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Validation of the Spanish version of The Pittsburgh Fatigability Scale for Older Adults

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Abstract

Background—The Pittsburgh Fatigability Scale (PFS) is the only validated scale for measuring perceived fatigability in older adults.

Aims—We validated the PFS Spanish version by assessing convergent validity with respect to several measures of physical performance, physical activity, physical function and disability.

Methods—A Cross-sectional validation study of 79 community-dwelling older adults aged 70 and older from Barcelona, Spain were included. Translation-retrotranslation was performed. Convergent validity was assessed in relation to physical activity and performance measurements, and analyzed with Spearman correlation coefficients, a linear trend test and non-linear regression. We also assessed the discriminant validity of the PFS physical score between participants with different physical activity and performance levels.

Results—Higher PFS physical scores were inversely associated with the Short Physical Performance Battery ($r=-0.5$, $p<0.001$) and weak to moderately correlated with gait speed ($r=-0.38$, $p=0.001$), and self-reported weekly walking time ($r=-0.24$, $p=0.035$).

Conclusion—The PFS is a novel, brief instrument to assess fatigability in Spanish-speaking older adults, with good convergent validity against physical performance measurements. Thus, the PFS can be used in Spanish speaking populations.

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Conflicts of interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Keywords

fatigability; fatigue; validity; Spanish version

Introduction

Global fatigue is a common symptom in older adults, particularly in those with high comorbidity [1,2]. Perceived global fatigue refers to a subjective self-report of global tiredness and lack of energy, which leads to decreased physiological reserve, functional decline and disability [3–7] and it has been recognized as one of the key elements of frailty [8]. Fatigue can be the result of an inactive lifestyle, but can often be a symptom of underlying medical or psychiatric illnesses, or the result of medical treatments [4]. Prevalence rates vary widely across studies because of the lack of both consistent definitions and consensus on assessment tools. Currently, there are a number of available tools to evaluate fatigue, both self-reported and performance-based; however, no consensus about a gold standard measure has been reached [4].

The concept of fatigability-fatigue in relation to a defined activity of a specific intensity and duration, constitutes an objective metric to assess the degree to which someone is physically limited due to fatigue [3,4,9]. Measuring fatigability accounts for self-pacing bias and thus provides greater capacity to assess fatigue's role in the disablement pathway. Recently, the Pittsburgh Fatigability Scale (PFS), a 10-item self-administered instrument designed to measure perceived physical and mental fatigability in older adults, was developed and validated [9]. PFS physical scores have shown good convergent validity against performance measures of mobility, physical function, and fitness, as well as good concurrent validity against performance-based measures of fatigability [9].

Given the emerging importance of measuring fatigability in older adults, its relation to declining function in this population [7], and the lack of a similar validated tool in Spanish, it is important to evaluate the validity of the PFS in Spanish community-dwelling older adults. The aim of this project was to validate the PFS Spanish version by assessing convergent validity against several measures of physical performance, physical activity, physical function and disability in a sample of inactive older adults.

Methods

Participants

We included all participants (N=79) from the randomized clinical trial “Exercise Park Equipment for Improving Physical Function and Physical Activity Levels in the Elderly” (NCT02375594), which compared a guided 3-month exercise program using public exercise equipment with a non-active control intervention. This study was approved by the Animal and Human Experimentation Ethics Committee of the Universitat Autònoma de Barcelona.

Community-dwelling older adults age 70 years and older were drawn from a convenient sample of older adults identified by General Practitioners, and were telephone screened for eligibility and willingness to participate. Enrollees had self-reported insufficient physical

activity according to the optimal standards proposed by the World Health Organization (less than 30 minutes a day of moderate physical activity including leisure activities and travel, 5 days a week, or 30 minutes of vigorous physical activity three days a week) [10]. Eligibility also included preserved mobility (participant self-reported being able to walk 400m at a usual pace without help or only using a cane in 15 min, without needing to sit) [11]. Exclusion criteria included previous moderate and severe cognitive impairment; any moderate or severe chronic disease that precluded performing physical activity and inability to attend the intervention sessions or followup visits.

Linguistic Translation and Validation

The validated method of translation-retrotranslation was followed to obtain the final Spanish version of the PFS [12]. Two Spanish-speaking researchers independently translated the PFS into Spanish. Discrepancies were discussed and agreement was reached by consensus. Next, we assessed the preliminary version of the PFS with three independent native Spanish-speaking researchers, and their recommendations were considered when we derived the final version. We evaluated the proper understanding of the scale items by administering the PFS to two Spanish-older community-dwellers. To further check the fidelity against the original scale, the final Spanish version of the PFS was retro-translated into English by a bilingual researcher, and then translated and retrotranslated versions were checked for accuracy by an independent bilingual individual. After retro-translation, no additions changes were required. The final Spanish version of the PFS can be found as Supplementary data.

The PFS asks individuals to rate the level of physical and mental fatigue they would expect or imagine they would feel immediately after completing 10 different activities, and each statement is rated on a 6-point scale ranging from 0 (no fatigue) to 5 (extreme fatigue). Participants answer each item even if they have not performed the activity in the past month, and they are prompted to pay careful attention to the intensity and duration of each activity [9]. Due to the low educational level and advanced age of our sample, a member of the research team initially provided oral guidance on how to fill the questionnaire, and was available to clarify participants' concerns, if needed. The scale comprises physical and mental fatigability scores, calculated by summing the ratings of the 10 items for physical and mental fatigue separately, with total scores ranging from 0 to 50 (higher score = higher fatigability). To date, only the original PFS physical score has been validated, so convergent validity and discrimination power were calculated only for this component of the PFS – Spanish version.

Other measures

Baseline socio-demographic characteristics (age, gender, marital status, education grade) were collected—The PFS – physical score Spanish version convergent validity was assessed for physical performance, physical activity, physical function and disability. Physical performance was assessed by the Short Physical Performance Battery (SPPB) test, a strong predictor of physical disability in older adults [13]. The SPPB includes the evaluation of balance, gait speed (m/sec), and chair stand performance (sec). The total score ranges from 0 (worst physical performance) to 12 (best performance) [13–16]. According to previous studies, poor physical performance was

defined as SPPB < 10 points [14]. In order to obtain more information of each SPPB component, gait speed during a usual pace walk over 4-meters and chair stand performance (time to complete five chair stands without using the arms) were analyzed as independent variables. According to the literature, thresholds were set for gait speed and chair stand test. Gait speed ≥ 0.8 m/sec was considered slow [17–19] and time > 16.7 sec to performed the chair stand test or not be able to performed it was defined as low strength performance [13,14]. Physical activity was assessed by the self-report weekly walking time (WWT, hours/week). Low physical activity was defined according to WHO recommendations as WWT ≤ 2.5 hours/week [20,21]. Physical function and disability were assessed by the Short Form Late Life Function and Disability Instrument (SF-LLFDI), which is a valid measure of functional limitations and disability in older adults [22]. The SF-LLFDI was developed as a self-report instrument and it includes three subscales: one for functional assessment and two for disability (frequency and limitation) [23,24]. The function subscale is scored from 15 to 75 (maximal to minimal functional limitation) and both disability subscales range from 8 to 40 (severe to no disability) [23]. All data were collected at the baseline clinic visit prior to randomization.

Statistical analysis

We assessed convergent validity (degree to which two measures that theoretically should be related are related) of the Spanish version of the PFS physical score in relation to total SPPB, gait speed, chair stand time, WWT and the SF-LLFDI. Spearman correlation coefficients were analyzed and strength of correlations were interpreted as follows: < 0.2 : very weak correlation, 0.2-0.39: weak correlation, 0.4-0.59: moderate correlation and > 0.6 : strong correlation [25]. Reliability (internal consistency) of the final Spanish version of the PFS physical score was also measured using Cronbach's alpha.

The least square means and standard error adjusted for age and gender, and the Area Under the Curve (AUC) were used to analyze the discriminant validity of the PFS physical score. Discriminant validity tests whether two measurements, not expected to be related are actually unrelated. In our study, this was assessed in order to evaluate the ability of the PFS physical score to differentiate between participants with good or normal vs. poor physical performance, faster or normal vs slower gait speed, good or normal vs low strength performance, and high or normal vs lower physical activity levels. The discriminant validity evaluated through the AUC was interpreted as follows: < 0.6 not good, 0.6-0.7 poor, 0.7-0.8 fair, 0.8-0.9 good and 0.9-1.0 excellent.

Additionally, linear trend tests were used to explore the linear and non-linear relationships among PFS physical score and tertiles of SPPB, gait speed, chair stands, WWT and SF-LLFDI.

All statistical tests were conducted using the SPSS software ver. 22.0 (SPSS Inc., Chicago, IL, USA).

Results

Baseline characteristics of our population (mean age \pm SD = 77.21 \pm 5.0 years, 76% women) can be found in Table 1. Values for the physical fatigability score were distributed across the range of potential values, with no sign of ceiling or floor effects. The final Spanish version of the PFS physical score showed strong internal consistency, with a Cronbach's alpha of 0.83.

The PFS physical score showed a moderate to strong negative correlation with physical function and disability scale (SF-LLFDI disability and function scores), a weak to moderate negative correlation with physical performance measures (moderate correlation with total SPPB score and weak correlation with gait speed and chair stand tests) and a weak correlation with physical activity measurement (WWT), Table 2.

Moreover, the PFS physical score showed moderate ability to discriminate between higher and lower levels of physical performance measures (SPPB total score and chair stand test). However, the ability to discriminate those participants with high or normal vs. low physical activity was low. Nevertheless, physical fatigability was lower in subgroups of participants with high functional levels as assessed by least square-means of the PFS physical score, with differences between 3.1 and 7.9, Table 3.

Finally, physical fatigability score showed a linear trend, with higher PFS scores for participants with low SPPB score, slow gait speed and higher functional limitation and disability according to SF-LLFDI, Figure 1.

Discussion

Our study findings indicate that the Spanish version of the PFS is a valid, easy to use measurement of perceived physical fatigability in Spanish older adults. The PFS physical score has moderate to good convergent validity. Additionally, physical and functional performance was associated with lower physical fatigability.

The aging population phenomena and the increase in Spanish-speaking populations worldwide reinforce the need for Spanish translations of reliable tests to help clinicians assess this growing population group. Fatigue and exhaustion have been recognized as one of the key elements of frailty [8], a symptom highly prevalent in older adults. Additionally, perceived fatigability assessment in older adults is becoming increasingly important due to its close relationship to frailty [26]. However, until now, available fatigability tools were developed and targeted to assess this symptom mainly in younger populations, with specific pathologies and without adjustment for physical activity or age. Thus, the PFS development takes a step forward and responds to the need to assess activity-anchored fatigue in older adults in clinical and research settings. Currently, the PFS is the only self-report validated instrument to measure perceived physical fatigability that takes into account a wide spectrum of activities usually performed by older populations.

The PFS physical score has previously demonstrated high concurrent validity and strong convergent validity against both functional and physical performance measures, including

physical activity measurements such as 400 meters long distance corridor walk test, five chair stand test and gait speed [9]. The differences between the results shown by Glynn et al. and our study, may be explained by the differences between both samples in sample size, our sample was smaller, and socio-demographic characteristics, our population was older. However, there were also important differences in baseline physical activity performance, while our population was insufficiently active, 45.3% of participants in the original development sample, and 58.0% in the validation sample, performed moderate to vigorous physical activity.

Our study has some limitations: first, the small number of participants. Second, participants were insufficiently active and interested in taking part of a clinical trial, so this may have biased the results towards a specific group population among older adults, not a general elderly population. Main strengths include the rigorous methodology to translate the PFS and the assessment of convergent validity across a wide variety of objective measurements. Finally, it is the first scale developed and validated to assess fatigability in Spanish older adults.

In conclusion, the Spanish version of the PFS is a convenient and valid tool to assess perceived fatigability in Spanish older adults and it has strong convergent validity against physical and functional performance measurements. This is an important step, to improve the evaluation of perceived fatigability impact in Spanish-speaking older adults, which represent a growing population. This study has opened up the possibility of including an area of research through considering perceived fatigability as a predictor variable or an outcome measure in intervention studies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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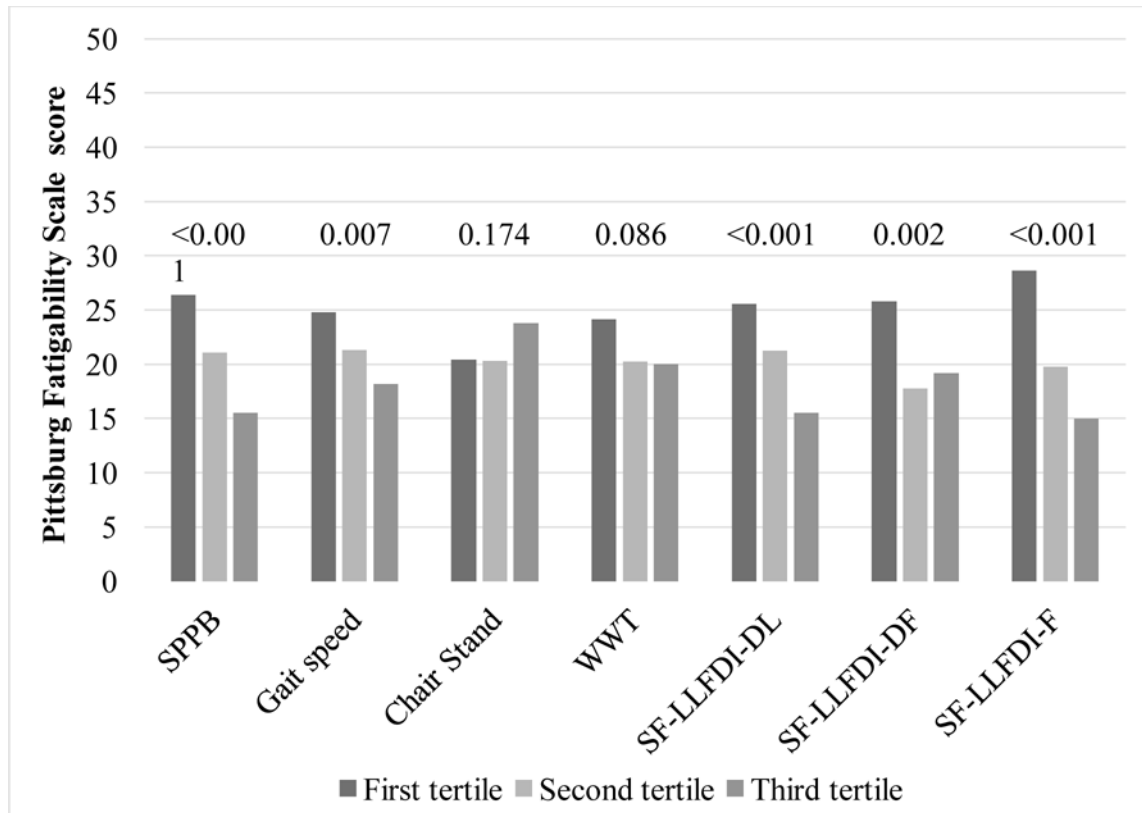


Figure 1. Linear trend among the Spanish version PFS physical score and physical performance, physical activity and disability measures stratified by tertiles

SPPB: Short Physical Performance Battery, WWT: Weekly Time Walking, SF-LLFDI-DL: Short Form Late Life Disability Instrument-Disability Limitation sub-scale, SF-LLFDI-DF: Short Form Late Life Disability - Disability Frequency, SF-LLFDI-F: Short Form Late Life Disability – Function sub-scale.

Table 1

Sample baseline characteristics.

Characteristics	Total sample N=79
Age, years	77.2 (5.0)
Female, % (N)	75.9 (60)
Education level, % (N)	
Illiterate	3.8% (3)
Can write	5.1% (4)
Primary education	48.1% (38)
Secondary education	21.5% (17)
Graduate education	21.5% (17)
PFS physical score	21.4 (8.7)
High fatigability, % (N)	79.7 (63)
Total SPPB score (SD)	7.9 (2.4)
SSPB categories, % (N)	
0–3 points	7.7% (6)
4–6 points	7.7% (6)
7–9 points	57.7% (45)
10–12 points	25.6% (20)
Gait speed (m/sec)	0.7 (0.2)
Slow gait speed, % (N)	67.1% (51)
Chair stand test time (seconds)	15.1 (7.3)
Lower strength performance, % (N)	55.8% (43)
Weekly Walking Time (hours/week)	3.4 (2.9)
SF-LLFDI disability	
Disability limitation	34.3 (5.2)
Disability frequency	30.0 (5.2)
SF-LLFDI function	54.2 (9.9)

Values are presented in % (N) and mean (SD) for categorical and continuous variables respectively. PFS: Pittsburg Fatigability Score, high fatigability PFS ≥ 15 . SPPB: Short Physical Performance Battery, low physical performance SPPB ≤ 10 . Slow gait speed < 0.8 m/sec. Lower strength performance: time to performed chair stand test > 16.7 seconds or not able to perform it. SF-LLFDI: Short Form Late Life Function and Disability Instrument.

Table 2

Convergent validity of Spanish version of the PFS physical score.

Characteristics	PFS Physical	
	Spearman correlation	p value
Age, years	0.13	0.266
Total SPPB score	-0.50	<0.001
Gait speed (m/sec)	-0.38	0.001
Chair stand test time (sec)	-0.15	0.203
Weekly Walking Time (hours/week)	-0.24	0.035
SF-LLFDI disability		
Disability limitation	-0.55	<0.001
Disability frequency	-0.40	<0.001
SF-LLFDI function	-0.72	<0.001

SPPB: Short Physical Performance Battery. SF-LLFDI: Short Form Late Life Function and Disability Instrument.

Discriminative validity of the PFS physical score – Spanish version with physical performance and physical activity measures.

Table 3

Measures	PFS Physical Score					AUC
	LS means (SE) ^a		Difference		95%CI	
	Yes	No	Mean (SE)			
Poor physical performance ^b	23.5(1.0)	15.6(1.2)	7.9(0.3)		7.3-8.5	0.77
Slow gait speed ^c	23.1(1.2)	17.5(1.1)	5.6(0.3)		5.0-6.2	0.69
Low strength performance ^d	24.1(0.9)	16.4(1.1)	7.6 (0.3)		7.0-8.2	0.79
Low physical activity ^e	23.1(1.1)	20.2(1.7)	3.1(0.3)		2.5-3.7	0.64

LS means: Least squares means, SE: Standard Error, AUC: Area Under the Curve.

^a Adjusted by age and gender.

^b Defined as Short Physical Performance Battery (SPPB) <10 points.

^c Defined as low gait speed: gait speed < 0.8 m/sec during a walk at usual pace over 4-meters.

^d Defined as time to performed chair stand test < 16.7 seconds or not able to do 5 stands.

^e Defined as weekly walking time < 2.5hours/week.