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ORIGINAL INVESTIGATION

Reliability and validity of Turkish version of "Physical Fitness and Exercise Activity Levels of Older Adults" Scale

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Background and aims. This research aimed to investigate the reliability and validity of the Turkish version of the Physical Fitness and Exercise Activity Levels of Older Adults Scale.
Methods. Methodological study was conducted at an elderly care centre. The study sample comprised of 347 residents. The Physical Fitness and Exercise Activity Levels of Older Adults Scale was used for reliability and validity analysis.
Results. The overall content validity index value for overall scale was 0.91. KMO sample coefficient of concordance was found as 0.87, Barlett's test $\chi 2$ value is calculated as 1736.3 ($p = 0.000$). Compatibility values were RMSEA = 0.08, RMR = 0.05, CFI = 0.88, GFI = 0.89, AGFI= 0.86. Internal consistency reliability was 0.89, corresponding coefficients for the perceived motivators factor was 0.88, for the perceived barriers factor was 0.78 and the physical fitness factor was 0.86. In contrast to the original 41-item scale, the number of items in the scale used in the present study was reduced to 34 after the confirmatory factor analysis.
Conclusions. The study demonstrated that this scale is a valid and reliable instrument that could be used to determine exercise-related motivators and barriers perceived by individuals aged ≥ 60 years.

Key words: Older adults, Reliability, Exercise, Factor analysis

INTRODUCTION

Regularly performed physical activities and exercises are known to improve not only the psychosocial, but also the physical and emotional health of older adults, and to offer several benefits [1]. If performed daily, even a very low level of physical activity has been reported to play an important role in reducing the risk of coronary heart disease [2]. In addition to the aforementioned benefits, regular exercise contributes to the maintenance and improvement of functional health, reduce the risk or delays the development of diseases such as diabetes mellitus and osteoporosis, promotes immune functions, regulates sleep patterns, reduce colorectal cancer risk, regulates blood pressure, improves cognitive capacity, facilitates weight control, reduces anxiety and can effectively treatment mild depression in older adults 3. All evidence obtained from comparisons of physically active and inactive people aged ≥65 years suggests that the former group has lower mortality rates related to coronary heart disease, high blood pressure, stroke, type 2 diabetes mellitus, lower colon cancer and breast cancer; improved heart, lung and muscle health; a healthier body mass and composition and an improved biomarker profile; all of these factors reduce the risk of the development of cardiovascular diseases and type 2 diabetes and ensure better bone health in the former group [4]. Physical exercise reduces the risk of disease

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through assist with weight control and prevention of obesity in populations. Thirty minutes of activity per day would, on average, be expected to confer additional protection against the development of diabetes and cardiovasculer disease and would assist with weight control and prevention of obesity in populations with low baseline activity [5]. Despite the known benefits of physical activity and exercise, however, most older adults are not physically active, and the number of people in this age group who participate in regular exercise is very low [6]. In 2009, physical inactivity was identified as the fourth leading risk factor for non-communicable diseases and accounted for more than 3 million preventable deaths [7]. Physical inactivity was responsible for 13·4 million DALYs worldwide [8]. Inactivity increases with age in all World Health Organization (WHO) regions, which is a pattern known to have a strong biological basis. The frequency of inactivity in older adults varied between WHO regions: 30% of older adults are inactive in southeast Asia, 40% in Africa, 47% in western Pacific, 49% in Europe, 55% in the eastern Mediterranean, and 62% in the Americas [7].

In recent years, among older populations, the concept of healthy ageing has developed. Physical activity is associated with better physical health and is a priority of public health with a successfully ageing population [9]. According to the health belief and health promotion model, the perceived barriers obstruct the behavior while the perceived motivators facilitate the behavior. A positive perception towards physical activity may encourage older adults to develop it [10]. Despite considerable emphasis on the importance of physical activity to the realization of healthy lifestyle behaviours among the older adults, little information is available regarding the motivations of older adults to be physically active or the factors preventing physical activity in this population. Motivators for activity include enhanced physical and psychological health and independence, chronic condition management, social interaction and support, advice from medical professionals, and enjoyment in the olders [11-13]. Clearly, more research is needed to determine the nature (consistency and perception) of physical activity barriers and motivators among older adults. Studies on this issue have demonstrated that performing group exercise activities and the presence of family support and community resources are perceived by the elderly as exercise motivators [6 14]. Deci & Ryan classified these motivators as intrinsic and extrinsic. High levels of intrinsic motivation are connected to feelings of enjoyment and low levels of anxiety. An extrinsically motivated, on the other hand, engages in an activity for its subsequent positive outcomes, such as exercising to improve health or to lose weight [11]. In older adults particularly, the barriers that permeate their engagement in physical activity involve the following: fear of falling or injury, fear of being victim of violence when exercising outdoors, fatigue, morbidity, physical limitation, pain and also lack of companionship, lack of time and lack of family encouragement [10]. Sechrist et al. reported that the most important factors that affect the performance of physical activities are healthy lifestyle behaviors, perceived benefits, perceived barriers, health problems, low perceptions of self-efficacy and health, advanced age, income inequality and shortage of time [15]. According to Olanrewaju et al. barriers include health status, previous physical activity habits and experiences, and cultural sensitivity, while facilitators include enjoyable activities and convenient scheduling [16]. Common categories of barriers that have been identified include environmental (e.g., access to facilities or transportation, safe walking routes, lack of social support from significant others such as verbal persuasion from medical professionals and others not to exercise, weather), and personal (e.g., facility cost, dislike of exercise, depression, fear of injury, lack of time and/or motivation, perceptions of age appropriateness and capabilities, physical ailments such health, joint pain, and injury).

Within the scope of advanced nursing practices, nurses are expected to perform comprehensive health diagnostics and recommend lifestyle changes related to the health conditions of older adults, with the intent to identify exercise-related benefits and barriers perceived by the older adults. Therefore, advanced nursing practices should include data collection, which ensures that the older adults become aware of factors preventing them from exercising and determines their perceptions of health status. Ensuring the participation of older adults in healthcare plans, including self-care-related aims such as physical fitness and exercise, is a standard of gerontological nursing practices [17].

For older adults, physical activity measurement is complicated because they often engage in lighter activities more frequently than in moderate or vigorous activities and they may perform activities on an irregular basis, making it difficult to recall. There are widely used international scales to assess the type, frequency, weekly duration-hours and intensity (kcal/min-1) of physical activity in the elderly [13 18-20]. Because these scales assess physical activities performed only within the past week, they cannot be used to determine perceived barriers and motivators regarding exercise. The Community Healthy Activities Model Program for Seniors (CHAMPS) Questionnaire, the Physical Activity Scale for the Elderly (PASE), and the Yale Physical Activity Survey (YPAS) were developed for community-dwelling older adults [13 18-20]. These three surveys ask about the duration of activity performed over one week rather than per

session to facilitate recording of irregular activity. The YPAS allows the estimation of PA of a typical week in the last month prior to evaluation (PA type, duration-h. wk and intensity-kcal.min-1) in five domains (household, yard work, caregiving, exercise, and recreational activities) [18]. The CHAMPS survey was developed to assess outcomes of a physical activity promotion intervention designed to change activity behavior. The questionnaire assesses weekly frequency and duration of various physical activities (light, moderate, and vigorous physical activities) typically undertaken by older adults in the last four weeks [19]. The Physical Activity Scale for the Elderly was developed by Washburn et al. in 1993 to assess older adults' performance of physical activities at home, work, or for recreation [13]. This scale assesses participants' walking, light/moderate/strenuous sporting and recreational activities within the last week, muscular strength and endurance exercises, work-related activities such as walking and standing, lawn work or yard care, providing care for someone else, home repairs and light or heavy housework requiring physical activity [12]. The Physical Fitness and Exercise Activity Levels of Older Adults Scale (PFES) is a tool based on a health promotion model used to determine factors motivating an elderly person to exercise or preventing him/her from exercising. There is any scale to assess the physical fitness and exercise activity levels of older adults in Turkey, and we used PFES since that its' items are short and designed considering the level of literacy of older adults and easy to understand by the elderly people. In addition, the scale measures the frequency of physical activity in general, without a time limit such as last week, last four weeks. The purpose of this research is to test the reliability and validity of Turkish version of the "Physical Fitness and Exercise Activity Levels of Older Adults" Scale. It is expected that this tool could be used to determine factors motivating elderly people to exercise or preventing them from exercising in clinical settings, nursing homes, as well as in research. Within the scope of the study, the following research problems were sought:

- Do the items of the Turkish form yield the same meanings as the items in the original form?
- Is the reliability of the scale items sufficiently high?
- Is the scale acceptably stable over time?
- Is the factor structure of the Turkish scale similar to that of the original form?

MATERIAL AND METHODS

Research type

This is a methodological study to evaluate the validity and reliability of the 'Physical Fitness and Exercise Scale for the Older Adults'.

Sample

The study was conducted between March 15, 2014 and December 20, 2014 at an elderly care centre affiliated with the Provincial Directorate of Izmir of the Ministry of Family and Social Policies. This elderly care centre houses retirees older than 60 years who receive pensions from the Turkish state retirement fund. The centre residents also receive medical and social services. Primary health care services are provided to these residents by family physicians, nurses and healthcare providers who work in primary healthcare services.

Inclusion and exclusion criteria: Individuals who aged 60 years or older, lived in the elderly care center, had no hearing problems, could independently perform activities of daily living, and agreed to participate in the study were included in the sample. Those who had a neurologic condition (dementia, Parkinson or stroke) and those who did not meet any of the inclusion criteria were excluded from the study.

The population of this methodological study comprised 792 elderly residents of the aforementioned elderly care centre. Of these residents, 30 did not want to participate in the study and 415 were on a summer holiday. Therefore, the study sample comprised the 347 residents who remained at the elderly care centre had no hearing problems and agreed to participate in the study. According to the literature, the recommended size of a methodological study sample is five- to 10-fold the number of items in the scale 21. Therefore, the size of the sample in this study was considered of sufficient in number.

Data collection tools

The following tools were used to collect data:

1. Sociodemographic characteristics questionnaire: this questionnaire comprises eight questions regarding the sociodemographic characteristics of the elderly;
2. Physical Fitness and Exercise Activity Levels of Older Adults Scale (PFES): This scale was developed by Melillo et al. in 1997 to assess the physical fitness level of older adults as well as their perceived motivators and barriers and exercise frequency 22. The scale has 41 items within four subscales: physical fitness, perceived barriers, perceived motivators and exercise frequency. The minimum and maximum possible scores of the overall scale are 41 and 164, respectively. Possible subscale and item scores are as follows:
   - physical fitness subscale: this subscale comprises nine items, with minimum and maximum possible

scores of 9 and 36, respectively. A higher score indicates a lower physical fitness level;
- perceived barriers subscale: this subscale comprises 13 items, with minimum and maximum possible scores of 13 and 52, respectively. A higher score indicates a higher number of perceived barriers;
- perceived motivators subscale: this subscale comprises 11 items, with minimum and maximum possible scores of 11 and 44, respectively. A higher score indicates a lower number of perceived motivators;
- exercise frequency subscale: this subscale comprises eight items, with minimum and maximum possible scores of 8 and 28, respectively.

Items in the physical fitness, perceived barriers and perceived motivators subscales are rated using a four-point Likert scale (1 = Strongly Agree, 2 = Agree, 3 = Disagree, 4 = Strongly Disagree). Items in the exercise frequency subscale, which indicate how frequently the subject participates in physical activities, are also rated on a four-point Likert scale (1 = Never, 2 = Once a week, 3 = 2-3 times a week, 4 = Daily).

Translation process and content validity

The scale was translated into Turkish by three experts and back-translated into English by two additional experts. The opinions of eight experts regarding content validity were obtained. Davis expert technique was applied to evaluate the content validity of the scale items [23]. Specifically, the experts were requested to evaluate the items as (a) 'is appropriate', (b) 'needs minor revision', (c) 'needs major revision', or (d) 'is not appropriate'. According to this technique, the number of the experts who marked the (a) and (b) options was divided by the total number of the experts to obtain a 'content validity index' was obtained.

Data collection

Data were collected through face-to-face interviews conducted in the lounge of the elderly care centre. Because of decline in the elderly participants' perception and hearing abilities, each interview required approximately 20-25 min. The scale was re-administered to 36 elderly people in the sample who were re-contacted as a post-test for reliability after a 2-week interval. Participants were asked to write not any personally identifiable information other than a nickname on the questionnaire during both the first and second administration of the scale and the test-retest applications.

Data analysis

Data were analysed using SPSS 22 (Statistical Package for the Social Sciences) software (SPSS, Inc., Chicago, IL, USA). SPSS AMOS version 22 was used for the confirmatory factor analysis (CFA). Mean, minimum and maximum values were used for numerical data, whereas numbers and percentage calculations were used for categorical data. Regarding the reliability analysis, item-total correlations were used to determine item reliability, and Cronbach's alpha was used to determine homogeneity. The test-retest and Pearson product moment correlation methods were used to evaluate the stability of the scale over time. A value of 0.30 was used as a criterion for item-total correlations [24 25]. Exploratory factor and confirmatory factor analyses were used to determine the construct validity of the scale. Determining the suitability of the data for factor analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett's tests were implemented [26 27].

A basic component factor analysis was performed to distinguish the subscales from each other while assessing construct validity. Factor loadings were determined using the Varimax method. Hotelling's T^2 test was used to investigate whether the scale items were perceived similarly by the elderly, whether understanding difficulty levels were similar and whether they were distributed normally [28]. A p-value of < 0.05 was used to indicate significance.

Ethical issues

Written permission to translate the PFES into Turkish and use it was obtained from Melillo K by e-mail (personal communication). Written approval and Permission to conduct this study was received from the institutional non-interventional ethical committee and from the Provincial Directorate of Izmir of the Ministry of Family and Social Polices. An informed consent form including information about the purpose of the study, the length of time it would take to complete and participants' rights was signed by the participants. Participants were assured that the questionnaire was anonymous, participation was voluntary and they could withdraw from the research at any time and the data collected would be kept confidential.

RESULTS

The mean age of the individuals participating in the study was 77 ± 7.9 years (min-max: 60-94 years). In addition, 64.8% were female, 66.6% were high school/college graduates and 47.0% were widows or widowers.

Construct validity of Turkish PFES

Content validity

Back-translation method was used to translate to Turkish version. The scale was translated into Turkish

by three experts and back-translated into English by two additional experts. The final Turkish version was reviewed by eight faculty members (expert panel) to assess the suitability and clarity of its language, intelligibility, and understandability. Specifically, the experts were requested to evaluate the items as (a) 'is appropriate', (b) 'needs minor revision', (c) 'needs major revision', or (d) 'is not appropriate'. According to this technique, the number of the experts who marked the (a) and (b) options was divided by the total number of the experts to obtain a 'content validity index' was obtained. The overall content validity index value for all scale items of the scale was 0.91. To determine the clarity of the items in the scale, the scale was pilot-tested among 10 elderly people with characteristics similar to those of the participants but who had not been included in the sample. The pilot testing demonstrated that the items were sufficiently clear and understood by the participants. Minor changes in wording were made and final form showed no linguistic problems and finally content and face validity of the Turkish version of the scale were satisfactory.

Construct validity

To establish the construct validity of the scale, a factor analysis was conducted. The KMO value of the scale was 0.87. The significance of the Bartlett's test was p = 0.000 (X2 = 1736.3). A confirmatory factor analysis of the construct validity of the scale yielded the following compatibility values: RMSEA = 0.076, RMR = 0.06, CFI = 0.77, GFI = 0.78, NFI = 0.70, AGF =0.75 ($p < 0.05$). In the confirmatory factor analysis, items with values of < 0.70 or near 0.070 were revised; a repeated confirmatory factor analysis yielded the following values: RMSEA = 0.08, RMR = 0.05, CFI = 0.88, GFI = 0.89, AGFI = 0.86 ($p < 0.05$; Tab. I).

The factor structure of the scale was subjected to an exploratory factor analysis, in which three factors were determined to have eigenvalues > 1. The eigenvalues were 9.57 for the first factor, 3.56 for the second factor and 2.26 for the third factor, and these factors accounted for 38.38%, 13.74% and 8.69% of the variance, respectively. Therefore, the three-factor structure accounted for 60.83% of the variance. Table II shows the loads and eigenvalues of the scale items. Load factors ranged from 0.320 to 0.903 (Tab. II).

Reliability of the scale

Internal consistency analysis and mean scores of the Turkish PFES

The total mean score for the overall scale was 80.0 ± 10.1 (Tab. III). The mean scores obtained from the subscales were as follows: 18.2 ± 4.6 for the motivators subscale, 32.03 ± 6.1 for the barriers subscale, 16.3 ± 3.8 for the physical fitness subscale and 13.4 ± 3.9 for the exercise frequency subscale. The lowest and highest mean scores were obtained for item 31 (1.96 ± 0.69) and item 12 (2.88 ± 0.84), respectively (Tab. II). The distributions of the mean item and overall scale scores are presented in Table II.

In contrast to the original 41-item scale, the number of items in the scale used in the present study was reduced to 34 after the confirmatory factor analysis; the four-factor internal consistency coefficient used to test internal consistency reliability was 0.89. The corresponding coefficients were 0.88 for the perceived motivators factor, 0.78 for the perceived barriers factor and 0.86 for the physical fitness factor (Tab. III). A Cronbach's alpha of 0.76 was calculated after obtaining data from 36 subjects who were contacted a second time to determine the test-retest reliability of the scale. In addition, item-total correlations and Cronbach's alpha coefficients for each scale item were calculated using the item-elimination method. Cronbach's alpha coefficients ranged from 0.88 to 0.89. The scale item and reliability analyses yielded item-total correlations of 0.215-0.737, which were considered significant ($p = 0.001$). The analysis of the relationship between each subscale's score and the overall scale score demonstrated that the reliability coefficients ranged between 0.60 and 0.81 ($p = 0.000$).

Table I. Compatibility values of the scale.

Compatibility values	CFA Analysis-I	CFA Analysis-II
Chi-square/ p-value	1736.3/p = 0.000	840.340/291
CMIN/df	2.98	2.88
Degrees of freedom	581	291
RMSEA	0.076/p < 0.05	0.08
RMR	0.06	0.05
CFI (Comparative Fit Index)	0.77	0.88
GFI (Goodness of Fit Index)	0.78	0.89
AGFI (Adjusted Goodness of Fit Index)	0.75	0.86

Table II. Subscales and distributions of factor loading, item-total mean scores and correlation coefficients.

Factors	Factor loading	Mean	SD	Item-total correlations	Variance
Physical fitness					
9. I am physically fit.	,774	2,00	,66	,488	%8.69
10. I can do more than most people my age.	,844	1,91	,69	,475	
17. I have a lot of energy.	,607	2,55	,77	,536	
18. I feel able to face the day when I get up in the morning.	,793	1,98	,57	,471	
19. I feel physically able to do what I want.	,756	2,10	,67	,580	
21. I feel that my mind and body work together.	,522	1,82	,63	,405	
28. I can take care of myself.	,490	1,81	,59	,526	
29. I can do a lot more for my age.	,484	2,13	,74	,428	
Barriers					
12. I am concerned that I will hurt or strain myself if I am too physically active.	,676	2,88	,84	,361	%13.74
13. I sometimes get tightness in my chest when I exert myself.	,320	2,27	,89	,401	
14. I have too little time for exercise.	,578	1,99	,77	,295	
16. I do not have the strength to exercise.	,505	2,23	,81	,647	
24.I am not interested in exercise.	,476	2,34	,83	,441	
34. It is difficult to exercise if I feel depressed.	,476	2,81	,84	,249	
35. Lack of transportation limits my exercise options.	,782	2,16	,85	,270	
37. Bad weather prevents me from exercising.	,728	2,27	,87	,215	
39. I sometimes get short of breath when I exercise.	,770	2,26	,85	,411	
40. Fear of falling prevents me from exercising.	,688	2,60	0,88	0,41	
Motivators					
15. I prefer to be in a scheduled exercise program.	,735	2,49	0,92	,27	%38.38
22. I feel better when I am active.	,439	1,68	,54	,446	
25. Exercising gives me more energy.	,793	2,13	,76	,737	
26. Exercising gives me a sense of accomplishment.	,890	2,09	,73	,651	
27. Exercise keeps my mind active.	,844	2,02	,72	,629	
30. Exercise is good for my heart.	,857	2,00	,68	,676	
31. Exercise helps my spirits.	,903	1,96	,69	,695	
32. I exercise to keep myself healthy.	,710	2,23	,77	,581	
Total					**60.83**

Test-retest variability

The internal consistency and test-retest stability of the scale was estimated as the bivariate correlation between the baseline and follow-up PFES scores by administering the same test twice over a period of two weeks to 36 elderly participants selected from the study group. The test-retest correlation value was determined to have a Pearson r value of 0.76 (p = 0.000). The analysis determined that the mean values were different with a Hotelling's T2 value of 28.75 (p = 0.0000), indicating that the participants responded to the items differently and that the responses were reliable.

Internal consistency analysis

Three of the four subscales were subjected to validity and reliability analyses. Of the 34 items of the three subscales, seven items (11, 20, 23, 33, 36, 38, 41) were removed (range: 0.20-0.50). The item-total correlation values of the same items were either < 0.30 or negative. Of the remaining 26 items, 20 (items 9, 10, 13, 16–19, 21, 22, 24–32, 39, 40) had correlation values > 0.40 (Tab. II) and were therefore considered very distinctive. Five items (items 14, 15, 34, 35, 37) had correlation values between 0.20 and 0.30 and needed revision. Because the confirmatory factor analysis values of these five items were > 0.70, they were not removed from the scale.

DISCUSSION

It is important to determine what factors motivate older people to involve in more physical activity or prevent them from doing so. It is also important to use a standard measuring instrument to determine these factors. This present study is the first one in which the PFES

was used in a language other than the original language to assess the physical fitness level of older adults as well as their perceived motivators and barriers and exercise frequency.

For psychometric assessments of scales, the content validity index values calculated after receiving expert opinions should equal or exceed 0.80, according to the Davis method [23]. In the present study, the content validity index values met this criterion. The psychometric properties of the scale were determined to be good [21]. According to the determined criteria, the KMO value of the present study was adequate [29]. When determining the construct validity of the scale, the goodness of fit index in the CFA should meet the desired level. Based on these values, the scale compatibility was considered good (≥ 0.95 indicates perfect compatibility, 0.90-0.95 indicates good compatibility and 0.80-0.90 indicates compatibility) [30].

The following items were removed from the scale: item 11 "I feel well whether or not I am physically active"; item 20 "I cannot do a lot of movements I was able to do in the past"; item 23, "If my health were better, I would be more active"; item 33, "When I have pain, it becomes hard to exercise"; item 36, "I want to exercise of my own free will, not when someone else tells me to do so"; item 38, "I feel better when I am active" and item 41, "I prefer to exercise together with others". So the Turkish form of PFES was consisted of four-factor with 34 items. In the present study, the four-factor structure of the original scale was also confirmed with the confirmatory factor analysis, and four-factor model fit reasonably well, with the sample data. In addition, in the original study, factor analysis was not performed and the necessity of performing factor analysis in larger sampler was emphasized [22]. Therefore, the present study also gives the results of the factor analysis of the Melillo et al.'s scale.

Internal consistency analysis

Reliability is defined as the consistency or repeatability of measurements obtained from a test or measurement instrument administered to a particular population or sample [27 29 31]. The alpha coefficient is used to test internal consistency [29]. A Cronbach's alpha coefficient of < 0.40 indicates that the tool is not reliable, whereas values of 0.80-1.00 indicate very good reliability [27-29]. Melillo et al. determined Cronbach's alpha values of 0.76 for the overall scale, 0.78 for the physical fitness subscale, 0.88 for the perceived motivators subscale and 0.72 for the perceived barriers subscale. A Cronbach's alpha value was not calculated for the exercise frequency subscale [22]. In the present study, the Cronbach's alpha value for four-factor structure scale is very reliable. Therefore, the reliability of in the Turkish version of the PFES are similar to or higher than those of the subscales of the original scale.

In the item-total item correlations, values of ≥ 0.40 are considered very distinctive, values between 0.30 and 0.40 are considered distinctive. Items that represent values between 0.20 and 0.30 need revision 24-26. Seven items were removed from the scale because their factor scores were significantly low (< 0.5). Of the remaining 26 items, 20 items were considered as very good distinctive items (> 0.40).

The test-retest method is implemented to determine a correlation between two measurements of a test administered to the same individuals under the same conditions at a certain time interval [28]. The test-retest value of the original scale was 0.61. The test-retest-reliability coefficient in this study, which exceeded 0.70 (Pearson's r = 0.76, p = 0.000), demonstrated that this tool is capable of providing similar measurement values during repeated measurements. Hotelling's T^2 test was used to investigate whether the participating elderly subjects gave the same responses to the survey items [28]. The results of Hotelling's T^2 test revealed that the mean scores of the scale items showed that the participating elderly had low levels of physical fitness, neither many nor few perceived barriers related to exercise, few perceived motivators and a lower frequency of exercise.

In the present study, the total score for the overall scale was 80.0 ± 10.1 (Tab. III). In Mellillo et al.'s study, the total score for the overall scale was 100.96 ± 12.47 22. In the present study, the total scores the elderly obtained from the PFES scale was lower, they had more barriers, fewer

Table III. Subscale reliability values.

Factors (item number)	χ± SS	Min-Max	Cronbach alpha	Sub-total Scale correlations*
Factor 1: motivators (15, 22, 25-27, 30–32)	18.2 ± 4.6	11-44	0.88	0.70
Factor 2: barriers (12-14, 16, 24, 34, 35, 37, 39, 40)	32.03 ± 6.1	13-52	0.78	0.81
Factor 3: physical fitness (9, 10, 17-19, 21, 28, 29)	16.3 ± 3.8	9-36	0.86	0.60
Factor 4: exercise frequency (1-8)	13.4 ± 3.9	8-28	-	-
Total	**80.0 ± 10.1**		**0.89**	

* Pearson correlation analysis, p = 0.000

Cronbach's alpha values were not calculated for the Exercise frequency subscale.

motivators, lower physical fitness and moderate exercise frequency. In Mellilo et al.'s study, motivators score was higher (33.2 ± 4.4), barriers score was lower (29.3 ± 4.1), physical fitness score was higher (27.9 ± 3.1) and exercise frequency was similar (14.1 ± 3.3) [22].

Barriers – and motivators – related perceptions of from different cultural groups may vary. Motivators such as education, treatment of co-morbid conditions, group exercising, safety, past positive experiences are important variables to increase compliance to exercise. However, barriers such as poor health, unfavorable weather conditions, fear of falling are major obstacles to the initiation and maintenance of exercise behavior. It will be useful to identify motivators and barriers for elderly people to start exercising and to assess their compliance. This scale can be applied to different samples in different societies to determine the barriers and motivators that affect the physical activity frequency of the elderly. The data obtained will guide the planning of interventions to increase the frequency of physical activity and to improve quality of life.

Limitations

The literature recommends that the parallel forms technique be used in analyses of the reliability of a questionnaire [27]. This study is limited by the lack of a parallel form reliability analysis; however, parallel forms were not used because of the elderly subjects' difficulties with reading and comprehension. Since that the original scale has not been adopted yet into an other language. Another limitation of this study is that we could not compare the findings with those of other cultures.

CONCLUSIONS

The Turkish version of the 34-item, 4-subscale PFES showed statistically acceptable levels of reliability and validity. Nurses and physiotherapists who work in health care institutions, primary health care services, or nursing homes can use this tool to determine the frequency of exercise undertaken by older adults, as well as their physical fitness and exercise levels and perceived exercise-related motivators and barriers. This scale can serve to measure the effectiveness of nursing interventions related to exercise, functional well-being and health promotion. Thus, older adults may maintain or achieve a better quality of life through enhanced functional capacity.

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