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Translation, cultural adaptation, and validation of the physical activity scale for elderly (PASE-PT): the European Portuguese version

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Abstract The Physical Activity Scale for the Elderly (PASE) assesses Physical Activity (PA) levels of older people, providing information on the frequency, duration, and intensity. Aims: To translate, culturally adapt, and validate the PASE for the Portuguese population. Methods: Translation and cross-cultural adaptation for the Portuguese population of the PASE, according to the Report of ISPOR Translation and Cultural Adaptation guidelines and metric validation was evaluated using the analysis of reliability and validity. Results: The PASE-PT is a reliable and valid instrument to assess PA levels among the Portuguese population, with excellent test-retest reliability in the various domains and in total, with an ICC between 0.938 and 1.00, an acceptable internal consistency, with Cronbach's alpha of $\alpha = 0.695$, and ω de McDonald was 0.63 and is significantly related to TUG ($r = -0.303$) and accelerometer AF levels ($r = 0.416$). Conclusions: The PASE-PT is an instrument that can be used in clinical practice and in research studies involving the older population.

Keywords: PASE, Physical Activity scale, elderly, time up and go

Introduction

The growth in the number of older people is a global phenomenon. According to Eurostat data from 2019, people aged 65 years and older accounted for 19.4% of the total population of the European Union (EU-27) and Portugal was within the first 4 countries with the highest percentages with 21.8%. Moreover, the ageing rate of the oldest among the older people is increasing at the fastest rate. It is forecast that between 2019 and 2100, the percentage of people aged 80 and over in the EU-27 population will more than double from 5.8 to 14.6%.[1]

Population aging demands a comprehensive public health response. Promoting healthy aging and building systems to meet the needs of older adults are necessary. Among several factors related to the health of the population, it is estimated that an increase in Physical Activity (PA) within the senior population has the greatest impact on public health. Studies have demonstrated a relationship between higher levels of PA and disease prevention, reduction of the period of morbidity, the risk of functional losses, and preservation of independence.[2]

Physical inactivity is an important risk factor and is associated with an increased risk of morbidity[3] due to cardiovascular disease,[4,5] diabetes,[6,7] cancer,[8,9] osteoporosis,[10,11] dementia,[12,13] and even an individual's fall risk.[14,15]

Knowledge of older adults' PA levels is vital to determining their health statuses as well as protective and preventive approaches to chronic disease. Methods of assessing PA range from objective approaches, such as accelerometers, to subjective approaches featuring participant self-reported measures. The evaluation of PA through questionnaires has become popular in recent years due to the fact that it is cheaper compared with other methods and has an easy-to-use quality in extensive studies.[16] There are, however, few questionnaires to measure the PA level specifically for the older people, and none exist translated for the Portuguese population.

The Physical Activity Scale for the Elderly (PASE) was developed in 1993 by Washburn et al, specifically to assess PA in epidemiologic studies of older people. It is a commonly used as a self-reported measurement of PA that provides information on the frequency, duration, and intensity of various activities. The PASE consists of 10 items focusing on the following 3 domains of activity over a period of 7 days: leisure (5 components), household activities (4 components), and work-related (1 component) activities. Participation in leisure activities is recorded as frequency (never, seldom, sometimes, and often) and duration (less than an hour, 2–4 hours, or more than 4 hours); paid or unpaid work is recorded as total hours of work per week; and household activities including housework, lawn work, home repair, outdoor gardening, and care for others are recorded as yes or no answers. The total PASE score is calculated by multiplying activity participation (yes or no) or the amount of time spent on each activity (hours/week) by the weights of the items obtained in the original study.[17]

The advantages of this questionnaire compared with the others are the short training period required, the easy scoring process,

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the inclusion of low-intensity activities (e.g., housework), that it can be completed in 5–15 minutes, and it can be interviewer-administered or self-administered by email, phone, or letter.[17] The 3 domains covered (leisure time, household, and work-related activities) make it easy to evaluate the physical activities of individuals in more detail and to compare these domains with other functional measures.[18,19]

PASE has been chosen for cultural adaptation and validation as it is used in research worldwide. It has been translated and validated in various countries, including the United States,[19] Denmark,[20] Norway,[21] Japan,[22] China,[23] Malaysia,[24] Turkey,[25] Korea,[26] Italy,[27] Saudi Arabia,[28] Iran,[29] and Poland.[30] The aim of this study was to adapt the PASE to the Portuguese language (PASE-PT) and assess its accuracy and reliability in Portuguese community-dwelling older people.

Material and methods

Sample/participants

The sample selected composed of 125 seniors, of which 28.0% were male and 72.0% were female. The average age was 75.0 years (SD = 6.7). All participants were independent in their daily life activities.

Procedure

The study had a cross-sectional design in 2 moments with a convenience sampling. Seniors were interviewed face to face by the principal investigator to obtain their sociodemographic data and medical history. The data were recollected during the year 2021 and 2022. Participants were asked if they had any of the following diseases: cardiovascular, respiratory, endocrine, central nervous system, and musculoskeletal. According to the Montreal Cognitive Assessment (MoCA) criteria, individuals with severe cognitive impairment, those who used a pacemaker and support products, who had a problem preventing them from using an accelerometer or that could interfere or influence the data were excluded.[31] Heart rate and blood pressure were, additionally, measured.

Instruments

The PASE is an instrument in which self-reported measurements are used to measure PA among older adults in three domains (leisure, household, and work-related activities) over the previous 7 days. According to the original instrument, the internal consistency of these items was 0.69 (Cronbach alpha) and the test-retest reliability coefficient was 0.75 (95%, Confidence Interval (CI) = 0.69–0.80).[17]

The development of the translated and adapted Portuguese version was developed in line with the "Translation and Cultural Adaptation of Patient-Reported Outcomes Measures—Principles of Good Practice" guidelines.[32]

The procedure was divided into ten stages: 1) permission to use the original PASE questionnaire was obtained from the developer/author, who was invited to participate in the translation process; 2) two independent progressive translations were developed with an explanation of the instrument concepts provided to the translators; 3) reconciliation of the 2 translations to a single translation; 4) back translation into the source language; 5) review of the back translations; 6) harmonization of all translations with each other and with the source version; 7) cognitive debriefing with patients drawn from the target population; 8) review of cognitive debriefing results and finalization of the translation; 9) proofreading; and 10) preparation of a written report on the translation development, including all changes made to the original version.

Table 1 presents the set of changes made to the original version.

The total and domain scores were calculated following the original PASE methodology, by multiplying activity participation (yes/no) or the amount of time spent on each activity (hours/week) by the weights of the items obtained in the original study by Washburn et al (1993).[17]

The physical measures components validated against PASE-PT score were:

- Strength of upper limb: upper limb strength was assessed through grip strength of both hands which was measured 3 times using a digital hand dynamometer (Lafayette Digital Hand Dynamometer 5030D1) held with the wrist in a neutral position and the elbow at 90° of flexion, as per the recommendations of the American Society of Hand Therapists.[33] The average was used as the value for upper limb strength.
- Physiological component: body composition analyses (body mass index [BMI]) were determined using bioimpedance analysis (BIA) equipment (TANITA BC-601), which automatically measured weight. Height was entered manually, and the device calculated BMI using the standard equation (weight [kg]/height $[m]^2$).
- Functional test by Time Up and Go (TUG) Test: participants were asked to get up from a chair, walk 3 m, rotate 180°, and return to the chair.[34] They were asked to complete 3 attempts and the shortest time was used to score.
- Balance by Berg Balance Scale (BBS): the ability to maintain balance during 14 different tasks was assessed. Transition from a sitting to standing position, standing without support, sitting without support, transition from standing to sitting, moving, standing with eyes closed, standing with legs together, stretching hands forward, lifting an object from the floor, looking back, 360° rotation, alternating feet on a step, standing with one foot extended in front of the other, and standing on one leg.[35]

The PASE was readministered to the same respondents one week after the first interview by the principal investigator to evaluate the test-retest reliability. A 1-week time interval was selected as it was short enough to ensure participants were not able to change their PA level while being long enough to prevent recall bias.[36]

The 43 participants were loaned an accelerometer (*activPAL4*®) to wear for 7 consecutive days. Detailed procedure and the do's and don'ts of wearing the accelerometer was given verbally to all participants. The accelerometer was fixed to the participants as per the manufacturer's recommendations and placed on the anterior thigh of the nondominant lower limb. Participants used the accelerometer for 24 hours throughout 7 days. On the eighth day, the accelerometers were collected and the PASE instrument was applied.

Psychometric assessments and statistical analysis

All participants' demographic data were presented as counts (percentage) or mean and SD, as appropriate. Validity and reproducibility results were presented with the corresponding 95% CI. Cronbach alpha was used to determine the internal consistency. Alpha values greater than 0.70 were considered

Table 1

Changes made to the original version

PASE numbers	PASE activities	Replaced activities in the Portuguese version
3	Bowling, golf with a cart, shuffleboard, fishing from a boat or pier	Recreational walk, pétanque, billiards, fishing
4	Double's tennis, ballroom dancing, hunting, ice skating, golf without a cart, softball	Dancing, hunting, caring for animals (medium and large)
5	Jogging, swimming, cycling, singles tennis, aerobic dance, skiing (downhill or cross-country)	Running, swimming, cycling, aqua aerobics

satisfactory.[37] Test-retest reliability was determined using intra-class correlation coefficient (ICC) (2, 1) in two-way random effects model. An ICC (2, 1) value equivalent to or >0.70 indicated a good level of reliability.[38]

Construct validity of PASE-PT was evaluated using Pearson and Spearman rank correlation coefficients (*r*), along with handgrip strength (HGS), TUG, BBS, physiological components, heart rate, and blood pressure. All statistical analyses were performed using IBM-SPSS version 27.[39]

Results

PASE-PT was applied of 125 older adults from several areas of Portugal. The characteristics of both samples are summarized in Table 2.

According to the reliability, PASE-PT components showed adequate test-retest ability and ICC (2, 1) values ranged from 0.938 to 1.00 ($P < 0.001$). Of the components of the PASE[1], the internal consistency index (Cronbach alpha) for Leisure Time Activities was = 0.754 and ω de McDonald was 0.71; for household activity was = 0.492 and ω de McDonald was 0.46 and for work-related activities was = 0.644 and ω de McDonald was 0.61. Table 2 presents a summary of the reliability results. The Cronbach alpha for the total items was 0.69 and ω de McDonald was 0.63. For the components of the PASE,[2] the internal consistency index (Cronbach alpha) for Leisure Time Activities was = 0.733 and ω de McDonald was 0.72, for household Activities was = 0.525 and ω de McDonald was 0.53 and for work-related activities was = 0.674 and ω de McDonald was 0.66. Table 3 presents a summary of the reliability results.

Table 4 presents the concurrent validity between PASE scores, its components, and several validation measures including BMI, systolic and diastolic Blood Pressure (BP), heart rate, BBS, dominant and nondominant HGS, TUG test, and accelerometer measure, evaluated in 43 of the participants. The PASE-PT overall score was significantly correlated with the TUG ($r = -0.326$, $P < 0.05$, $n = 43$) and accelerometer measures ($r = 0.457$, $P < 0.01$, $n = 43$), whereas Leisure Time Activity was significantly correlated with diastolic BP ($r = 0.487$, $P < 0.01$) and TUG ($r = -0.334$, $P < 0.01$).

Discussion

This is the first instrument specifically validated for the senior population in Portugal. This population has different characteristics compared with younger age groups, not only due to the physiological changes that come from the aging process but also due to the activities this population performs in their daily lives. This study conducted the translation, adaption, and validation of the PASE, enabling access to an adequate instrument that assesses the level of PA in the Portuguese senior population. We demonstrated that the PASE-PT is a reliable and valid instrument to assess PA levels among the Portuguese population.

The ability to discriminate between leisure, domestic, and work-related physical activities is an undoubted benefit, as within

Table 2

Characteristics of the population included

Variable	Sample = 125, n (%)
Age, mean (SD)	75.0 ± 6.7
Sex	
Male	35 (28.0)
Female	90 (72.0)
Marital Status	
Married	81 (64.8)
Single	1 (0.8)
Divorced	17 (13.6)
Widow/er	26 (20.8)
Household Inhabitants	
Alone	35 (28.0)
Spouse	75 (88.0)
Family	10 (8.0)
Spouse and children	5 (4.0)
Education	
0 years	8 (6.4)
1–6 years	71 (56.8)
7–12 years	34 (27.2)
≥13 years	12 (9.6)
Working status	
Employed	8 (6.4)
Retired	111 (88.8)
Unemployed	6 (4.8)
Sociodemographic environment	
Rural	48 (38.4)
Urban	50 (40.0)
Semiurban	27 (21.6)
Cardiovascular diseases	102 (81.6)
Respiratory diseases	24 (19.2)
Sensory deficits	74 (59.2)
Musculoskeletal disorders	82 (65.6)
Endocrine diseases	41 (32.8)
Central nervous system diseases	35 (28.0)
Polymedicated (>3)	45 (36.0)
Smoking	5 (4.0)
BMI	
Low weight	1 (0.8)
Normal weight	31 (24.8)
Overweight	93 (74.4)
Those who have fallen in the last year	55 (36.0)
MoCA	22.8 ± 4.4
Cognitive deficit	6 (6.6)
Systolic BP	138.4 ± 19.5
Diastolic BP	75.7 ± 10.7
Heart rate	67.6 ± 10.9
PASE	118.6 ± 61.1

Table 3

Test-retest reliability of the PASE overall and its three components' scores

	PASE[1], M (SD)	PASE[2], M (SD)	R_s*	ICC_s†	95% CI
N = 43					
Overall	31.52 (10.54)	31.16 (10.56)	0.984**	0.996**	(0.993–0.998)
Leisure	17.35 (4.82)	17.07 (4.62)	0.975**	0.981**	(0.966–0.990)
Household	8.16 (1.05)	8.11 (.0967)	0.890**	0.938**	(0.884–0.966)
Work	6.00 (11.23)	5.97 (11.18)	1.00**	1.00**	(1.00–1.00)

* Spearman rank correlation coefficient;
† Intraclass correlation coefficients (ICCs) (2, 1); * $P < 0.05$; ** $P < 0.01$.

this age group it is important to assess the different areas of daily life, as this population performs a high number of activities related to domestic or work activities, as well as rural work, as is the case of the Portuguese population, and which could not be included if only leisure activities were evaluated.

The total PASE-PT score was 118.6 ± 61.1. Very similar scores were found in the validations for the United States (102.9 ± 61.1),[40] China (104.4 ± 47.1),[23] and Saudi Arabia (111.7 ± 77.7).[28] Others differed significantly, with higher values, seen in the Italian validation 159 ± 77.88[27] and the Iranian validation 153.73 ± 48.47,[29] whereas lower values were observed in the Polish validation 91.54 ± 71.15)[30] and Malaysian validation 94.96 ± 62.82 and 92.19 ± 64.02, which analyzed the total PASE score at baseline and after follow-up.[24] Following this analysis, it is possible to conclude that the sample presented relatively low levels of PA, which is related to a sedentary lifestyle and contributed to a variety of health problems found in the senior population like the incidence if disability and loneliness.[41]

The low level of PA assessed in our sample, compared with other populations in the PASE validation, such as the Italian validation, may be related to our sample being older, with a higher prevalence of women and a lower level of education. Older adults may be less likely to engage in leisure activities such as sports and recreational activities, and women in turn are more likely than men to be less physically active. Multiple factors such as family and societal roles, psychological issues, and life conditions may account for these differences.[42] The low level of education in our sample may have decreased their involvement in physical activities. A study reported that older adults with higher education were more likely to participate in leisure activities such as sports or exercise but not associated with being active in gardening or yard work.[43]

The reliability and validity of the PASE-PT were evaluated in a sample of 42 seniors. Excellent test-retest reliability was obtained in the various domains and in total (0.938–1.00) over a 7-day interval. These results were superior to some validations, including those of the United States (r = 0.910),[40] China (r = 0.810),[23] Japan (r = 0.850),[22] Iran (r = 0.920),[29] and the original PASE.[17] However, the results were similar to those seen in the validations performed in Italy (r = 0.977)[27] and Turkey (r = 0.977).[25]

The internal consistency of the components of the PASE-PT was acceptable, as for the total of items it presented a consistency of 0.695 in the initial PASE and of 0.675 in the final PASE. Only the Domestic Activity domain had a Cronbach alpha lower than 0.6. This result could be explained by the choices made during the translation and cultural adaptation process that may not have been the most beneficial, namely, in certain expressions adopted, for example "putting up wallpaper" is an activity that Portuguese older people do not culturally perform. This aspect demonstrates the importance of good cultural adaptation and not just translation.

Many validation studies of the PASE did not assess internal consistency, since its calculation is not necessary for the entire instrument, in studies composed of different parts and different types of responses.[44] Studies that evaluated internal consistency showed Cronbach alpha values of 0.73 for the validation of Norway,[21] 0.815 for the Italian validation,[27] 0.714 for the Turkish validation,[25] and between 0.69 and 0.75 for the Saudi Arabian validation, as the evaluated internal consistency of each PASE component.[28]

It was found that the total PASE-PT score showed a moderate correlation with the TUG and with the level of PA detected by the accelerometers. The correlation with the TUG allowed us to verify that the higher the PA level, the lower the TUG values, which corresponds to a better functional performance. This correlation was identified by several validation studies, such as the Iranian validation, which showed a strong correlation[29] and the Saudi Arabian validation, which, like this study, showed a moderate correlation.[28] With the accelerometers, the

Table 4

Concurrent validity of PASE-M scores, components, validation, and accelerometer measures

	Validation measures	PASE overall	PASE1 leisure time activity	PASE1 household activity	PASE1 work-related activity
N = 43	BMI	0.144	0.216	0.191	−0.038
	Systolic BP	0.199	0.279	0.233	−0.044
	Diastolic BP	0.276	0.487**	−0.199	−0.051
	Heart rate	−0.087	0.156	−0.148	−0.195
	BBS	0.263	0.148	−0.083	0.172
	Dominant HGS	0.170	0.253	0.385**	−0.010
	Nondominant HGS	0.276	0.246	0.362**	0.080
	TUG	−0.326**	−0.334**	0.182	−0.093
	Accelerometer	0.457**	0.086	0.183	0.377**

*$P < 0.05$; **$P < 0.01$.
Concerning household activity, the significant correlations were dominant HGS (r = 0.385, $P < 0.01$) and nondominant HGS (r = 0.362, $P < 0.01$). Finally, work-related activity was correlated with accelerometer measures (r = 0.377, $P < 0.01$).

correlation was positive, which indicated that the PA levels were directly proportional. These results support the validity of the PASE-PT since it showed good results compared with the gold standard. Few PASE validation studies performed this analysis; however, those that did obtained significant correlations, as demonstrated by the validation study for the Malay language, which found a moderate correlation with accelerometers[42] and the validation for Japanese that found a weak but significant correlation.[22]

The PASE component—Leisure activities also showed a moderate correlation with TUG and with Diastolic BP. Some validation studies also performed the analysis of the different components of the PASE, the study of Saudi Arabia in all components obtained an inverse correlation with the TUG, moderate in leisure activities, and weak in domestic and work-related activities[28]; however, at present, there were no correlations between domestic and work-related activities. The Polish validation also showed a moderate correlation between leisure and domestic activities but did not correlate with work.[30] Regarding the association with BP, only the original validation study showed a significant correlation[19]; however, it was with systolic BP as opposed to this study in which there was a correlation with diastolic BP. Considering these results, it is believed that the level of PA related to leisure is associated with greater functional mobility and better BP.

The domestic activities component showed a moderate correlation with the HGS of both limbs; however, no studies were found that discriminated this relationship. The original Chinese and Malaysian validation study found a moderate correlation with the HGS of both limbs; however, this was using the total PASE score.[17,23,24] The Saudi Arabia validation study, on the other hand, showed a weak correlation with HGS with the total score.[28] The relationship between the PASE-PT's domestic activities may be associated with FPM due to the typology of seniors' daily activities.

The work-related component only showed a positive correlation with the accelerometer measurements. The only validation found with this analysis did not find a significant correlation between work component and accelerometer PA level.[45] This result confirms that people who continue to be professionally active or who choose to volunteer can maintain higher levels of PA.

Although an analysis of the correlation with the Berg Balance Scale (BBS) and with body composition was also performed, no significant correlations were obtained with the total score nor with the various components of the PASE-PT.

Studies that verified the association with the BBS, such as the Italian validation study, showed a strong correlation between the scale and the total PASE score, as well as with the component of work-related activities. The remaining components showed a positive, but moderate, correlation.[27] In addition, the Polish validation showed a strong correlation with the PASE total and the leisure activities component, a moderate correlation with household activities and only work-related activities showed no relationship.[30] Although these studies have shown strong correlations between the PASE and the BBS, the latter has relatively rigid scoring criteria and depends on a somewhat subjective assessment by the evaluator. This issue could have been eliminated if the balance had been evaluated through a method eliminating this subjectivity, as is the case of the evaluation of the Oscillation of the Center of Pressure, through a force platform.

Studies that investigated the relationship between PASE and body composition also did not find significant correlations with the BMI, as is the case of the validation study of Saudi Arabia,[28] Iran,[29] and even the original validation.[17]

The results of this study show that the PASE-PT is a reliable and valid instrument to assess PA levels among the Portuguese population, which has an excellent test-retest reliability in the various domains alone and in total, along an acceptable internal consistency and is inversely related to the TUG and directly to the accelerometer AF levels.

This study had several important strengths in the assessment of PA, such as the comparison with a gold standard measure, in which the accelerometers used allow the discrimination of various types of activities, as data collection is performed in the three planes of movement and, thus, manages to be discriminatory when it comes to the movement performed. The use of an accelerometer was guaranteed during the 7 days of evaluation, since it was fixed to the lower limb and coated so that it could not be removed, and it also allowed for the answers to the PASE questions that require the individual to remember the activities of the past 7 days. A further strength of the study was the diversity of the participants in terms of sociodemographic background, gender, and age, which inevitably influences the level of PA.

The limitations found in this study included the fact that the concurrent validity was only verified in the sample of 43 seniors, which is small compared with the Portuguese population and that the reliability indices were moderately acceptable and the internal consistency, particularly regarding the household activity component is below the acceptable standard, a better adaptation at this point is suggested in future validations. In addition, memory bias among seniors may have been a limitation. Moreover, EFA and CFA should be applied with a large sample of participants to check the theoretical structure of the PASE. Similarly, the size of the sample of the concurrent validity was small, and this fact could have influence on the strength of the correlations.

Conclusions

The PASE-PT is a reliable and valid instrument with an excellent test-retest reliability, acceptable internal consistency, and relation to the TUG test as well as levels of PA as provided by accelerometers. It can be used in clinical practice and in research studies related to the senior population.

The use of the PASE-PT is considered important, since it is able to discriminate different types of activities, relevant to older age groups, including leisure, domestic, work-related, and volunteering activities.

References

[1] Eurostat. Population structure and ageing. Statistics Explained. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Population_structure_and_ageing. Accessed April 23, 2021.
[2] Reiner M, Niermann C, Jekauc D, Woll A. Long-term health benefits of physical activity - a systematic review of longitudinal studies. BMC Public Health. 2013;13(1):813.
[3] Warburton DER, Nicol CW, Bredin SSD. Health benefits of physical activity: the evidence. CMAJ. 2006;174(6):801–809.
[4] Kraus WE, Powell KE, Haskell WL, et al. Physical activity, all-cause and cardiovascular mortality, and cardiovascular disease. Med Sci Sports Exerc. 2019;51(6):1270–1281.
[5] Villella M, Villella A. Exercise and cardiovascular diseases. Kidney Blood Press Res. 2014;39(2-3):147–153.
[6] Lumb A. Diabetes and Exercise. London: Clinical Medicine; 2014:Vol 14.
[7] Smith AD, Crippa A, Woodcock J, Brage S. Physical activity and incident type 2 diabetes mellitus: a systematic review and dose–response meta-

analysis of prospective cohort studies. Diabetologia. 2016;59(12): 2527–2545.
[8] Mctiernan A, Friedenreich CM, Katzmarzyk PT, et al. Physical activity in cancer prevention and survival: a systematic review. Med Sci Sports Exerc. 2019;51(6):1252–1261.
[9] Patel AV, Friedenreich CM, Moore SC, et al. American college of sports medicine roundtable report on physical activity, sedentary behavior, and cancer prevention and control. Med Sci Sports Exerc. 2019;51(11): 2391–2402.
[10] Tong X, Chen X, Zhang S, et al. The effect of exercise on the prevention of osteoporosis and bone angiogenesis. Biomed Res Int. 2019;2019: 8171897.
[11] Troy KL, Mancuso ME, Butler TA, Johnson JE. Exercise early and often: effects of physical activity and exercise on women's bone health. Int J Environ Res Public Health. 2018;15(5):878.
[12] Lamb SE, Sheehan B, Atherton N, et al. Dementia and physical activity (DAPA) trial of moderate to high intensity exercise training for people with dementia: randomised controlled trial. BMJ. 2018;361:k1675.
[13] Kirk-Sanchez NJ, McGough EL. Physical exercise and cognitive performance in the elderly: current perspectives. Clin Interv Aging. 2014;9:51–62.
[14] Thomas E, Battaglia G, Patti A, et al. Physical activity programs for balance and fall prevention in elderly. Medicine. 2019;98(27):e16218.
[15] Liu-Ambrose T, Davis JC, Best JR, et al. Effect of a home-based exercise program on subsequent falls among community-dwelling high-risk older adults after a fall: a randomized clinical trial. JAMA. 2019;321(21): 2092–2100.
[16] Shephard RJ. Limits to the measurement of habitual physical activity by questionnaires. Br J Sports Med. 2003;37(3):197–206.
[17] Washburn RA, Smith KW, Jette AM, Janney CA. The physical activity scale for the elderly (pase): development and evaluation. J Clin Epidemiol. 1993;46(2):153–162.
[18] Washburn RA. Assessment of physical activity in older adults. Res Q Exerc Sport. 2000;71(Suppl 2):79–87.
[19] Washburn RA, Mcauley E, Katula J, Mihalko SL, Boileau RA. The physical activity scale for the elderly (PASE): evidence for validity. J Clin Epidemiol. 1999;52(7):643–651.
[20] Schuit AJ, Schouten EG, Westerterp KR, Saris WHM. Validity of the physical activity scale for the elderly (PASE): according to energy expenditure assessed by the doubly labeled water method. J Clin Epidemiol. 1997;50(5):541–546.
[21] Loland NW. Reliability of the physical activity scale for the elderly (PASE). Eur J Sport Sci. 2002;2(5):1–12.
[22] Hagiwara A, Ito N, Sawai K, Kazuma K. Validity and reliability of the physical activity scale for the elderly (PASE) in Japanese elderly people. Geriatr Gerontol Int. 2008;8(3):143–151.
[23] Ngai SPC, Cheung RTH, Lam PL, Chiu JKW, Fung EYH. Validation and reliability of the physical activity scale for the elderly in Chinese population. J Rehabil Med. 2012;44(5):462–465.
[24] Ismail N, Hairi F, Choo WY, Hairi NN, Peramalah D, Bulgiba A. The physical activity scale for the elderly (PASE): validity and reliability among community-dwelling older adults in Malaysia. Asia-Pacific J Public Health. 2015;27(8 Suppl):62S–72S.
[25] Ayvat E, Kilinç M, Kirdi N. The Turkish version of the physical activity scale for the elderly (PASE): its cultural adaptation, validation, and reliability. Turkish J Med Sci. 2017;47(3):908–915.
[26] Jang IY, Jung HW, Lee CK, Lee YS, Lee E, Kim DH. Comparison between Korean version of physical activity scale for the elderly and international physical activity questionnaire-short form in evaluation of frailty phenotype. Ann Geriatr Med Res. 2017;21(3):101–107.
[27] Covotta A, Gagliardi M, Berardi A, et al. Physical activity scale for the elderly: translation, cultural adaptation, and validation of the Italian version. Curr Gerontol Geriatr Res. 2018;2018:8294568.
[28] Alqarni AM, Vennu V, Alshammari SA, Bindawas SM. Cross-cultural adaptation and validation of the Arabic version of the physical activity scale for the elderly among community-dwelling older adults in Saudi Arabia. Clin Interv Aging. 2018;13:419–427.
[29] Keikavoosi-Arani L, Salehi L. Cultural adaptation and psychometric adequacy of the Persian version of the physical activity scale for the elderly (P-PASE). BMC Res Notes. 2019;12(1):555.
[30] Wiśniowska-Szurlej A, Ćwirlej-Sozańska A, Wołoszyn N, Sozański B, Wilmowska-Pietruszyńska A, Washburn R. Cultural adaptation and validation of the Polish version of the physical activity scale for older people living in a community: a cross-sectional study. Eur Rev Aging Phys Act. 2020;17(1):19.
[31] Freitas S, Simões MR, Santana I. Montreal cognitive assessment (MoCA): cutoff points for mild cognitive impairment, alzheimer's disease, frontotemporal dementia and vascular dementia. Sinapse. 2014;14(1):18–30.
[32] Wild D, Grove A, Martin M, et al. Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures: report of the ISPOR task force for translation and cultural adaptation. Value Health. 2005;8(2):94–104.
[33] Fess EE, Moran CA. American society of hand therapists clinical assessment recommendations. Res Gate. 1981;1–17. https://www.researchgate.net/publication/303400806. Accessed May 4, 2021.
[34] Shumway-Cook A, Brauer S, Woollacott M. Predicting the probability for falls in community-dwelling older adults using the timed Up & Go test. Phys Ther. 2000;80(9):896–903.
[35] Berg K, Wood-Dauphinée S, Williams JI, Gayton D. Measuring balance in the elderly: preliminary development of an instrument. Physiother Can. 1989;41(6):304–311.
[36] Terwee CB, Mokkink LB, Van Poppel MNM, Chinapaw MJM, Van Mechelen W, De Vet HCW. Qualitative attributes and measurement properties of physical activity questionnaires—a checklist. Sports Med. 2010;40(7):525–537.
[37] Bland JM, Altman D. Cronbach's alpha. BMJ. 1997;314(7080):572.
[38] Bland JM, Altman DG. Agreement between methods of measurement with multiple observations per individual. J Biopharm Stat. 2007;17(4): 571–582.
[39] IBM Corp. Released. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corporation; 2020.
[40] Dinger MK, Oman R, Taylor EL, Vesely SK, Able J. Stability and convergent validity of the physical activity scale for the elderly (PASE). J Sports Med Phys fitness. 2004;44(2):186–192.
[41] McPhee JS, French DP, Jackson D, Nazroo J, Pendleton N, Degens H. Physical activity in older age: perspectives for healthy ageing and frailty. Biogerontology. 2016;17(3):567–580.
[42] Giuli C, Papa R, Mocchegiani E, Marcellini F. Predictors of participation in physical activity for community-dwelling elderly Italians. Arch Gerontol Geriatr. 2012;54(1):50–54.
[43] Haley C, Andel R. Correlates of physical activity participation in community-dwelling older adults. J Aging Phys Act. 2010;18(4): 375–389.
[44] Tavakol M, Dennick R. Making sense of Cronbach's alpha. Int J Med Educ. 2011;2:53–55.
[45] Kaur Ajit Singh D, Najwatul Akmal Ab Rahman N, Rajaratnam BS, Chin Yi T, Shahar S, Najwatul Akmal Binti Ab Rahman N. Validity and reliability of physical activity scale for elderly in malay language (PASE-M). Malaysian J Public Heal Med. 2018;1(1):116–123.