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ORIGINAL REPORT

VALIDATION AND RELIABILITY OF THE PHYSICAL ACTIVITY SCALE FOR THE ELDERLY IN CHINESE POPULATION

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Objectives: **Physical Activity Scale for the Elderly (PASE) is a widely used questionnaire in epidemiological studies for assessing the physical activity level of elderly. This study aims to translate and validate PASE in Chinese population.**
Design: **Cross-sectional study.**
Subjects: **Chinese elderly aged 65 or above.**
Methods: **The original English version of PASE was translated into Chinese (PASE-C) following standardized translation procedures. Ninety Chinese elderly aged 65 or above were recruited in the community. Test-retest reliability was determined by comparing the scores obtained from two separate administrations by the intraclass correlation coefficient. Validity was evaluated by Spearman's rank correlation coefficients between PASE and Medical Outcome Survey 36-Item Short Form Health Survey (SF-36), grip strength, single-leg-stance, 5 times sit-to-stand and 10-m walk.**
Results: **PASE-C demonstrated good test-retest reliability (intraclass correlation coefficient = 0.81). Fair to moderate association were found between PASE-C and most of the subscales of SF-36 (r_s = 0.285 to 0.578, p < 0.01), grip strength (r_s = 0.405 to 0.426, p < 0.001), single-leg-stance (r_s = 0.470 to 0.548, p < 0.001), 5 times sit-to-stand (r_s = –0.33, p = 0.001) and 10-m walk (r_s = –0.281, p = 0.007).**
Conclusion: **PASE-C is a reliable and valid instrument for assessing the physical activity level of elderly in Chinese population.**

Key words: geriatrics; exercise; validation; physical activity.

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INTRODUCTION

Aging is one factor that is associated with chronic disease. It is currently one of the major global issues that impinges an influence on the government medical policy. According to the census data from the National Bureau of Statistics (1) in China, population aged more than 65 years old occupied 8.9% of the national population accounting for a 1.9% increase when comparing with the census conducted in 2000 (1). Regular physical activities have been reported to reduce risks of various disorders (2) such as cardiovascular disease and diabetes mellitus. Hence, a quantitative measure of physical activities level among elderly is essential to facilitate the promotion of physical activity and its importance to health.

Physical Activity Scale for Elderly (PASE) was introduced by Washburn et al. (3). It comprises 12 items addressing the leisure, physical, household and work related activities over the past week. PASE, either self-administered or interviewer-administered, can be completed in 5–15 minutes. This scale has been translated and validated in other languages (4, 5) and used worldwide for evaluating the physical activity level of the elderly in epidemiological studies and assessing the effectiveness of exercise interventions (3). However, a Chinese version of PASE is currently not available in our community. Thus, the main objectives of this study were to translate and validate the current PASE scale into Chinese version (PASE-C).

METHOD

Subjects

Individuals aged 65 or above, independent in daily living, were recruited in the community. Cognitive status of the potential subjects was screened by a validated Mini-Mental State Examination in Cantonese version (MMSE) (6). Participants with MMSE scores lower than the cutoff were excluded. Ethical approval was obtained from the institutional review committee of the involved university. Study details were explained and informed consent was obtained prior to the study.

Translation and cross cultural adaption of PASE-C

Permission and original questionnaire of PASE was obtained from the New England Research Institute (NERI), the copyright owner. The translation process was based on the guidelines described by Beaton and coworkers (7):

1) The original English version of PASE was translated into Chinese by a physiotherapist (T1) and a professional translator independent to medical field (T2).
2) The two Chinese drafts (T1 and T2) were reviewed by a third medical professional to formulate a compromised forward translated version (PASE-T12).
3) The PASE-T12 version was then undergone a backward translation into English by another two independent professionals. The reverse translation process was performed to ensure no conceptual

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discrepancies existed. All reports were documented for discussion in the fourth stage.

4) An expert panel committee consisting of 4 physiotherapists from different institutes, i.e. hospitals, elderly center and university, was formed to evaluate the translated version and review all written reports documented in the aforementioned stages. Due to the cultural differences, some activities were rephrased based on the need of the Chinese community e.g. addition of Tai Chi, Qigong and Mahjong. A drafted PASE, Chinese version (PASE-C-initial) was formulated.
5) PASE-C-initial was then evaluated in a pilot test involving 10 healthy elderly. Comments for clarification of wordings were encountered and a revised Chinese version of PASE (PASE-C) was finalized.

Validation of PASE-C

Demographic and socioeconomical information of participants were recorded. The validity of PASE-C was compared with known physiological measures that could be affected by the level of physical activities as well as psychosocial factors (3). Psychosocial component was evaluated by a Chinese version of Medical Outcomes Survey 36-Item Short Form Health Survey (SF-36) (8). SF-36 is a generic health related quality of life questionnaire which comprises 36 items addressing 8 subscales of physical health, role physical, bodily pain, general health, vitality, social function, role emotion and metal health. The higher score represents the better quality of life. While the physiological components were validated and assessed as follow:

Heart rate and blood pressure. Each subject was allowed to rest in sitting for 10 min before measurement. Heart rate and blood pressure were measured by pulse oximeter and mercury sphygmomanometer respectively.

Body mass index (BMI) and fat distribution. BMI based on the calculation of weight/(height × height) was measured. Fat distribution was evaluated by the Waist to Hip Ratio (WHR) which was equaled to measurement of waist divided by the measurement of hip.

Strength of upper and lower limb. Grip strength of both hands was measured 3 times by a gripper (JAMAR, Jackson, USA) held with wrist in neutral position and elbow at 90° flexion. The quadriceps strength was evaluated by a hand held dynamometer (Nicholas Manual Muscle Tester, Model 01160, Lafayette instrument Company, Lafayette, USA). Subjects sat in a chair with hip and knee bent at 90° and ankle in neutral position (9) and were asked to work against the resistance of the tester. Both left and right side were assessed for 3 times with adequate rest in between.

Functional test. a) Balance. Subjects were asked to put their hands on waist and lifted up one leg to sustain balance with eyes open. The duration of single-leg-stance was recorded. *b) Five times sit-to-stand (5STS).* 5STS is a validated test to evaluate the functionality of lower limb (9). Each subject was asked to have their arms crossed at shoulder to perform sit-to-stand for 5 times at their quickest pace. The duration of the performance was recorded. *c) 10-m walk.* Subjects were asked to walk along a 10-m path. The duration of the walk was recorded. All of these functional tests were repeated 3 times with adequate rest in between,

Test-retest Reliability

PASE-C was self administered or interviewed if the participant was illiterate. The scale was completed twice to evaluate the reliability of the scale.

Statistical analyses

Data were presented as mean and standard deviation (SD). Background variables in nominal data between genders were compared by Wilcoxon rank sum test and χ^2 test. A mean value of the 3 tests was calculated for each of the assessed physiological variables. Independent *t*-test was used to compare the PASE score between genders. Validity was evaluated by the Spearman's rank correlation coefficient (r_s) between the measured components and PASE-C score. A coefficient value > 0.75 indicates good to excellent association while value between 0.25–0.75 indicates fair to good association (10). The reliability was evaluated by intraclass correlation coefficient (ICC) of PASE-C scores measured in the first and second test. An ICC > 0.75 indicates good reliability (10). PASW version 17 (SPSS Software, Chicago, IL, USA) was used for statistically analysis.

RESULTS

Subject characteristics

Ninety subjects (36 men, 54 women), with a mean age of 77.7 years (SD 7.7) and MMSE score higher than the cut-off point (mean score 25.5 (SD 4.0)) (6), participated in this study. All of them completed the first trial of PASE-C, physiological and psychosocial assessments. Among all, 32 subjects (8 male, 24 women) completed the PASE-C twice. Subjects characteristics are summarized in Table I. A lower PASE-C score was correlated with an advanced age ($r_s = -0.464$, $p < 0.001$) and a lowered MMSE score ($r_s = 0.437$, $p < 0001$). Participants with higher educational background had a higher PASE-C score ($r_s = 0.314$, $p = 0.003$). No association was found between the PASE-C and the living, marital or drinking status ($p > 0.05$).

PASE-C score and test-retest reliability

The mean PASE-C score for all subjects, men and women were 104.4 (SD 47.1), median (98.3), IRQ (61.4), 113.4 (SD 42.7), median (110.3), IRQ (67.4) and 98.5 (SD 49.3), median (85.7); IRQ (62.8), respectively, with no between gender differences. Thirty-two subjects completed PASE-C twice. The $ICC_{(3,1)}$ of PASE-C score was 0.81 ($p < 0.001$) for total subjects, 0.82 ($p = 0.004$) for men and 0.79 ($p < 0.001$) for women.

Table I. *Descriptive characteristics of total participants and by gender subgroups*

	All subjects (n=90)	Male (n=36)	Female (n=54)	p-value
Age, years, mean (SD)	77.7 (7.7)	75.9 (7.8)	78.9 (7.4)	0.074
Height, m, mean (SD)	1.54 (0.08)	1.61 (0.05)	1.50 (0.07)	<0.001**
Weight, kg, mean (SD)	58.3 (11.8)	65.8 (10.4)	53.3 (9.8)	<0.001**
BMI, kg/m^2, mean (SD)	24.4 (3.8)	25.3 (4.0)	23.7 (3.6)	0.066
Education, *n* (%)				
Never	31 (34.4)	3 (8.3)	28 (51.9)	<0.001**
Elementary school	38 (42.2)	20 (55.6)	18 (42.2)	
High school	17 (18.9)	11 (30.6)	6 (11.1)	
College/ university	4 (4.4)	2 (5.6)	2 (3.7)	
Smoking status, *n* (%)				
Current smoker	3 (3.3)	3 (8.3)	0 (0)	<0.001**
Non smoker	68 (75.6)	18 (50)	50 (92.6)	
Ex-smoker	19 (21.1)	15 (41.7)	4 (7.4)	
Alcohol, *n* (%)				
Current drinker	4 (4.4)	4 (11.1)	0 (0)	0.023*
Non drinker	86 (95.6)	32 (88.9)	54 (100)	

*p<0.05; **p<0.01.
SD: standard deviation; BMI: body mass index.

Validity of PASE-C

Table II shows the Spearman's rank correlation coefficient between PASE-C score and the validation measurements on psychosocial and physiological aspects.

Psychosocial measures

The PASE-C score was fairly to moderately correlated with most of the subscales of SF-36 ($r_s = 0.285–0.578$, $p < 0.01$). When stratified by gender, except role emotion, female showed significant association between PASE-C score and all subscales of SF-36 ($r_s = 0.272–0.622$, $p < 0.05$) while male only demonstrated moderate association with physical function ($r_s = 0.466$, $p = 0.004$), role physical ($r_s = 0.445$, $p = 0.006$) and social function ($r_s = 0.339$, $p = 0.043$).

Physiological measures

No association was found between PASE-C and blood pressure, heart rate, BMI and WHR ($p > 0.05$). Moderate association was found between PASE-C score and grip strength in all subjects ($r_s = 0.405–0.426$, $p < 0.001$) and gender stratified analysis ($r_s = 0.364–0.546$, $p < 0.05$) but not in lower limb strength ($p > 0.05$). PASE-C score was found to be significantly associated with the functional tests such as single-leg-stance ($r_s = 0.470–0.548$, $p < 0.001$), 5STS ($r_s = –0.330$, $p = 0.001$) and 10-m walk ($r_s = –0.284$, $p = 0.007$) among all subjects and particularly in women (Table II).

Table II. *Spearman rank correlation coefficient between Physical Activity Scale for the Elderly Chinese version (PASE-C) and validation measures for all participants and gender subgroups*

	All subjects ($n=90$)	Men ($n=36$)	Women ($n=54$)
Mental status			
MMSE	0.437**	0.485**	0.375**
Psychosocial measures (SF-36)			
Physical function	0.578**	0.466**	0.622**
Role physical	0.471**	0.445**	0.407**
Bodily pain	0.285**	0.171	0.300*
General health	0.357**	0.317	0.306*
Vitality	0.393**	0.094	0.523**
Social function	0.358**	0.339*	0.272*
Role emotion	0.80	0.214	–0.041
Mental health	0.199	0.080	0.280*
Physical measures			
Grip strength			
Dominant	0.426**	0.546**	0.335*
Non dominant	0.405**	0.418**	0.364**
Quadriceps strength			
Dominant	0.205	0.036	0.216
Non dominant	0.184	–0.025	0.260
Balance (SLS)			
Dominant	0.548**	0.361*	0.672**
Non dominant	0.470**	0.272	0.607**
5-times sit-to-stand	–0.330**	–0.242	–0.355**
10-m walk time	–0.281**	–0.265	–0.322*

*$p < 0.05$, **$p < 0.01$.
MMSE: Mini-Mental State Examination; SF-36: Medical Outcome Survey Short Form 36; SLS: Single Leg Stance.

DISCUSSION

PASE-C demonstrated good test-retest reliability and fair to moderate association with psychosocial and physical measures among Chinese elderly. Our findings suggested that PASE-C is a reliable and valid tool to evaluate the physical activity level and physical function.

PASE scores

The mean PASE score of the Chinese population obtained in this present study was 104.4 (SD 47.1), which is slightly higher than that reported in American (102.9 (SD 64.1)) (3) and Dutch (men: 71.9 (SD 26.8); women: 97.9 (SD 45.9)) (4) but slightly lower than Japanese (114.9 (SD 44.9)) (5). Similar to the original PASE study (3), our study demonstrated a higher but non-significant PASE-C score in male. The non-significant gender stratified PASE score demonstrated was consistent in all of the reported studies (3–5). In accord with previous literature about physical activities and aging, the PASE-C score reported in this study was found to be negatively correlated with age (11), positively correlated with the cognitive status (12) and educational level (13) of elderly. This may imply that, apart from gender, other factors may also attribute to the altered pattern of physical activities among elderly. Hence, further investigation addressing these issues is warranted.

Test-retest reliability of PASE

This study demonstrated a good test-retest reliability (ICC = 0.81) by comparing the scores of PASE administered on two occasions and this result is comparable to the ICC previously reported (3, 5).

Validity of PASE

a) Psychosocial measures. Fair to moderate significant association was found between PASE and most of the subscales of SF-36 in the participants and particularly in female. Out of the 8 subscales, physical function, role physical and social functions were found to be significantly associated with PASE-C in both men (0.339–0.466, $p < 0.05$) and women (0.272–0.622, $p < 0.05$). Not surprisingly, the better self perception of physical function and involvement in social function were found to be associated with higher level of physical activity in the current study and previous reports (3, 14).

b) Physiological measures. Washburn and coworkers (3, 15) demonstrated mild association between systolic blood pressure ($r_s = –0.18$) (15) and heart rate ($r_s = –0.13$) (3) with PASE scores, however, these associations were not apparent in this study. Age associated decline in muscle mass and muscle strength of both upper and lower extremities have been reported (16). The reduced muscle strength and mass is one factor that may affect balance and mobility in elderly (17). Regular physical activity could improve musculoskeletal strength and hence maintaining the functional independency among elderly (2). Our findings demonstrated an increased level of physical activities to be associated with the increased grip strength (3) and balance (5,

15) in both genders and shorter duration of 10-m walk and 5 STS but particularly in women.

Unlike other PASE validation studies, this study did not use direct energy expenditure as the validation measures. Instead, we focus on assessing the association of physical and physiological outcomes with PASE. Further investigation addressing both direct and indirect measurements is warranted.

In conclusion, our findings supported that PASE-C is a reliable and valid instrument for evaluating and assessing the physical activity level of elderly in the Chinese population.

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