with older women (25,78 ± 7,43 cm). Sousa et al. (2017) found that functional reach score of 19 older people aged 65-79 years was 31.6 ± 6.6 cm. Duncan et al. (1993) reported the functional reach test scores for men aged 41-69 was 14.9 ± 2.2 cm, and 13.8 ± 2.2 cm for women; functional reach test scores for men aged 70-87 years was 13.2 ± 1.6cm and 10.5 ± 3.5cm for women. Bohannon et al. (2017) found that the overall mean functional reach distance was 27.5 ± 7.2 cm in the infinity study. The INFINITY study and 20 other studies contributed to the 29 functional reach test summary data sets from 7535 elderly people. The weight averages (standard error) for functional reach test score from all studies were 27.2 ± 0.9 cm. For the 95% confidence interval, this value was 25.5 to 28.9 cm. In Bohannon et al. (2017) INFINITY study, the overall mean functional extension distance was 27.5 ± 7.2 cm. They reported that these values provided a reasonable standard for interpreting functional reach performance of elderly individuals. Kamide et al., (2012) conducted a meta-analysis of 19 articles including 4274 participants with a mean age range of 69.0 to 81.4 and found the reference value of functional reach test score of Japanese older people by using the random effect model as 29.44 cm (95% confidence interval: 27.60-31.27 cm). In addition, the result of multivariate weighted least squares regression, functional react test scores were independently associated with gender, age, height and method of measurement (one-arm, two-arm reach). Vereeck et al. (2008) reported that older women performed worse in balance tests than older men. Hageman et al. (1995) found that gender had a significant effect on functional reach measurements. It was found that the taller men had higher functional reach test scores than shorter women. There was no statistically significant difference between the genders when functional reach test values were normalized according to height. Schultz et al. (1997) stated that older women had approximately 1.5-2 times more fall and disability rates as compared with older men. In addition, the reason of gender differences in balance performance was attributed to differences in muscle strength and muscle contraction speed after the initiation of contraction rather than the neural factors underlying motor planning that led to sensory processing and muscle contraction. Koyuncu et al. (2017), in their research on the elderly, stated that the problem of balance in older women was higher than older men. This was explained by the fact that men had higher muscle strength than women. Even in studies in the literature, female gender was stated as a risk factor for falls (Oh et al., 2017; Gazibara et al., 2017; Agudelo-Botero et al., 2018)

Balance skills according to the risk of falling

The maintenance and control of postural balance are important for daily living activities; the poor postural balance is a predictor of future falls (Howcroft et al. 2017). Aging negatively affects muscle strength, neuromuscular coordination, postural stability the structural features of bone and cause a decrease in the functional ability of the elderly such as walking and balance. The deterioration in balance and walking ability increases the risk of falling in elderly individuals (Atay and Akdeniz, 2011). A statistically significant difference was found when the risk of falling and functional reach test scores of the elderly were compared according to the fall risk. There were 103 elderly with a high risk of falling and 45 elderly with a low risk of falling. There was a certain relationship between gender and the assessment of the risk of falls according to Downton (1993) (X2=6,414, df=1, p=.009). 46,60% of the older women and 53,40% of the older men had a high risk of falling; it was observed that% 24-40 of the elderly women and 75,60% of the elderly men had a low risk of falling.

Older people with a low risk of falling (30.54±7,39 cm) were found to have higher functional reach test scores as compared with elderly people with high fall risk (27,56±8,52 cm). Moreira et al. (2016) reported that the functional reach test scores of older people with a low risk of falling and who had not a previous fall (23.5 cm) were found to be significantly higher than people with a low risk of falling and who had a previous fall (20.8 cm). In addition, the functional reach test scores were found to be higher in the elderly group with a low risk of falling. They suggested that elderly people who had a high risk of falling should be evaluated using predictive postural correction tests. Sampaio et al., (2013) stated that balance performances of the falling individuals were found to be worse. The study was done on 163 older men and women who were in long-term care homes aged 60-95 years, by Dhargave and Sendhilkumar (2016) showed that older people with a low risk of falling according to the Long-Term Fall Risk Assessment form had better balance performance than the older people with a high risk of falling. Zhou et al., (2018), in their study of 1290 older people aged between 60-98 years, showed that having poor balance skills was associated with a greater number of falls in previous years. Smee et al. (2012) showed a strong relationship between fall risk and physical functioning. They stated that ageing and risk of falling were related to each other as well as many physical disorders such as decreased balance, muscle weakness. In a study conducted by Koyuncu et al. (2017), they found that balance disorder was more prominent in older people with a history of falls. Jeon et al. (2017) showed that dynamic and static balance performance of the older people who had previous falls were found to be better than older people who had not previous falls. Toosizadeh et al. (2018) reported that low intensity vibration applications to ankle muscles improved the balance performance in the elderly and decreased the risk of unexpected falls in elderly people with high fall risk.

CONCLUSION

In conclusion, older women were more likely to fall than older men, had a higher risk of falling, fear of falling, and a poorer balance. The older people who lived in the nursing home had a greater risk of falling and less fear of falling as compared with older people who lived the home. This can be explained by the having higher self-confidence level of the older people living in the nursing home. In addition, it can also be linked to the better environment of the nursing home. One of the results should be emphasized especially in this study that both male and female elderly people living at home had a higher fear of falling than those living in a nursing home. The reason for this; the elderly people may feel more confidence themselves because of the security measures in the nursing home. Furthermore, the elderly people living in the home may have a more intense feeling of loneliness, so it may trigger more fear of falling. It can be said that the social interaction between the elderly people in the nursing home has a positive effect on the fear of falling.

In this study, the Downton fall risk index applied to elderly people includes intrinsic factors from falling risk factors. Therefore, this index contains questions related to existing shortcomings such as previous falls, drug use, sensory loss, mental state, and walking style in older people. According to the evaluation of this index; 103 elderly individuals had a high risk of falling and 45 elderly individuals had a low risk of falling. Elderly people with high risk of falling were also found to have impaired balance skills. It has been observed in the study that having one or more of the above mentioned deficiencies may have a negative effect on balance.

RECOMMENDATIONS AND LIMITATIONS

In this study, the Downton fall risk index applied to the elderly includes intrinsic factors from falling risk factors. This is one of the limitations of the study. In addition, psychological characteristics of the elderly such as self-confidence, self-efficacy, and depression could also be determined in this study. In future studies, it is considered that the evaluation of the older people's fall risk in terms of both intrinsic and extrinsic factors will be more important with regard to giving more accurate information. In addition, as well as functional reach test, different balance tests (Time-Up Go, Tinetti, Romberg) can be applied to older people in future studies. Also one of the limitations of this study, the physical activity level of the elderly people could be determined. In future studies, the effect of physical activity, health and skill-related to physical fitness elements can be investigated on a number of falls, the risk of falling, fear of falling and balance skills. Elderly people living at home were not asked whether they lived alone or with their parents. This is among the limitations of the study

Duray and Genc (2017), Kirkwood (2018), Svantesson et al. (2015) stated that increase in the level of physical activity and the development of health-related physical fitness elements have a positive effect on the fear of falling, the risk of falling and falls by improving the confidence of the elderly. Based on these results, it is thought that being physically active is one of the most effective methods for a good quality of life. Elderly people are recommended to regularly perform physical activity, muscle-bone strengthening activities and balance exercises in order to decrease the number of falls, minimize the risks of falling, prevent fears of falling, improve their balance skills and improve their quality of life.

REFERENCES

1. Abyad A, Hammami SO (2017): Fear of falling in the elderly an emerging syndrome. Middle East Journal of Age and Ageing, 14(3), 16-25.
2. Agudelo-Botero M, Giraldo-Rodriguez L, Murillo-Gonzalez JC, et al. (2018): Factors associated with occasional and recurrent falls in Mexican community-dwelling older people. PLoS One, 13(2), 1-12. doi:10.1371/journal.pone.0192926
3. Aibar-Almazan A, Martinez-Amat A, Cruz-Diaz D et al. (2018): Sarcopenia and sarcopenic obesity in Spanish community-dwelling middle-aged and older women: Association with balance confidence, fear of falling and fall risk. Maturitas, 107, 26-32.
4. Atay E, Akdeniz M (2011): Yaslılarda dusme, dusme korkusu ve bedensel etkinlik. GeroFam, 2(1), 11-28.
5. Barban F, Annicchiarico R, Melideo M, et al. (2017): Reducing fall risk with combined motor and cognitive training in elderly fallers. Brain Sciences, 7(2), 1-19. Doi:10.3390/brainsci7020019
6. Bohannon RW, Wolfson LI, White WB (2017): Functional reach of older adults: normative reference values based on new and published data. Physiotherapy, 103(4), 387-391.
7. Chang VC, Do MT (2015): Risk factors for falls among seniors: implications of gender. American Journal of Epidemiology, 181(7), 521-531.
8. Costa ME, Pepersack T, Godin I, et al. (2012): Fear of falling and associated activity restriction in older people. results of a cross-sectional study conducted in a Belgian town. Arch Public Health, 70(1), 1-8.

9. Curcio CL, Gomez F, Reyes-Ortiz CA (2009): Activity restriction related to fear of falling among older people in the Colombian Andes mountains: are functional or psychosocial risk factors more important? Journal of Aging and Health, 21(3), 460-479.
10. Dhargave P, Sendhilkumar R (2016): Prevalence of risk factors for falls among elderly people living in long-term care homes. Journal of Clinical Gerontology and Geriatrics, 7(3), 99-103.
11. Downton JH (1993): Falls in the elderly. London: Edward Arnold.
12. Duncan PW, Studenski S, Chandler J, et al. (1992): Functional reach: predictive validity in a sample of elderly male veterans. Journal of Gerontology, 47(3), 93-98.
13. Duncan PW, Weiner DK, Chandler, et al. (1990): Functional reach: a new clinical measure of balance. Journal of gerontology, 45(6), 192-197.
14. Duray M, Genc A (2017): The relationship between physical fitness and falling risk and fear of falling in community-dwelling elderly people with different physical activity levels. Turkish Journal of Medical Sciences, 47(2), 455-462.
15. Family Structure Study (2016): Turkey Statistical Institute. Retrived from http://www.tuik.gov.tr/PreHaberBultenleri.do?id=24644.
16. Gadelha AB, Neri SGR, Nobrega OT, et al. (2018): Muscle quality is associated with dynamic balance, fear of falling, and falls in older women. Experimental Gerontology. 104, 1–6. https://doi.org/10.1016/j.exger.2018.01.003
17. Gazibara T, Kurtagic I, Kisic-Tepavcevic D, et al. (2017): Falls, risk factors and fear of falling among persons older than 65 years of age. Psychogeriatrics, 17(4), 215-223.
18. Gunay M, Tamer K, Cicioglu I (2013): Spor fizyolojisi ve performans olcumu (3 baski). Ankara: Gazi kitapevi.
19. Hadjistavropoulos T, Delbaere K, Fitzgerald TD (2011): Reconceptualizing the role of fear of falling and balance confidence in fall risk. Journal of Aging and Health, 23(1), 3-23.
20. Hageman PA, Leibowitz JM, Blanke D (1995): Age and gender effects on postural control measures. Archives of Physical Medicine and Rehabilitation, 76(10), 961-965.
21. Harding S, Gardner A (2009): Fear of falling (Scholarly paper). Australian Journal of Advanced Nursing, 27(1), 94-100
22. Hoang OTT, Jullamate P, Piphatvanitcha N, et al. (2017): Factors related to fear of falling among community-dwelling older adults. Journal of Clinical Nursing, 26(1-2), 68-76.
23. Horton K (2007): Gender and the risk of falling: a sociological approach. Journal of Advanced Nursing, 57(1), 69-76.
24. Howcroft J, Lemaire ED, Kofman J, et al. (2017): Elderly fall risk prediction using static posturography. PLoS One, 12(2). doi:10.1371/journal.pone.0172398
25. Irez GB (2014): Identifying Falls efficacy and number of falls in older adults of Turkish population. International Journal of Science Culture and Sport, 2(3), 89-94.
26. Jeon M, Gu MO, Yim J (2017): Comparison of walking, muscle strength, balance, and fear of falling between repeated fall group, one-time fall group, and nonfall group of the elderly receiving home care service. Asian Nursing Research., 11(4), 290-296
27. Jiang XY, Chen Y, Yang ML, et al. (2016): Predictors of falls efficacy scale responses among nursing home residents in China. International Journal of Nursing Sciences, 3(1), 24-28.
28. Jung D (2008): Fear of falling in older adults: Comprehensive review. Asian Nursing Research, 2(4), 214-222.
29. Kamide N, Takahashi-Narita K, Kawamura A, et al. (2012): Determination of the reference value and systematic bias of the functional reach test in Japanese elderly people by meta-analysis. Journal of Clinical Gerontology and Geriatrics, 3(4), 122-126.
30. Katz-Leurer M, Fisher I, Neeb M, et al. (2009): Reliability and validity of the modified functional reach test at the sub-acute stage post-stroke. Disabil Rehabil., 31(3), 243-248.
31. Karatas GK, Maral I (2001): Ankara-Golbasi ilcesinde geriatrik populasyonda 6 aylik donemde dusme sikligi ve dusme icin risk faktorleri. Turkish Journal of Geriatrics, 4(4), 152-158.
32. Kirkwood RN (2018): Increased physical activity in older adults is associated with decreased fear of falling. Evidence-based nursing, 21(2), 52-52. http://dx.doi.org/10.1136/eb-2018-102868.
33. Koyuncu G, Tuna F, Yavuz S, et al. (2017): The last station before fracture: Assessment of falling and loss of balance in elderly. Turkish Journal of Physical Medicine and Rehabilitation, 63(1), 14-22.
34. Kumar A, Carpenter H, Morris R, et al. (2014): Which factors are associated with fear of falling in community-dwelling older people? Age and Ageing, 43(1), 76-84.
35. Moreira MN, Bilton TL, Dias RC, et al. (2016): What are the main physical functioning factors associated with falls among older people with different perceived fall risk? Physiotherapy Research International, 22(3). Doi: 10.1002/pri.1664

36. Oh E, Hong GRS, Lee S, et al. (2017): Fear of falling and its predictors among community-living older adults in Korea. Aging & Mental Health, 21(4), 369-378.
37. Paul S (2018): Falls: prevention and management. In Geriatric Medicine (pp. 109-119). Singapore: Springer.
38. Prata MG, Scheicher ME (2017): Relationship between fear of falling and quality of life in older women fallers fear of falling and quality of life in older. MOJ Gerontology & Geriat. 1(5), 128-131. Doi:10.15406/mojgg.2017.01.00027
39. Rosendahl E, Lundin-Olsson L, Kallin K, et al. (2003): Prediction of falls among older people in residential care facilities by the Downton index. Aging Clinical and Experimental Research, 15(2), 142-147.
40. Rubenstein LZ (2006): Falls in older people: epidemiology, risk factors and strategies for prevention. Age and Ageing, 35(2), 37-41.
41. Rubenstein LZ, Josephson KR (2002): The epidemiology of falls and syncope. Clinics in Geriatric Medicine, 18(2), 141-158.
42. Saglik Bakanligi Temel Saglik Hizmetleri Genel Mudurlugu (2011): Yasli Sagliği Modulleri. Ankara: Anil Matbaacilik
43. Sampaio RAC, Sampaio PYS, Yamada M, et al. (2013): Factors associated with falls in active older adults in Japan and Brazil. Journal of Clinical Gerontology and Geriatrics, 4(3), 89-92.
44. Schultz AB, Ashton-Miller JA, Alexander NB (1997): What leads to age and gender differences in balance maintenance and recovery? Muscle Nerve, 5, 60-64.
45. Smee DJ, Anson JM, Waddington GS, et al. (2012): Association between physical functionality and falls risk in community-living older adults. Current Gerontology and Geriatrics Research, 1-6. doi:10.1155/2012/864516
46. Sousa N, Mendes R, Silva A, et al. (2017): Combined exercise is more effective than aerobic exercise in the improvement of fall risk factors: a randomized controlled trial in community-dwelling older men. Clinical Rehabilitation, 31(4), 478-486.
47. Soyuer F, Cankurtaran F, Akin S, et al. (2015): Fear of falling in elderly people living in rest home and related factors. Gaziantep Med. J., 21(3), 172-177
48. Suzuki M, Shimamoto Y, Kawamura I, et al. (1997): Does gender make a difference the risk of falls? A Japanese Study. Journal of Gerontological Nursing, 23(1), 41-48.
49. Svantesson U, Jones J, Wolbert K, et al. (2015): Impact of physical activity on the self-perceived quality of life in non-frail older adults. Journal of Clinical Medicine Research, 7(8), 585.
50. Thiamwong L, Suwanno J (2017): Fear of falling and related factors in a community-based study of people 60 years and older in Thailand. International Journal of Gerontology, 11(2), 80-84.
51. Tinetti ME, Richman D, Powell L (1990): Falls efficacy as a measure of fear of falling. Journal of Gerontology, 45(6), 239-243.
52. Tomita Y, Arima K, Tsujimoto R, et al. (2018): Prevalence of fear of falling and associated factors among Japanese community-dwelling older adults. Medicine, 97(4). Doi: 10.1097/MD.0000000000009721
53. Toosizadeh N, Mohler J, Marlinski V (2018): Low intensity vibration of ankle muscles improves balance in elderly persons at high risk of falling. PLoS One, 13(3). https://doi.org/ 10.1371/journal.pone.0194720
54. Tran TV, Phan PT (2018): Serious psychological distress, sex, and falls among the elderly. Journal of Women & Aging, 30(1), 75-84.
55. Tuunainen E, Rasku J, Jantti P, et al. (2014): Risk factors of falls in community dwelling active elderly. Auris Nasus Larynx, 41(1), 10-16.
56. Ulus Y, Durmus D, Akyol Y (2012): Reliability and validity of the Turkish version of the Falls Efficacy Scale International (FES-I) in community-dwelling older persons. Arch Gerontol Geriatr., 54, 429–433.
57. Vereeck L, Wuyts F, Truijen S et al. (2008). Clinical assessment of balance: normative data, and gender and age effects. International journal of Audiology, 47(2), 67-75.
58. White AM, Tooth LR, Peeters GG (2018): Fall risk factors in mid-age women: the australian longitudinal study on women's health. American Journal of Preventive Medicine, 54(1), 51-63.
59. Yamagiwa K, Iijima S, Furuya T, et al. (2011): Incidence of falls and fear of falling in Japanese patients with rheumatoid arthritis. Modern Rheumatology, 21(1), 51-56.
60. Yardley L, Beyer N, Hauer K, et al. (2005): Development and initial validation of the Falls Efficacy Scale-International (FES-I). Age Ageing, 34, 614–619.
61. Young WR, Williams AM (2015): How fear of falling can increase fall-risk in older adults: Applying psychological theory to practical observations. Gait & Posture, 41(1), 7-12.
62. Zhou H, Peng K, Tiedemann A, et al. (2018): Risk factors for falls among older community dwellers in Shenzhen, China. Injury Prevention. doi:10.1136/injuryprev-2017-042597