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Pak-Kwong Chung
Hong Kong Baptist University

Ka-Man Leung
Hong Kong Baptist University

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Authors: Pak-Kwong Chung and Ka-Man Leung

Affiliations: Department of Physical Education, Hong Kong Baptist University, Kowloon Tong, Kowloon, Hong Kong.

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Psychometric Properties of 8-item *Physical Activity Enjoyment Scale* in Chinese Population

Pak-Kwong Chung, DPE.¹,
Ka-Man Leung, Ph.D.¹

¹Department of Physical Education, Hong Kong Baptist University, Kowloon Tong, Kowloon,
Hong Kong

Correspondence should be directed to Ka Man Leung at

Email: kmleung@hkbu.edu.hk

Postal address: Room AAB 926, 9/F, Academic and Administration Building, Baptist University
Road Campus, Hong Kong Baptist University, Hong Kong

(Original article)

Abstract

This study examined the psychometric properties of the 8-item Physical Activity Enjoyment Scale (PACES) in Hong Kong older adults. Study 1 assessed the scale’s factor validity and test–retest reliability, whereas Study 2 examined its convergent validity in Hong Kong older adults.

A total of 168 (Study 1) older adults completed the PACES twice over a 2-week interval, and 57 (Study 2) older adults completed both the 8-item PACES and a measure of quality of life. The results of both studies showed that the 8-item PACES had a high degree of internal consistency. Both the composite reliability and average variance extracted of Study 1 were high, suggesting that as a set, the 8 items of the PACES reliably measured the construct. The observed test–retest reliability was satisfactory over a 2-week interval. This 8-item PACES is an expedited and reliable instrument for assessing physical activity enjoyment in Chinese older adults.

Keywords: Enjoyment, older adults, measurement

item PACES and (b) its test–retest reliability. Study 2 examined the convergent validity of the eight-item PACES, correlating with the quality of life in a sample of Hong Kong older adults.

Because the Chinese version of the eight-item PACES has not been used in Hong Kong, this study can considerably enhance our knowledge about PA enjoyment among Hong Kong older adults.

Methods

Participants

Study 1. A convenience sample of 168 older adults from two community centers for older adults participated in this study. The older adults were surveyed between October 2015 and December 2015. This sample size satisfied Bentler’s recommendations (1993) that a ratio of sample size to estimated parameters of at least 10:1 is adequate for structural equation modeling, and the sample-size-to-item ratio in this study was also adequate for factor analysis (Costello & Osborne, 2005). Most respondents were women (81%) and retired (82.5%). Approximately 60% (56%) of the respondents were aged 74 years or younger and had attained no or only primary education (62.3%); 48.8% owned an apartment.

Study 2. A convenience sample of 57 older adults from a center for older adults in Hong Kong participated in Study 2. Similar to Study 1, most of the respondents were women (81%), retired (75.9%), and had attained no or primary education (64.9%). Their average age was 72.93 years ($SD = 7.57$), ranging from 60 to 91 years (See Table 1 for the participants’ sociodemographic characteristics for Studies 1 and 2).

Data were managed using SPSS (version 24). In Study 1, no outliers (with standard score ± 4.0) were identified. All items’ skewness and kurtosis and their variance inflation factors were less than 4 ($-.63$ – 1.14) and 10 (1.38 – 4.89), respectively, indicating that the data distribution was

functioning refers to the presence of limitations associated with physical capability, whereas social functioning refers to psychological well-being. Examples of the items include asking participants if they encountered any restrictions or limitations while performing moderate PA, such as moving a table, using a vacuum cleaner, bowling, playing golf, and walking (physical capability), and how much of the time their physical health or emotional problems had interfered with social activities over the preceding 4 weeks (social functioning). PA enjoyment has been determined to be positively associated with quality of life in physical and social dimensions (Mullen et al., 2011; Rejeski & Mihalko, 2001). A higher score indicated better physical or social functioning.

Procedures

In Study 1, data were collected at each center through face-to-face interviewing by trained interviewers. Consent was provided by the centers prior to the site visits, and we subsequently scheduled the data collection dates. At each site visit, a study material pack describing the purpose and details of the study was provided or explained to the potential participants. With their consent, they were asked to complete the short version of the PACES with the trained interviewers' help, who included a research assistant and trained student helpers. The research assistant held a master's degree in Sport Medicine and Health Science. All student helpers underwent training in the testing and training procedures before implementation. After a 2-week interval, all participants were asked to return to the centers and recompleted the questionnaire set.

The student helpers required 5 min to explain the study's purpose, and the participants completed the questionnaires in approximately 5 min. Similar procedures were used in Study 2, except that participants were asked to complete both the short version of the PACES and SF-36.

All participants provided written consent and declared that they understood the confidentiality agreement of the study and that they could leave the project before data collection.

.908 before and after the 2-week interval, respectively, showing high internal consistency for the items in the PACES. Additionally, the composite reliability (i.e., .91) indicated that the PACES had satisfactory construct reliability over the recommended value of .7 (Fornell & Larcker, 1981). The eight items in the PACES represented a construct, PA enjoyment in older adults. The SFLs of the items ranged from .41 to .88, denoting acceptable reliability for the indicators concerned.

Convergent Validity

The bivariate association between PA enjoyment and quality of life (i.e., physical functioning and social functioning) was examined, and the correlation coefficients revealed that the PACES was significantly and positively associated with physical functioning ($r = .43, p < .01$) and social functioning ($r = .43, p < .01$). Participants who reported having more enjoyment, as measured using the PACES, were associated with a higher quality of life (i.e., physical functioning and social functioning). In this convergent validity analysis, the results of the correlation demonstrated that the PACES was moderately correlated with quality of life in older adults.

Discussion

The aim of this study was to assess (a) the factorial validity of the eight-item PACES; (b) the test–retest reliability of the eight-item PACES (Study 1); and (c) the convergent validity of the eight-item PACES, correlating with the quality of life (Study 2) in a sample of Hong Kong older adults. The results of both Study 1 and Study 2 reveal a high degree of internal consistency in the eight-item PACES in older adults. Both the composite reliability and AVE of Study 1 were high, suggesting that—as a set—the eight items of the PA enjoyment scale provided reliable measurements of the construct. Therefore, the substantial variance in the indicators was captured by the studied construct instead of the measurement error. Additionally, the observed test–retest reliability was satisfactory over a 2-week interval.

Regarding factorial validity, the one-factor eight-item PACES was supported as a valid measurement of PA enjoyment in older adults. The measurement invariance analysis result provides additional support that this eight-item PACES was factor invariant across the sexes in older adults. This result supports Raedeke’s (2007) suggestion that the original 18-item PACES was not unidimensional. Rather than identifying both enjoyment of PA and the potential consequences and antecedents of enjoyment as executed in the original 18-item PACES, this eight-item PACES identified only a generalized state of PA enjoyment. Although our shortened eight-item PACES version is different from the shortened eight-item PACES version developed by Mullen and colleagues (2011), both shortened PACES versions were observed to yield a stronger one-factor model of PA enjoyment in older adults, compared with the original 18-item PACES.

Concerning reliability, similar to other studies (Jekua et al., 2013; Kendzierski & Carlo, 1991; Roman et al., 2014), the internal consistency of this eight-item PACES was determined to be very high (above .9). However, compared with the test–retest reliability of the PACES in other studies (approximately .7–.8) (Jekua et al., 2013; Liang et al., 2014; Roman et al., 2014), the test–retest reliability of the eight-item PACES in the current study was determined to be lower (less than .7). The difference in population is a possible explanation. No other studies have been conducted on older adults. Mullen and colleagues (2011) examined the psychometric properties of the shortened version of the PACES in older adults, but this was limited to validity and measurement invariance. Another possible explanation is the variation in environments when completing the questionnaires. In Study 1, one of the participating centers for older adults underwent minor construction work. The noise and distraction may have affected measurement stability.

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Table 1: Participant’s Socio-demographic Characteristics.

	<u>Study 1 (N = 168)</u>	<u>Study 2 (N = 57)</u>
	%	%
Age (in years)		
65-59	39.9	26.5
70-74	16.1	24.5
75-79	22.0	20.4
80-84	11.9	22.4
≥ 85	10.1	6.1
Gender		
Male	19	19
Female	81	81
Education level		
No education	16.8	19.3
Primary school education	45.5	45.6
Secondary school education	28.7	29.8
Tertiary education or above	9.0	5.3
Housing types		
Bought	48.8	41.8
rented	51.2	58.2
Occupation		
Housewife	16.9	22.4
Retired	82.5	75.9
Part-time job	.6	1.7

Table 2: Fit Indices for the Models (PACES).

Model	χ^2	<i>df</i>	<i>p</i>	χ^2/df	RMSEA (90%CI)	CFI	NNFI	SRMR
Model 1	100.107	20	.0005	5.005	.153 (.124 - .183)	.9418	.885	.043
Model 2	81.352	19	.0005	4.282	.138 (.108 - .170)	.938	.606	.040
Model 3	57.032	18	.0005	3.168	.112 (.080 - .146)	.960	.938	.034
Model 4	41.498	17	.0005	2.441	.092 (.057 - .127)	.975	.959	.028
Final Model	34.276	16	.0005	2.142	.082 (.043 - .119)	.981	.967	.023

Note: RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; CFI = Comparative Fit Index; NNFI = Non-Normed Fit Index; SRMR = Standardized Root Mean Residual

Table 3: Completely Standardized Factor Loadings (SFL), Standardized Error, Squared Multiple Correlation (R^2), Composite Reliability (CR), and Average Variance Extracted (AVE).

Items	SFL	Theta	R^2	CR/AVE
				.91/.76
1 I enjoy it.	.88	.23	.78	
2 I feel bored.	.85	.27	.73	
3 I dislike it.	.87	.25	.75	
4 I find it pleasurable.	.79	.37	.63	
5 I am very absorbed in this activity.	.70	.51	.49	
6 It's no fun at all.	.79	.37	.63	
7 It's very pleasant.	.69	.53	.47	
8 I feel as though I would rather be doing something else.	.41	.83	.17	

Table 4: Testing for Measurement Invariance across Males and Females.

Model	χ^2	<i>df</i>	<i>p</i>	Model comparison	$\Delta \chi^2$	Δd <i>f</i>	CFI	Δ CFI
Males	23.396	20	.270				.985	
Females	97.469	20	.001				.904	
1.	120.173	40	.001				.953	
2.	130.741	47	.001	Model 1 – Model 2	10.568	7	.951	< .01
3.	137.450	53	.001	Model 2 – Model 3	.291	6	.951	0
4.	205.166	61	.001	Model 3 – Model 4	67.716*	8	.915	>.01

Note: χ^2 = Maximum Likelihood Ratio Chi-Square; CFI = Comparative Fit Index. Model 1: Configural Invariance (unconstraint); Model 2: Metric Invariance (Constrained factor loadings); Model 3: Scalar Invariance (constrained factor loadings and intercept); Model 4: Error Variance Invariance (constrained factor loadings, intercepts and measurement error)