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ARAŞTIRMA / RESEARCH

Effectiveness of reminder telephone calls for physical activity on the fall risk in older adults: A nonrandomized posttest-only evaluation study

Yaşlı bireylerde fiziksel aktivite hakkında hatırlatıcı telefon görüşmesinin düşme riski üzerindeki etkinliği: Randomize olmayan, son-test çalışması

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Abstract

Purpose: The study aimed to determine the effectiveness of reminder telephone calls for physical activity on fall risk in older adults.
Materials and Methods: This study was nonrandomized posttest-only evaluation. The older adults were non-randomly assigned to the reminder telephone call group (n=30), the control group (n=30). For the reminder telephone call group, the physical activity program to be applied at home 3 days a week, for a total of 8 weeks. The participants were invited to an outpatient follow-up at the 4th and 8th weeks, and the fall risk was evaluated by using the Multiple Platform Dynamic Posturography Device.
Results: The majority were women (93.33%), and their mean age was 70.40 ± 6.52 years. Of the participants, 43.33% live alone, 51.67% use drugs (non-steroidal anti-inflammatory), 61.67% had fall history. The mean fall risk in both follow-ups after the reminder telephone call for physical activity was significantly lower in the experimental group than the control group
Conclusion: Telephone call including reminders and encouragement for physical activity was effective on the fall risk in older adults.
Keywords:. Fall risk, older adults, telephone calls

Öz

Amaç: Çalışmanın amacı, yaşlı bireylerde fiziksel aktivite hakkında hatırlatıcı telefon görüşmesinin düşme riski üzerindeki etkinliğini belirlemektir.
Gereç ve Yöntem: Bu çalışmanın tasarımı, randomize olmayan, son-testti. Yaşlı bireyler, hatırlatıcı telefon görüşmesi grubuna (n=30) ve kontrol grubuna (n=30) rastgele atandı. Hatırlatıcı telefon görüşmesi grubu için haftada 3 gün, toplam 8 hafta evde fiziksel aktivite programı uygulandı. Katılımcılar 4. ve 8. haftalarda poliklinik kontrolüne çağırılarak Çoklu Platform Dinamik Postürografi Cihazı ile düşme riski değerlendirildi.
Bulgular: Çalışmaya katılan bireylerin çoğunluğu kadın (%93.33) ve yaş ortalamaları 70.40 ±6.52 yıl idi. Katılımcıların %43.33'ü yalnız yaşamakta, %51.67'si ilaç (nonsteroidal antiinflamatuar) kullanmakta, %61.67'si düşme öyküsüne sahipti. Fiziksel aktivite hakkında hatırlatıcı telefon görüşmesi sonrası her iki izlemde de ortalama düşme riski deney grubunda kontrol grubuna göre anlamlı derecede düşüktü
Sonuç: Yaşlı bireylerde, düşme riski üzerinde fiziksel aktivite hakkında hatırlatıcı ve teşvik edici telefon görüşmesi etkili olmuştur.
Anahtar kelimeler: Düşme riski, yaşlı yetişkinler, telefon görüşmeleri.

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INTRODUCTION

Aging is an inevitable bio-physiological process; however, some bio-physiological changes that can occur during aging may have a negative effect especially on the movement, even if they do not lead to severe health problems[1-2]. The coordination of movement is ensured by the cooperation of the musculoskeletal and nervous systems. As people age, significant decrease in muscle mass occurs. Approximately 30% of the total body mass of an adult is muscle mass, and this may be reduced to 15% in people aged 65 and older [1]. Moreover, advanced age and multiple drug use may lead to musculoskeletal system problems such as weakening of the central nervous system, impaired joint mobility, and arthritis that make it difficult to walk or climb stairs, maintain balance, and coordination during walking[3]. These may often result in falls. There are studies showing that more than 33% of people above the age of 65 fall at least once a year, and 50% experience recurrent falls. However, as age advances, the fall rate can increase up to 60%[4-5]. Most falls do not result in serious injuries; however, older adults who experience falls may develop a fear of pain and fear of falling[6]. Fractures, especially hip joint fractures, are among the most serious consequences of falls. Hip fractures mostly affect the quality of life and independence of older adults. Despite rehabilitation, many older adults cannot have the quality of life that they had before the fracture. It is important to identify the fall risk and to implement a fall prevention program by identifying the cognitive and physical abilities (balance, dependence, muscle strength, etc.) of the older adults[7].

Health care providers use assessments (computer-assisted or scale) to determine the fall risk. A computer-assisted device, such as Multiple Platform Dynamic Posturography Device, provides objective data on balance and fall risk by analyzing body endurance, vigorous activity score, and total activity score. Therefore, it is considered that this device is more valid and reliable compared to subjective risk assessment scales[8-9].

Some fall risk factors are irreversible; however, some can be prevented by the appropriate intervention. Physical activity, ensuring good condition, and mobility of the older adults are very important in the prevention of falls[3]. Sherrington et al. (2011) suggested that fall prevention activities (strength, balance training, and walking, etc.) might be undertaken in a group or home-based setting. In this context, a regular physical activity program that increases the well-being and the quality of life of an individual is an important intervention[7]. However, the fear of falling that results from a fall history, or a lack of following, or encouragement or motivation for physical activity affect the continuity of the activity in the older adult. On the other hand, decreased physical activity is very common in older adults and it is a risk factor for falling[3]. Furthermore, improper pavements and stairs, wet and slippery surfaces, and slippery carpets are environmental factors for the fall risk[11]. Johnston et al. (2019) demonstrated that implementation of The Centers for Disease Control and Prevention's Stopping Elderly Accidents, Deaths, and Injuries (STEADI), an approach for screening of fall risk and prevention strategies among older adults in the primary care setting, can reduce geriatric hospitalization in fall-related injuries and may reduce associated health care expenditures[12]. Arkkukangas et al. (2015) examined the effects of the Otago activity program, a home-based activity program designed to improve strength, balance, and endurance, with the support of motivational interviewing on the fall risk on people aged 75 and older[13]. Also, Montgomery and Smith, (2020) developed fall prevention training programs (Stall the Fall) targeted at non-clinical caregivers to community-dwelling older adults[14].

Follow-up of older adults for regular activity is of great importance. The widespread use of telephones (calling or text-messages or face-to-face interview) in health care changes the relationship between health professionals and individuals. In this context, following an individual by telephone is a nursing intervention that increases the quality of care and ensures the continuity of the therapeutic nurse-individual or patient relationship. With the emergence of COVID-19, telephone follow-up has been a key strategy while reducing the spread of the virus, and especially for providing ongoing care to patients. Telephone follow-up is important for people who are particularly susceptible to COVID-19 such as cardiopulmonary diseases, diabetes, cancer, and elderly individuals with an underlying disease, to avoid contact with potentially infected patients[15]. Studies showed that telephone interviewing and monitoring were successful in increasing drug compliance in people with hypertension and cardiovascular disease. Moreover, telephone interview was effective for maintaining healthy lifestyle changes and improving the quality of

life in people with a metabolic risk or Parkinson's disease[16-18]. The study aimed to determine the effectiveness of reminder telephone calls for physical activity on fall risk in older adults. Accordingly, the research hypotheses were determined as "Research Hypothesis (H)1. Reminder telephone calls for physical activity reduces the fall risk in older adults."

MATERIALS AND METHODS

This was a nonrandomized posttest-only evaluation study. This study consisted of people aged 65 years and older, and who were monitored at the osteoporosis outpatient clinic of a university hospital between May and December 2019. Inclusion criteria were as follows: (a) normal cognitive and perceptual functions (Mini-Mental Test result 24-30 points), (b) not having fear of falling (Visual Analog Scale 0-5 points), (c) being able to perform self-care (Barthel Index 91-100 points), (d) not having a problem with balance or walking (Tinetti score 25-28 points, Get up-Walk Test≤12 seconds), (e) no history of a hip replacement or knee replacement surgery, and (f) no history of chronic heart failure.

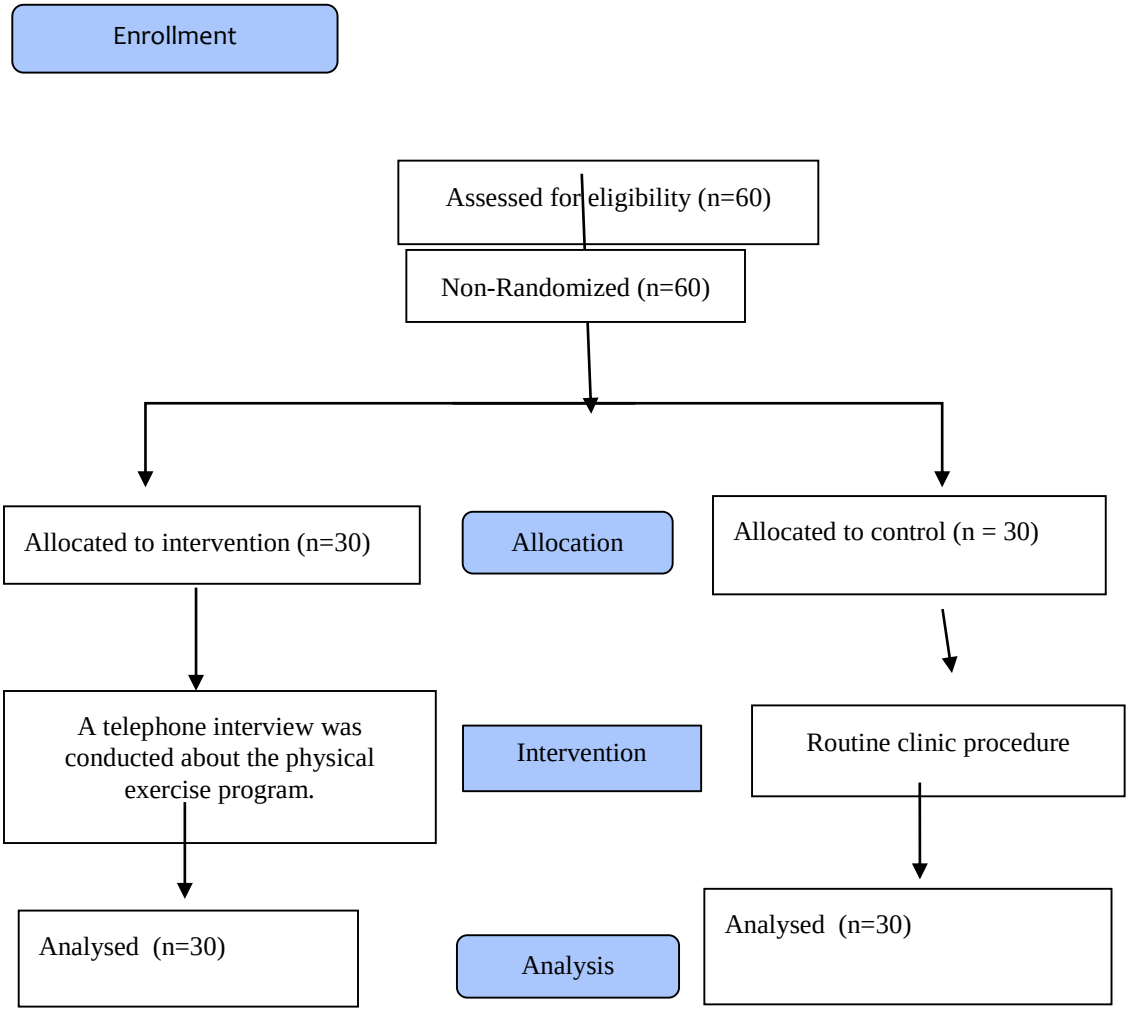

Figure 1. Allocation of subjects according to the TREND Statement

The sample size calculation was based on previous research with a large cohort[19]. A power analysis was used to determine the sample size. A sample size of 60 was determined as adequate with a power of 0.80 and α value of 0.05.

Following the assessment for inclusion criteria, eligible older adults (N= 60) were invited to participate in the study. The participants were divided into two groups with 30 participants in the experimental group (received reminder telephone call) and 30 in the control group (without telephone call) with a computer-based random number sequence. This study was designed in accordance with the TREND Statement Checklist (Figure 1)[20]. First, the researchers followed the routine clinical procedures of the clinic without reminder telephone call (control group). Second, they determined the effectiveness of reminder telephone calls for physical activity (experimental group).

Procedure

Data were collected by a physician and a research nurse. The research physician is a medical doctor (MD) of physical therapy and rehabilitation. The research nurse, a registered nurse (RN), is a doctorate student in fundamentals of nursing with a 5-year experience and 18-year clinical experience in the rehabilitation department. The MD took the medical history of the older adults who came to the outpatient clinic for follow-up. The MD and RN evaluated the physical examination findings that might affect the fall and evaluated the fall risk.

Following the physical examination, the physical activity program to be implemented at home 3 days a week, for a total of 8 weeks, was explained to the older adults in *the experimental group* by the RN in the patient training room for 30 minutes. Physical activity was configured in line with the Training Booklet that was developed by the Turkish Osteoporosis Patient Society in 2015. This physical activity program was carried out gradually to improve the balance and mobility (strength, lifting, and balance activities including the upper and lower extremities, breathing, warm-up, and short-term walking) of older adults [7,10,17,32]. Table 1 shows the manual of the Training Booklet. The Training Booklet was also delivered to the experimental group. This Training Booklet included written and visual knowledge about physical activity. Moreover, the older adults in the experimental group were called by telephone on the morning of the activity days (Monday-Wednesday-Friday). In the reminder telephone calls, they were asked whether they experienced any difficulties during the exercise and the status of the exercise, and they were reminded for daily physical activities. At the end of the 1st week, a reminder telephone call was conducted about the following week's physical activity program. The reminder telephone interviews were repeated for 8 weeks.

The reminder telephone call was also structured to encourage physical activity of 20 minutes in the older adults. First, the RN used a warm, supportive, respectful, and caring approach at the beginning of the telephone call. Second, the contradictions between the current behavior of the older adults and their goals were determined. Third, the importance of the goals was reminded, and physical activities were planned according to Table 1. Reminder telephone call included addressing the following questions in the experimental group: (1) Have you experienced any health problems lately, such as fall or unpleasant symptoms? (2) Has any positive or pleasing change occurred since you started the activity program? If yes, what is it? (3) Has any negative or unpleasant change occurred since you started the activity program? (4) What are your physical activity goals for the next week? [16]. The physical activities to be performed the following week were also explained during the telephone call.

Participants *in the control group*; the same exercise program was explained by the RN in the patient training room for 30 minutes (routine clinical procedure). In addition, the Training Booklet was also delivered to the control group (routine clinical procedure). Physical exercise program was applied as older adults' responsibility without reminder telephone calls.

The participants were invited to an outpatient follow-up at the 4th and 8th weeks, and the fall risk was evaluated. The MD and the RN calculated the fall risk by using the Multiple Platform Dynamic Posturography Device.

Statistical analysis

Data were analyzed by using SPSS statistical software (SPSS, Chicago, IL, USA) for Windows. Results were reported as mean, percentage, and median. The continuous variables were checked with the

Kolmogorov-Smirnov normality test to demonstrate the normality of the distributions. The t-test and Mann-Whitney U test were used for comparing two group means. The chi-square test was used to compare the qualitative variables between the two groups. The chi-square test was used to compare the qualitative variables between the two groups. A *p*-value of < .05 was considered statistically significant.

Written permission was obtained from the Clinical Research Ethics Committee of Istanbul University-Cerrahpaşa Cerrahpaşa Medical Faculty Hospital where the study was conducted (23/05/2019/78946). The participants were informed about the purpose, content, and scope of the research before the study. An informed consent form was obtained from the participants.

Table 1. Physical exercise program

1. week		
1. Monday	1. Wednesday	1. Friday
Breathing exercises Warm-up exercises (stepping on the spot, head, neck, back stretching)	1st Monday program Body, ankle exercise	1 st Wednesday program Strength exercises (knee, hip, heel toe)
2. week		
2. Monday	2. Wednesday	2. Friday
1 st Friday program Balance exercise (knee flexing, toe walking, heel toe posture)	2nd Monday program Balance exercise (toe heel walk, posture on one foot)	2 nd Wednesday program Balance exercise (side walk, heel walk)
3., 4., and 5. weeks		
3. Monday	3. Wednesday	3. Friday
2 nd Friday program Balance exercise (sitting up using hands)	3rd Monday program	3 rd Monday program Balance exercise (back-walking)
6. and 7. weeks		
4. Monday	4. Wednesday	4. Friday
3 rd Friday program Balance exercise (heel toe back walking, walking and returning)	4th Monday program Balance exercise (climbing stairs)	4 th Wednesday program Balance exercise (calf-thigh stretching)
8. week		
5. Monday	5. Wednesday	5. Friday
4th Friday Walking (10 minutes)	5th Monday Walking (15 minutes)	5th Wednesday program Walking (20 minutes)

RESULTS

The demographic characteristics of the older adults included in the study were examined. The majority were women (93.33%), and their mean age was 70.40 ± 6.52 years. Of the participants, 43.33% live alone, 63.33% live in an apartment without elevators, 86.67% have difficulty climbing stairs, 51.67% use drugs (non-steroidal anti-inflammatory) affecting the central nervous system, 61.67% have a fall history, 83.33% use walking aid, and 68.33% wear glasses (Table 2).

Table 3 shows the step length, laboratory analyses (calcium, Vitamin D, parathormone), cognitive and perceptual functions, fear of falling (VAS), self-care status, balance, and walking that may affect the fall of older adults.

Table 2. Characteristics of Older Adults

Characteristics	Experimental Group n (%)	Control Group n (%)	TOTAL GROUPS N (%)	Statistical analysis x^2 or t, p
Gender				
Female	29 (96.67)	27 (90)	56 (93.33)	x^2=1.071
Male	1 (3.33)	3 (10)	4 (6.67)	p= .301
Age (mean±standard deviation)	69.33±6.15	70.87±6.95	70.40±6.52	t=0.551, p= .584
Educational level				x^2= 4.305
Primary school	12 (40)	15 (50)	27 (45)	p= .258
Secondary school	6 (20)	1 (3.33)	7 (11.67)	
High school	4 (13.33)	6 (20)	10 (16.67)	
University	8 (26.67)	8 (26.67)	16 (26.66)	
Marital status				x^2=2.816
Married	16 (53.33)	19 (63.33)	35 (58.33)	p= .245
Single	8 (26.67)	3 (10)	11 (18.33)	
Widow/Divorced	6(20)	8 (26.67)	14(23.34)	
Having living partner				x^2=6.404
Alone	17 (56.67)	9 (30. 00)	26 (43.33)	p= .171
Spouses	5 (16.67)	11 (36.67)	16 (26.67)	
Spouse and Child	5 (16.66)	8 (26.67)	13 (21.67)	
Roommate	3 (10. 00)	2 (6.66)	5 (8.33)	
Feature of the House				x^2=1.994
Self-contained	1 (3.33)	3 (10. 00)	4 (6.67)	p= .369
Apartment with lift	11 (36.67)	7 (23.33)	18 (30. 00)	
Apartment without elevator	18 (60.00)	20 (66.67)	38 (63.33)	
Strain when climbing stairs				x^2=1.676
Yes	27 (90. 00)	25 (83.33)	52 (86.67)	p= .432
No	3 (10. 00)	5 (16.67)	8 (13.33)	
Using drugs				x^2=2.302
No	2 (6.67)	2 (6.67)	4 (6.67)	p= .492
Central Nervous System	15 (50. 00)	16 (53.33)	31 (51.67)	
Diuretics	1 (3.33)		1 (1.67)	
Antidiabetics	3 (10. 00)	2 (6.67)	5 (8.33)	
Antihypertensive	8 (26.67)	7 (23.33)	15 (25)	
Falling History				x^2=7.774
Yes	11 (36.67)	26 (86.67)	37 (61.67)	p= .251
No	19 (63.33)	4 (13.33)	23 (38.33)	
Use of Aids for Walking				x^2=4.138
Yes	27 (90. 00)	26 (86.67)	53 (88.33)	p= .126
No	3 (10. 00)	4 (13.33)	7 (11.67)	
Aids				x^2=5.875
Walking stick	25 (83.33)	25 (83.33)	50 (83.33)	p= .383
Walker	1 (3.33)	0	1 (6.67)	
Crutches	0	1 (3.33)	1 (6.67)	
Wheelchair	1(3.33)	0	1 (6.67)	
Using Glasses				x^2=12.921
Yes	20 (66.67)	21 (70. 00)	41 (68.33)	p= .126
No	10 (33.33)	9 (30. 00)	19 (31.67)	
Having Eye Surgery				x^2=0.098
Yes	6 (20. 00)	7 (23.33)	13 (21.67)	p= .754
No	24 (80. 00)	23 (76.67)	47 (78.33)	

Table 3. Physical and Laboratory Assessments of Older Adults

Physical and Laboratory Assessment	Experimental Group mean±standard deviation	Control Group mean±standard deviation	TOTAL GROUPS mean±standard deviation	t, *p*
Measurement of distance between two foot (centimeters)	18.03±4.16	19.60±4.32	18.82±4.28	t=1.431 *p*= .158
Measurement of distance of step (centimeters)	28.50±6.84	29.40±7.15	28.95±6.95	t=0.498 *p*= .620
Calcium (Ca)	9.41±0.53	9.65±0.32	9.48±12.24	t=7.802 *p*= .767
Vitamin D	29.34±9.37	32.63±13.77	32.12±22.31	t=5.391 *p*= .214
Parathormon (PTH)	50.50±11.73	53.13±22.67	50.49±11.73	t=4.872 *p*= .621
Minimental Test	27.20±2.06	27.30±1.99	27.25±2.01	t=0.192 *p*= .849
Fear of Falling (Visual Anolog Scale)	6.60±2.87	5.43±2.93	6.03±2.90	t=-1.557 *p*= .125
Bartel Index	99.00±4.62	97.33±8.28	98.17±6.70	t=-0.963 *p*= .341
Tinnetti Balance	12.73±3.07	12.79±2.56	12.76±2.78	t=-6.733 *p*= .936
Tinnetti Walking	11.17±1.53	10.31±2.62	10.78±2.01	t=1.212 *p*= .129
Get Walk Test (second)	10.80±3.52	11.77±4.42	11.28±3.99	t=0.942 *p*= .355

There was no significant difference between the experimental and control groups in terms of demographic characteristics and the risk factors for falling ($p > .05$) (Table 2 and 3).

The fall risk of the older adults was evaluated by using the Multiple Platform Dynamic Posturography Device (Tetrax®) software on the 4th and 8th weeks as the first outpatient follow-up. The fall risk of older adults in the experimental group was determined as 44.87 ± 26.09 and 44.87 ± 26.62 for the 4th week and the 8th week, respectively. In the control group, it was 57.23 ± 30.31 on the 4th week, and 63.42 ± 29.61 on the 8th week. The mean fall risk in both follow-ups after the reminder telephone call for physical activity was significantly lower in the experimental group than the control group ($p < .01$) (Table 4). Therefore, hypothesis 1 was confirmed.

Table 4. Comparison Risks of Fall of Experimental and Control Groups

Fall Scores	Experimental Group (n=30)	Control Group (n=30)	t, *p*
Fall Index (4th week)	44.87±26.09	57.23±30.31	t=1.694 ***p*= .009***
Fall Index (8th week)	44.87±26.62	63.42±29.61	t=-7.637 ***p*= .001***

*p< .01

DISCUSSION

The study investigated the effectiveness of reminder telephone calls for physical activity on fall risk in older adults. In the study conducted by Jeon et al. (2017), it was emphasized that walking disorders (stepping, balance and coordination disorders, etc.), sensory problems (joint contracture, etc.), and

musculoskeletal system problems (decreased muscle strength in the lower extremities, etc.) were the important causes of falls in older adults. Falls could result in prolonged pain, disability, functional impairment, lower quality of life, and even serious fractures [19]. Therefore, determining the fall risk and applying rehabilitation interventions may prevent undesired situations. Planned and regular physical activity is the most important intervention for rehabilitation in older adults. There are studies that demonstrate that muscle strengthening and balance activity programs may lead to a positive effect on various components of physical health (strength, cardiovascular function, and balance, etc.)[3-11,33]

In the first follow-up on the 4th week, the fall risk of the experimental group (reminder telephone call) and the control group (without telephone call) was at moderate levels (44.87 ± 26.09, 57.23 ± 30.31, respectively). However, the fall risk of the control group increased to high level (63.42 ± 29.61) in the second follow-up on the 8th week. The fall risk of the experimental group was at similar levels in both follow-ups. The fall risk differences between the two groups were considerable levels for both follow-ups (a difference of 13 units on the 4th week, a difference of 19 units in the 8th week). Furthermore, the fall risk in the experimental group was significantly lower than the control group in both follow-ups (Table 4). These results showed that the reminder telephone call about the physical activity program is an effective intervention for decreasing fall risk in older adults. It was determined that structured reminder telephone call including reminders and encouragement for physical activity was effective on the fall risk in older adults. Literature showed that the physical and balance activity programs significantly reduced the fall risk and fall-related injuries in older adults [32-36]. In a meta-analysis study, it was found that physical activity at least two days a week was effective in preventing falls [10]. Likewise, Lin et al. (2016) determined that motivational telephone counseling significantly increased physical activity in middle-aged and older women. Arkkukangas et al. (2015) showed that motivational interviewing did not affect the frequency of falling, physical performance, and self-efficacy of the home activity program in older adults. Freiberger, Ha¨berle, Spirduso, and Rixt Zijlstra (2012), and Elley et al. (2008) examined the long-term effects of physical activity programs and found no significant differences in the fall risk in older adults. These results were different from this study. The reason may be related to the fact that the measurements were evaluated by the questionnaires. In this study, the RN, who is an expert on outpatient rehabilitation nursing, and individual nursing care, conducted the structured reminder telephone call. Also, the fall risk was evaluated with the objective device (Tetrax® device).

The important strength of this study was that reminder telephone call for physical activity was effective in reducing fall risk in older adults. Another strength was that the assessment of the fall risk was performed using an objective device. The first limitation was that the fall risk was not assessed before intervention in this pre-experimental study. The second limitation was the characteristics of the older adults. Another experimental study should be planned in a different group of older adults (e.g., physical/laboratory/individual problems or different fall risk score). Moreover, the researchers recommend analyzing the longitudinal relationship between fall risk, and predisposing factors on fall risk grade to model and control these factors over time in the older adults.

As a result, the physical activity program implemented with reminder telephone call has reduced the fall risk by affecting the mobility positively in older adults. In this context, it is very important to decrease the fall risk of older adults and to increase the physical mobility level by using telephone interactions which is easy and effective. Geriatric Nurses and Community Health Nurses are key in determining the fall risk. For decreasing the fall risk, nurses should administer reminder telephone calls for encouragement for physical activity program which includes strengthening, balance-building, and mobility, to prevent fall risk in older adults. It is an important limitation that the study was carried out in the only post-test design and followed the elderly individuals in the Osteoporosis Outpatient Clinic. For these reasons, the authors recommend that the study be performed with a full experimental research protocol and in elderly individuals of different characteristics.

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