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Cross-Cultural Validity of Persian Version of Senior Perceived Physical Literacy Instrument

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ABSTRACT

Objective: Given the growing elderly population in Iran and the relationship between physical literacy and health, assessing physical literacy in this population is important. However, there are limited studies on the assessment of physical literacy in the elderly. The present study aimed to examine the cross-cultural validity of the Persian version of Senior Perceived Physical Literacy Instrument (SPPLI).

Method: At first, the translation/back translation process and content validity were carried out through the Content Validity Index (CVI) with opinion of five experts. Subsequently, concurrent and construct (age differences and convergent) validity, and internal consistency were examined in a sample of 78 older adults (aged 60–90 years) randomly selected from nursing homes and physiotherapy centers in Qazvin. Construct validity of the SPPLI was assessed by comparing age-related differences and its correlation with age and its convergent validity with the Physical Activity Scale for the Elderly (PASE) and the short-form Falls Efficacy Scale-International (FES-I) and concurrent validity was evaluated through the its relationship with the Senior Fitness Test (SFT) as a measure of actual physical literacy.

Results: The CVI results confirmed the content validity of all SPPLI items. The results of Mann-Whitney U test revealed no significant difference in perceived physical literacy between the two age groups ($p = 0.42$). Spearman's correlation between total scores of SPPLI and age was weak and non-significant ($r(78) = 0.123$). The Spearman correlation coefficients of SPPLI with total scores of SFT, PASE, and short FES-I were 0.501, 0.452, and -0.001, respectively.

Conclusions: The content and concurrent validity of the SPPLI was confirmed, and its internal consistency was good. However, convergent validity was moderate with the PASE and very weak with the short FES-I, while construct validity based on age differences was not confirmed. In conclusion, the Persian SPPLI exhibits appropriate cross-cultural validity.

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Introduction

Population aging in Iran has accelerated significantly, with individuals over 60 years old surpassing 10% of the total population in 2022 [1]. This demographic shift raises concerns regarding older adults' well-being, quality of life, escalating health system costs, economic growth, quality performance of healthcare system, and financial resilience of pension system. Targeted policies and interventions, including promoting health-enhancing behaviors, are essential to address these challenges [2]. Among the key determinants of health is physical literacy [3], defined as "the motivation, confidence, physical competence, knowledge, and understanding to maintain physical activity throughout life" [4]. Its impact on health is mediated through lifelong engagement in physical activity [5]. For older adults, physical literacy facilitates adaptation to age-related mobility challenges and physical limitations, enhancing motor performance, self-confidence, and exercise behaviors—factors that mitigate physical risks and improve quality of life [6]. Accurate assessment of physical literacy is thus critical to determine public health strategies, policies, and guidelines, as well as planning appropriate interventions. However, the uncertainty surrounding this concept [7] and its divergent definitions and interpretations worldwide [8] have posed significant challenges to its assessment [9].

Physical literacy encompasses affective, physical, cognitive, behavioral, and social domains, variably defined across studies [10–12]. Most existing tools assess only one or two domains [9], undermining comprehensiveness and philosophical foundations of this concept [7]. Edwards et al. [11] conducted the first and most comprehensive systematic review of physical literacy assessment and related constructs across age groups. Huang et al. [13] reviewed physical domain measurements of physical literacy in older adults. de Dieu and Zhou [9] reviewed the physical literacy assessment tools, which included only two adult-specific tools. Ryom et al. [14] reviewed self-reported measurements of physical literacy in adults, and found no valid instrument for assessing adult physical literacy. They recommended incorporating measures to evaluate the different elements three general domains of physical literacy within self-reported assessments. Boldovskaia et al. [15] systematically reviewed studies that measured adults' physical literacy or proposed measurement criteria. They identified seven tools for physical literacy measurement in adults, six of which were questionnaire-based instruments. The Senior Perceived Physical Literacy Instrument (SPPLI) was the first and only tool developed for the older adults. Due to insufficient information on the quality and applicability of the assessment tools in existing studies, they were unable to confirm the suitability of any instrument.

Liu et al. [16] initially modified the Perceived Physical Literacy Instrument (PPLI), originally developed for adults [17], into the Senior Perceived Physical Literacy Instrument (SPPLI) based on results of content validity, construct validity, and internal consistency in a pilot study. They assessed 341 elderly people from community centers in southern Taiwan. Principal component analysis (PCA) identified three SPPLI components, which—based on prior research—were labeled as 'Attitude Toward Physical Activity,' 'Physical Activity Ability,' and 'Sociality Around Physical Activity'. The first component explains older adults' attitudes toward physical activity or exercise. The second component reflects their

perceived abilities regarding physical activity or exercise. The third component describes the sociality of older adults in physical activity or exercise settings. The pursuit of social interactions may serve as a motivating factor for older adults to engage in exercise. They extracted 11 out of the 18 PPLI items as SPPLI. A Cronbach's alpha value of 0.90 reflected strong internal consistency among the instrument's items. Additionally, they found that gender was not a significant or influential factor in older adults' physical literacy, as physical literacy is more closely related to self-awareness rather than performance level. Therefore, the SPPLI demonstrates adequate validity and reliability for physical literacy assessment among older adults [16].

Language and cultural context influence the validity of motor assessment instruments [18]. Standardized motor assessment tools may not necessarily maintain their validity across different cultures. Therefore, cross-cultural adaptation or validation of motor assessments is essential [19]. Cultural adaptations of tests involve more than direct translation into native languages [20]. Cross-cultural adaptations must be contextually appropriate and regularly validated before being widely adopted for clinical application [18]. Cross-cultural validation refers to whether the criteria (most often psychological constructs) initially developed within a specific culture remain applicable, meaningful, and thus equivalent in another cultural context. Most published health-status assessment tools were originally developed and validated for English-speaking populations. With the growing number of multinational and multicultural studies, the need to adapt these instruments for use in other languages has become increasingly evident. However, adapting an instrument to be culturally relevant and comprehensible while preserving the original meaning of its items remains challenging [21]. Such research can provide appropriate criteria for planning older adults' rehabilitation and exercise programs in the country. Therefore, the present study aimed to examine the cross-cultural validity of the Persian version of the SPPLI.

Materials and Method

Participants. The sample of this study consisted of 78 older adults aged 60–90 years who were randomly selected from two nursing homes and a physiotherapy center at Shahid Rajaei Hospital in Qazvin, Iran. Inclusion criteria were: (1) absence of severe cognitive impairment, (2) no physical disabilities or mobility restrictions, and (3) no medical contraindications to physical activity based on medical records. The minimum sample size was determined using G*Power 3.1.9.7. For concurrent/convergent validity by correlation coefficient, power = 0.95, α = 0.05, strong correlation of 0.5 [22], 46 participants were obtained and for construct validity (between age differences) by independent t-test, power = 0.95, α = 0.05, strong effect size = 0.8, a sample of 70 participants were calculated. Ethical approval was obtained from Alzahra University's Institutional Review Board (IR.ALZAHRA.REC.1403.038), ensuring written informed consent, data confidentiality, and group reporting.

Instruments. The primary tool of the present study was the senior perceived physical literacy instrument. Concurrent validity was assessed using the senior fitness test, while convergent validity was examined via the physical activity scale for the elderly and the short version of the falls efficacy scale-international.

1. The Senior Perceived Physical Literacy Instrument (SPPLI) consists of 11 items rated on a 5-point Likert scale (from

strongly disagree to strongly agree), covering three components: attitude toward physical activity, physical activity ability, and sociality around physical activity. Liu et al. examined the content validity, construct validity, and internal consistency of the instrument among 341 older adults in Southern Taiwan. They confirmed that the SPPLI is a valid and reliable tool for assessing physical literacy in the elderly population [16].

2. The Senior Fitness Test (SFT) is a criterion-referenced battery designed to assess the physical performance of older adults (over 60 years old). This battery consists of six tests:

- 30-second chair stand (lower body strength),
- 30-second arm curl (upper body strength),
- 6-minute walk (or 2-minute step) (aerobic endurance),
- Chair sit-and-reach and back scratch (lower and upper body flexibility), and
- 8-foot (2.4 m) up-and-go (dynamic balance and agility).

Rikli and Jones examined the convergent validity of the SFT with the Composite Physical Function scale and test-retest reliability and reported coefficients ranging from 0.79 to 0.97 [23]. The test manual has been translated and published in Persian [24]. The SFT has been translated into different languages and is widely used worldwide with high reliability [25].

3. The Physical Activity Scale for the Elderly (PASE) is a self-report scale consisting of 11 questions designed to assess physical activity (leisure, work, and household activities) over the past week. This scale evaluates the frequency, duration, and intensity of physical activities, including walking; light, moderate, and vigorous recreational and sports activities; strength and endurance exercises; work-related activities (walking and standing); lawn and garden care; caring for another person; home repairs; and light and heavy household chores. Scoring varies across questions. The total score is calculated by multiplying the time spent on each activity (hours/week) or participation (yes/no) by predetermined item weights, then summing all activities. Higher scores indicate greater physical activity levels [26]. Hatami et al. [27] examined and confirmed the validity (content validity ratio and index), construct validity (confirmatory factor analysis), test-retest reliability (α = 0.94), and internal consistency (α = 0.94) of the Persian version of PASE in a sample of sedentary older adults (56 men, 134 women).

4. The short version of the Falls Efficacy Scale-International (FES-I) consists of 7 items, in which individuals rate their level of concern or fear of falling while performing various activities on a 4-point scale (from "not at all concerned" to "very concerned"). Kempen et al. [28] developed the short FES-I and examined its psychometric properties in 193 older adults. They used a combination of face validity and psychometric criteria to shorten the original scale and reported excellent concurrent validity between the short and complete versions (r = 0.97), high internal consistency (Cronbach's α = 0.92), and good test-retest reliability over a 4-week interval (ICC = 0.83), concluding that the short FES-I is a appropriate and practical tool for assessing fear of falling in older adults. Norouzi et al. [29] confirmed the factorial validity, convergent validity (with the UCLA Loneliness Scale, SHARE Frailty Instrument, and Geriatric Anxiety Questionnaire), construct validity based on age differences, as well as test-retest reliability, inter-rater reliability, and internal consistency of the Persian version of the short FES-I in 9,117 Iranian older adults (aged ≥60 years).

Procedure. To assess the cultural validity

of the instrument, a translation-back translation process was initially conducted, followed by adjustment and necessary revisions by a panel of five experts. Subsequently, for content validity index (CVI) calculation, five motor development specialists were asked to evaluate each item of the tool separately based on four criteria: relevance, clarity, simplicity, and ambiguity, using a 4-point Likert scale. For each criterion, the CVI was computed by dividing the number of ratings 3 and 4 (good and very good) by the total number of experts. The content validity index for each item was derived from the average CVI across all criteria. A cutoff point of CVI > 0.79 was set for item approval, CVI < 0.70 for item removal, and values between these thresholds for revision [30].

Following sampling and obtaining informed consent, eligible older adults completed the senior perceived physical literacy instrument, the physical activity scale for the elderly, and the short version of the falls efficacy scale-international. Anthropometric measurements (height and weight) were subsequently recorded. Participants then engaged in an 8-minute standardized warm-up protocol preceding the senior fitness test. Each SFT item was explained by the tester to ensure proper execution and the results were recorded. Finally, the standard scores of all six tests were summed to derive the Overall Physical Fitness Level (OPFL) for analysis [31].

Construct validity based on age differences was examined by comparing total scores of SPPLI across age groups. Convergent validity of the SPPLI was assessed through correlation coefficients between its total score with scores from the PASE and the short FES-I. For reliability analysis, internal consistency of SPPLI items was evaluated using Cronbach's alpha.

Statistical Analysis. Data analysis was performed using both descriptive and inferential statistics. Central tendency measures (mean) and dispersion indices (standard deviation) were calculated, along with frequency distributions and percentages. Construct validity was assessed through one-way ANOVA (for between-age group comparisons) and Spearman's correlation coefficient (to examine the relationship between physical literacy and age). Convergent validity was evaluated using Spearman's correlation coefficient and internal consistency was determined via Cronbach's alpha coefficient. All statistical analyses were conducted using SPSS (version 26).

Results

Demographic Characteristics. Table 1 presents the mean and standard deviation (SD) of age, height, and weight among participants. The sample comprised 47 adults aged 60–69 years, 28 aged 70–79 years, and 3 aged >80 years. Regarding education, 33 adults were illiterate, 39 had primary-level education, 5 had secondary education, and 1 held a higher degree. Marital status distribution was as follows: 42% married, 19% single, and 17% cohabiting with companions.

Table 1. Mean and standard deviation of participants' age, height, and weight

Variable	n	M	SD
Age (y)	78	67.81	5.62
Height (cm)	78	157.42	6.04

Weight (kg)	78	71.99	9.30

Content Validity. As shown in Table 2, all items of the senior perceived physical literacy instrument were confirmed (CVI ≥0.79). The overall CVI for SPPLI was 0.97.

Table 2. Content validity indices (CVI) of the SPPLI

Item	Clarity CVI	Simplicity CVI	Ambiguity CVI	Relevance CVI	Mean CVI	result
1	1	1	1	1	1	Confirmed
2	1	1	0.8	1	0.95	Confirmed
3	1	1	1	1	1	Confirmed
4	1	1	1	1	1	Confirmed
5	1	1	1	1	1	Confirmed
6	1	0.8	0.8	1	0.9	Confirmed
7	1	1	1	1	1	Confirmed
8	1	0.8	0.6	1	0.85	Confirmed
9	1	1	1	1	1	Confirmed
10	1	1	1	1	1	Confirmed
11	1	1	1	1	1	Confirmed

Construct Validity. Shapiro-Wilk tests indicated non-normal data distribution ($p < 0.05$). The Mann-Whitney U test revealed no significant difference in total scores of SPPLI between the 60–69 ($M = 5.97$) and 70–80-year ($M = 5.89$) age groups ($z = 782$, $p = 0.42$). Spearman's correlation coefficient also showed no significant association between total score of SPPLI and age (r_s> (78) = 0.123, $p = 0.282$), suggesting weak construct validity based on age differences.

Spearman's correlation coefficients between SPPLI and the physical activity scale for the elderly ($r_s = 0.452$, $p < 0.0001$) and the short version of the fall's efficacy scale-international ($r_s = -0.001$, $p = 0.995$) demonstrated moderate and very weak convergent validity, respectively, based on Evans' evaluation criteria [32].

Concurrent Validity. The correlation between SPPLI and SFT was calculated using Spearman's correlation coefficient ($r_s = 0.501$, $p < 0.0001$). According to the criteria proposed by Hopkins et al. [33], the concurrent validity of the instrument was high.

Internal Consistency. The internal consistency of SPPLI was analyzed using Cronbach's alpha. The Cronbach's alpha coefficient was 0.86, indicating good internal consistency according to the criteria proposed by Vangeneugden et al. [34]. As presented in Table 3, the item-total correlations ranged from 0.255 to 0.809. Items 6 ($r = 0.255$) and 7 ($r = 0.338$) showed the lowest correlations compared to other items. If these two items were deleted, the alpha value would increase to 0.87 and 0.863, respectively.

Table 3. Cronbach's α coefficients for SPPLI items

item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
1	35.2436	25.200	.809	.821	.824
2	35.1667	26.089	.776	.795	.828
3	34.5000	24.591	.739	.668	.833
4	33.8205	32.461	.362	.319	.860
5	35.1154	28.415	.623	.526	.842
6	35.1667	31.855	.255	.286	.870
7	35.7949	31.282	.338	.275	.863
8	35.9359	30.165	.708	.731	.841
9	35.8846	29.896	.665	.705	.842
10	34.7179	31.919	.488	.763	.854
11	34.6795	32.169	.451	.733	.856

Discussion

The present study aimed to examine the cross-cultural validity of the Persian version of the Senior Perceived Physical Literacy Instrument. For cross-cultural validity, in addition to the translation-back-translation process, various validity including content validity, construct validity (age differences and convergent validity), concurrent validity as well as internal consistency reliability were assessed. The results confirmed the content validity of all items in the Persian SPPLI. Age-group comparisons using the Mann-Whitney U test revealed no significant difference in perceived physical literacy between the two age groups (60–69 vs. 70–80 years; $p = 0.42$). A weak, non-significant Spearman's correlation was found between total score of SPPLI and age (r_s (78) = 0.123). Consistent with this finding, Liu et al. [36] also reported that age did not influence perceived physical literacy level. They measured perceived physical literacy and physical fitness in 350 older women from social centers in southern Taiwan using the SPPLI and the Senior Functional Fitness Test. While they observed age-related declines in physical fitness, no significant differences in SPPLI scores or its components were found across age groups. Age-dependent reductions in skeletal muscle quantity and performance contribute to gradual declines in body physical functions [37]. Increased age-related chronic diseases may lead to multisystem dysfunction and frailty in older adults [38]. The lack of significant age-group differences in perceived physical literacy may be attributed to factors such as recall bias, social desirability effects, health status, and self-efficacy, which could reduce the accuracy of subjective questionnaire responses [36].

The current study demonstrated a significant positive correlation between SPPLI and SFT (r_s= 0.501, $p < 0.0001$), supporting strong concurrent validity. In contrast, Huang et al. [39] found no significant relationship between perceived

and actual physical literacy (physical competence) in 97 older adults from Hong Kong day-care centers (r = 0.11), though a weak but significant correlation emerged between the knowledge and understanding domain of perceived physical literacy and physical competence (r = 0.21). Liu et al. [36] reported that waist-to-hip ratio (WHR) was the only SFFT component significantly correlated with perceived physical literacy. They concluded that SFFT was not a strong predictor of SPPLI score, as perceived physical literacy remained stable despite age-related declines in physical fitness. These findings highlight the need to balance between subjective and objective assessments when evaluating older adults' physical literacy.

Furthermore, discrepancies may exist between perceived and actual physical literacy in older adults. Assessment of perceived physical literacy focuses on evaluation of a person's conscious awareness of his/her physical competence, whereas actual physical literacy directly assesses physical competence. Thus, self-report tools should be used when assessing subjective perspectives, while objective measurement instruments of physical literacy (e.g., physical fitness tests) are needed to evaluate actual physical literacy [40]. Subjective assessments of physical literacy have lower measurement validity than objective assessments and may not accurately reflect objective data indicators [41]. However, the use of a combination of actual and perceived physical literacy assessments—particularly for older adults—is recommended [13].

In the present study, convergent validity between SPPLI and the PASE was moderate (r_s= 0.452). This finding was aligning with Chaichompoo et al. [42], Stathokostas et al. [43], and Liu et al. [16]. Chaichompoo et al. [42] reported moderate perceived physical literacy, high physical activity level, and a significant positive correlation between these variables (r = 0.318, p < 0.01) in 84 Thai older adults with hypertension. Stathokostas et al. [43] found that older adults who understood the benefits of physical literacy improve and maintain their physical activity. Similarly, Liu et al. [16] found significantly higher SPPLI scores in older adults who exercised regularly (p < 0.001). These results suggest that older adults with higher physical literacy possess the motivation, self-confidence, and ability and physical fitness necessary to engage in physical activity, as well as knowledge and understanding about the benefits of physical activity. Therefore, physical literacy can play an important role in maintaining and improving the level of physical activity in older adults.

The results of the present study showed that the convergent validity of the SPPLI with the short version of the Falls Efficacy Scale-International was very weak. Although there is little doubt about the association between fear of falling and physical activity in older adults [44], studies examining its relationship with physical literacy are extremely limited, which is inconsistent with the findings of the present study. Sales et al. [45] identified a significant correlation between knee strength and fear of falling in 66 community-dwelling older adults. They suggested that when planning interventions aimed at increasing physical activity or reducing fear of falling, older adults' perceptions should be taken into consideration. Kim et al. [46] demonstrated that health literacy mitigated the impact of fall risk in daily life on fear of falling in older adults. As the elderly perceived their risk of falling to be greater, the low health literacy group showed higher fear of falling, while the high health literacy group reported lower fear of falling. Tanenbaum et al. [47] investigated the role of physical literacy in falls among 51 Canadian older adults. They identified physical literacy as a prerequisite for

enhancing and maintaining physical activity in the elderly and recommended its integration into healthcare interventions, particularly for fall-related injury prevention. However, due to existing inconsistencies in the literature, definitive conclusions necessitate further research in this area.

In the present study, internal consistency—one of the most common methods for assessing reliability—was examined. Internal consistency refers to the degree of interrelatedness among the items within a measurement tool. The results indicated good internal consistency for the SPPLI (Cronbach's α = 0.86). This finding aligns with the results of Liu et al. [16], who reported a Cronbach's α of 0.9 for the total score, with component coefficients exceeding 0.8. The high internal consistency suggests that the items uniformly and consistently measure perceived physical literacy as a unitary construct. Thus, the SPPLI demonstrates satisfactory reliability in assessing perceived physical literacy among older adults. The slight discrepancy in Cronbach's alpha coefficients between the present study and that of Liu et al. may be attributed to contextual factors such as cultural differences, sampling variations, or demographic characteristics. These findings support the applicability of the SPPLI in geriatric health research. However, future studies should explore additional reliability dimensions, such as test-retest reliability, to further strengthen confidence in the instrument's reliability.

Geographic limitation to Qazvin (excluding rural areas) and sampling from nursing homes and physiotherapy centers may limit generalizability, as participants likely had lower physical activity levels than community-dwelling older adults. Additionally, 92% of participants had elementary-level education or were illiterate, and women outnumbered men. Women tend to express their emotions more openly and engage in greater social interaction [48]; thus, the higher proportion of female participants in the sample may have influenced the sociality scores. Future studies should employ broader, cluster-randomized sampling for more precise results.

Conclusion

The Persian SPPLI demonstrated good content validity, concurrent validity, and internal consistency. Convergent validity was moderate with the PASE but very weak with short FES-I, and construct validity based on age differences was not confirmed. Given its cross-cultural validity, SPPLI is recommended for assessing older adults' physical literacy to guide interventions. Further research with larger, more diverse samples is needed to verify its convergent and construct validity.

Author contributions

Conceptualization, F.H. and M.SH.; methodology, F.H.; software, F.H.; validation, F.H., M.SH. and SH.M.; formal analysis, F.H.; investigation, F.H.; resources, F.H.; data curation, F.H.; writing—original draft preparation, F.H.; writing—review and editing, F.H.; visualization, F.H. and M.SH.; supervision, M.SH.; project administration, M.SH.; funding acquisition, M.SH. All authors have read and agreed to the published version of the manuscript." Please turn to the CRediT taxonomy for the term explanation. Authorship must be limited to those who have contributed substantially to the work re-ported.

Data Availability Statement

Data available on request from the authors.

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Ethical Considerations

All ethical principles are considered in this article. The ethical principles observed in the article, such as the informed consent of the participants, the confidentiality of information, the permission of the participants to cancel their participation in the research. Ethical approval was obtained from the Research Ethics Committee of the Alzahra University. IR.ALZAHRA.REC.1403.038.

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Conflict of interest

The authors declared no conflict of interest.

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