Validation and Psychometric Evaluation of the Physical Activity Enjoyment Scale in a Bilingual-Speaking Indian College Students Population

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ABSTRACT   The Physical Activity Enjoyment Scale (PACES) is a widely recognized instrument for assessing an individual's enjoyment of physical activity. This study aimed to validate and assess the psychometric properties of the PACES-18 in a population of Indian college female students. The research also seeks to address the scarcity of Indian-specific descriptions of the scale, considering the multilingual and diverse nature of the country. Data from 300 college female students were collected to adapt the PACES-18 into the Indian context, emphasizing its potential utility in bilingual-speaking populations. The study discusses the relevance of cross-cultural research to understand the general applicability of the PACES-18 in diverse cultural contexts.

Keywords: Physical Activity Enjoyment Scale; PACES-18; psychometric evaluation; cross-cultural research; Indian college students; bilingual-speaking population

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INTRODUCTION

Physical activity is an essential component of a healthy lifestyle, and understanding the factors that influence an individual's enjoyment of physical activity is crucial for promoting sustained participation. The Physical Activity Enjoyment Scale (PACES) has been extensively used to assess the subjective pleasure associated with engaging in physical activities. It has consistently shown that enjoyment is a key determinant of physical activity behaviour, highlighting the importance of creating enjoyable physical activity experiences. Additionally, the PACES has identified various factors contributing to physical activity enjoyment, including intrinsic, extrinsic, and social aspects.

While the PACES has been widely validated and used in several countries, there remains a gap in its adaptation to the Indian context, where diverse linguistic and cultural backgrounds exist. This study aims to fill this gap by adapting the PACES-18 into the Indian context, considering the potential bilingual-speaking population.

The Physical Activity Enjoyment Scale (PACES) stands out as a pivotal tool in this pursuit. Developed by Kendzierski and DeCarlo in 1991, the PACES is designed to measure the degree of enjoyment and pleasure individuals derive from various physical activities. It provides a structured framework for individuals to self-report their subjective feelings while engaging in exercise, offering valuable insights into the emotional and psychological aspects of physical activity participation. This multidimensional instrument considers a range of factors contributing to enjoyment, encompassing both intrinsic elements related to the activity itself and extrinsic factors tied to external rewards and incentives.

In conclusion, the journey we embark upon in this research article is one of exploration, adaptation, and understanding. We recognize the pivotal role that enjoyment plays in shaping physical activity behavior and its profound implications for public health. By identifying the determinants of enjoyment, investigating strategies to enhance it, and extending the reach of the PACES-18 into diverse cultural contexts, we hope to pave the way for more effective interventions and ultimately improve the health and well-being of individuals worldwide

PROCEDURE

Data were collected from 300 college female students of Indian origin, aged 18 years and older, from various academic courses. The study was conducted with the approval of experts and advisory committee members. The participants were selected randomly, and their family backgrounds and socioeconomic statuses were not considered during the data collection process.The study involved a detailed conversation with experts, advisory committee members, and a thorough literature review to justify the selection of the PACES-18 for adaptation. The purpose of the study and the significance of the participants' contribution were explained to the subjects, emphasizing the investigation of physical activity enjoyment using the PACES-18.

STATISTICAL ANALYSIS

After the completion of data collection following statistical procedure will be employed for the calculation of the study. Descriptive statistics i.e., Mean, Standard Deviationon each subscale of the scale.The Statistical Package for Social Sciences (SPSS) AMOS was used to calculate CFA to the Factors and validate the questionnaire.

FINDING OF THE STUDY

The purpose of this phase of the study was to test the factor structure of the questionnaire as well as confirm all the factors and their variables with the help of confirmatory factor analysis. In this phase, statistical analysis was employed on all the eighteen statements. The participants completed the physical activity enjoyment scale was 300. But before conducting the confirmatory factor analysis, data screening must be done on each statement of the physical activity enjoyment scale using, mean and standard deviation, skewness, and kurtosis statistics as Field (2005) suggested values of the statements /variables should be normally distributed for measuring intercorrelations.

Table 1: Descriptive Statistics of Physical Activity Enjoyment scale

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistics	Statistics	Statistics	Statistics	Std. Error	Statistics	Std. Error
Q1	300	5.56	1.46	-1.001	.141	.536	.281
Q2	300	5.38	1.63	-1.012	.141	.224	.281
Q3	300	5.36	1.68	-.875	.141	-.178	.281
Q4	300	4.83	1.79	-.539	.141	-.675	.281
Q5	300	4.89	1.64	-.607	.141	-.219	.281
Q6	300	5.16	1.87	-.763	.141	-.517	.281

Q7	**300**	4.91	1.85	-.677	.141	-.598	.281
Q8	**300**	5.63	1.62	-1.314	.141	1.010	.281
Q9	**300**	4.98	1.78	-.783	.141	-.371	.281
Q10	**300**	5.61	1.49	-.973	.141	.225	.281
Q11	**300**	5.07	1.57	-.718	.141	.049	.281
Q12	**300**	4.97	1.80	-.622	.141	-.639	.281
Q13	**300**	4.81	1.85	-.593	.141	-.681	.281
Q14	**300**	4.85	1.69	-.531	.141	-.493	.281
Q15	**300**	4.44	1.91	-.241	.141	-1.123	.281
Q16	**300**	4.98	1.79	-.626	.141	-.544	.281
Q17	**300**	5.63	1.53	-1.284	.141	1.279	.281
Q18	**300**	3.57	1.90	-.224	.141	-1.080	.281
Valid N (listwise)	**300**						

Table 1 Shows the descriptive statistics for Physical activity enjoyment scale include all the eighteen statements and the mean value and standard deviation are 5.56 ± 1.46, 5.38 ± 1.63, 5.36 ± 1.68, 4.83 ± 1.79, 4.89 ± 1.64, 5.16 ± 1.87, 4.91 ± 1.85, 5.63 ± 1.62, 4.98 ± 1.78, 5.61 ± 1.49, 5.07 ± 1.57, 4.97 ± 1.80, 4.81 ± 1.85, 4.85 ± 1.69, 4.44 ± 1.91, 4.98 ± 1.79, 5.63 ± 1.53 and 3.57 ± 1.90 respectively.

Table 1 Also shows the values of skewness of the Physical activity enjoyment scale ranging from -0.224 to -1.314 (mean skewness value = 0.743). The value of Kurtosis of the Physical activity enjoyment scale ranged from 0.049 to 1.279 (mean kurtosis value = 0.580).

Both the values are less than the threshold, 3 for skewness and 7 for kurtosis (West, finch and Curron, 1995 cited in Zervas, Stavrou, and Psychountaki, 2007) so we may conclude that all the data scores set are Normally distributed.

Factorial Validity

Typically, the factor analysis is used to identify the underlying dimensions. The data can be narrowed down into different factors with the use of this analysis. As a result, the principal component analysis method was used in the exploratory factor analysis. Varimax technique was employed for the rotation. KMO and Bartlett Test of Sphericity, component variance and factor extraction, communalities before and after factor extraction, and rotated component matrix were the studies carried out for validation purposes.

The findings of KMO and Bartlett's test of sphericity are presented in table 2:

Table 2: KMO and Bartlett's Test of Sphericity

Kaiser- Meyer-Olkin Measure of sampling Adequacy	0.814
Bartlett's Test of Sphericity: Approx. Chi-Square	1042.028
Df	153

9253

Sig.	0.0005

Table- 2 Shows several important parts of the output: It is obvious to run the KMO and Bartlett's test of sphericity to see whether the data are suitable for the factor analysis. If both the Bartlett's test of sphericity and the KMO measure of sampling adequacy are significant, the data are said to be factorable. The KMO values vary from 0 to 1. The correlation pattern being rather compact, a value closer to 1 indicates that factor analysis should obtain reliable and distinct factors. For the present data the KMO value obtained is 0.814 which falls under meritorious category by Gaskin stats wiki however, is most appropriate and judged to be factorable. The Bartlett's test of sphericity has been found to be significant ($p < 0.0005$) which indicates that the data is fit to be factored.

The table 3 of Communalities Before and After Extraction has been depicted below:

Communalities

ITEM	Initial	Extraction
Q1	1.000	.548
Q2	1.000	.733
Q3	1.000	.783
Q4	1.000	.583
Q5	1.000	.526
Q6	1.000	.674
Q7	1.000	.612
Q8	1.000	.545
Q9	1.000	.571
Q10	1.000	.629
Q11	1.000	.533
Q12	1.000	.433
Q13	1.000	.704
Q14	1.000	.398
Q15	1.000	.671
Q16	1.000	.589
Q17	1.000	.491
Q18	1.000	.517

Extraction Method: Principal Component Analysis.

The table 3 displays the communalities table both before and after extraction. The proportion of shared variance within a variable that is communality. Since all variance is initially assumed to be common in principal component analysis, before extraction, all communalities are equal to 1. The neighbourhoods in the column marked the data structure's common variance is reflected in the extraction. As an illustration, we can say that question 1 is related to 54.8% of the variance, which is shared or common. Think about these communalities in terms of the proportion of variance that the underlying causes can account for. After extraction, some of the elements are removed, which causes some data loss. Following extraction, the communalities display the percentage of the variance.in each variable that can be accounted for by the retained factors. The average of the communalities obtained was 0.58

The extraction of the components and the variance of the components are reflected in the table 4.

Table: 4 Total Variance Explained

Component	Initial Eigenvalue					Extraction Sums of Squared Loading			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %		
1	5.799	32.219	32.219	5.799	32.219	32.219	3.475	19.304	19.304		
2	2.179	12.106	44.325	2.179	12.106	44.325	2.979	16.551	35.855		
3	1.419	7.882	52.207	1.419	7.882	52.207	2.656	14.757	50.612		
4	1.144	6.354	58.561	1.144	6.354	58.561	1.431	7.949	58.561		
5	.996	5.534	64.096								
6	.951	5.286	69.382								
7	.752	4.179	73.560								
8	.702	3.898	77.458								
9	.626	3.480	80.938								
10	.569	3.159	84.097								
11	.498	2.767	86.864								
12	.480	2.664	89.528								
13	.472	2.621	92.149								
14	.362	2.013	94.162								
15	.339	1.885	96.047								
16	.275	1.527	97.574								
17	.241	1.341	98.915								

18	.195	1.085	100.000						

Extraction Method: Principal Component Analysis.

Factor Extraction

Before and after factor rotation, there are the same number of factors and variables. However, there are differences in how well each of these variables captures variance in the original factors. Following factor extraction and rotation, each factor is associated with a single numerical value known as an Eigen value, as illustrated in Table 4 above. Therefore, higher Eigen values denote useful components, whereas lower Eigen values denote unnecessary ones. When the Kaiser Criterion is applied, these factors are only retained if their Eigen values are greater than 1.0.The table above denotes that there are three factors extracted with Eigen values greater than 1.0. It is evident from table that the factor 1 explains the largest variance amounting to 32.21 %. Before rotation, factor 1 accounted for considerably more variance than the remaining three (12.10 % compared to 7.88%, and 6.359 respectively), however after rotation it accounts for only 19.30 % of variance (compared to 16.55, 14.75 and 7.94 respectively).

Table No 5 Rotated Component Matrix Component

Total	1	2	3
Q.1	.532		
Q.5	.647		
Q.10	.540		
Q.11	.804		
Q.17	.608		
Q.4		.701	
Q.7		.690	
Q.9		.709	
Q13		.715	
Q16		.570	
Q2			.853
Q3			.547
Q6			.764
Q8			.592
Q12			.528

Rotation converged in 7 iterations.

Above table 5 represent the method of principal component extraction method with varimax rotation with Kaiser Normalization which converged in seven iterations. It could be seen from the table that since we set that all loadings less than 0.5 be suppressed in the output by Gaskin stats wiki and so there are vacant space for many of the loadings. Therefore, after rotation of the factors we could say that the final scale to assess Physical Activity Enjoyment Scale of college girl students comprises of 15 statements under three sub scales which are described in paragraphs.

The questions that load highly on factor 1 seem to all relate to Passionate however, we may label this factor as Passionate. There are five questions (Q.1, Q. 5, Q. 10, Q. 11, and Q.17) under the factor of Passionate. Questions which come under Passionate are mentioned below:

1. (1) I enjoy it   I hate it

2. (5) I am very absorbed in this   I am not at all absorbed in this activity
        activity

3. (10) I feel good physically while   I feel bad physically while doing it

        Doing it

4. (11) It is very invigorating   It is not at all invigorating

5. (17) It is very refreshing   It is not at all refreshing

The questions that load highly on factor 2 seem to all relate to Revitalized. so, we may label this factor as Revitalized. There are six questions (Q.4, Q.7, Q.9, Q.13, and Q.16) under the factor of Revitalized. Questions which come under Revitalized are mentioned below:

1. (4.) I find it pleasurable   I find it unpleasurable

2. (7.) I find it energizing.   I find it tiring

3. (9.) It is very pleasant   It is very unpleasant

4. (13) It is very gratifying   It is not at all gratifying

5. (16) It gives me a strong sense   It does not give me any sense of

    Of accomplishment   accomplishment at all

The questions that load highly on factor 3 seem to all relate to Annoyance. So, we may label this factor as Annoyance. There are five questions (Q.2, Q.3, Q.6, Q.8, and Q.12) under the factor of Annoyance. Questions which come under Annoyance are mentioned below:

1. (2) I feel bored   I feel interested

2. (3) I dislike it   I like it

3. (6) It is no fun at all   It is a lot of fun

4. (8) It makes me depressed   It makes me happy

5. (12) I am very frustrated by it   I am not at all frustrated by it

Thus, the analysis seems to reveal that the physical activity enjoyment scale questionnaire is composed of 15 statements grouped under three sub scales i.e., Passionate, Revitalized and Annoyance.

Therefore, one might say that the current physical activity enjoyment scale questionnaire adapted and validated on college girls' students of Indian origin contains 15 statements and these statements are grouped under three sub scales.

Conclusion:

By assessing enjoyment levels, identifying barriers, and tailoring interventions to cultural preferences, the scale can inform the development of effective and sustainable physical activity programs in India. Ultimately, this can lead to reduced sedentary behavior, improved physical and mental health outcomes, and a higher quality of life for individuals.

The Physical Activity Enjoyment Scale (PACES- 15) followed a detailed analysis based on that following valuable conclusions are drawn:

- The descriptive statistics of all the items are found satisfactory and with the help of skewness and kurtosis the normality of data checked. Based on that we concluded that the data is normally distributed for each item.

- The CFA model shows all the values in the second order after the elimination of the items having low factor loading, increases the model fit. The model fit confirmed all the factors are applied in Indian conditions

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