Original Research

Psychometric properties of the Sinhala version of the Bandura's exercise self-efficacy scale in women

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Abstract

Introduction: Engaging in regular exercise as part of a healthy lifestyle has shown an array of health benefits for many decades. Building confidence in maintaining an exercise routine is essential for success. To support individuals interested in exercise, the availability of appropriate measurement tools is vital. Bandura's Exercise Self-Efficacy Scale (ESE) is an 18-item brief measure that assesses confidence in exercising regularly and is a valuable tool for measuring exercise beliefs.

Objectives: To translate and adapt the Banduras ESE scale into Sinhala language and examine its psychometric properties

Methods: Data were collected from 225 women who were aged ≥18 years and had an interest in or a reason to watch their weight, in Panadura Medical Officer Health (MOH) Area, Sri Lanka. They were recruited using a purposive sampling method. Standard forward-backward translation was performed to translate the English version of ESE. The construct validity was tested using exploratory factor analysis. Reliability of the scale was determined by Cronbach's alpha. Data were analysed using SPSS version 22.0.

Results: Through exploratory factor analysis, 18-item ESE scale showed three factors with eigenvalues ranging from 1.392 to 9.409. The three-factor model explained 70.59% of total variance of the model. All the items in the scale were retained. The reliability of internal consistency, as assessed by Cronbach's alpha, indicated interpersonal, competing and internal sub factors as 0.92, 0.91 and 0.89 respectively, which were above the threshold level of 0.7.

Conclusions & Recommendations: The Sinhala translation of ESE is a reliable and valid scale to assess the level of self-efficacy for exercise among Sinhala-speaking adult women in Sri Lanka.

Keywords: validation, physical activity, Exercise Self-Efficacy scale, women, Sri Lanka

Introduction

The level of physical activity (PA) in the world is insufficient, and it is now a global health problem due to an increased sedentary lifestyle (1). Physical activity is defined as any bodily movement produced by skeletal muscles that causes energy expenditure, and the benefits can be obtained by structured exercise, doing housework, walking for transport or doing physically challenging work (1). In the world, nearly a quarter of adults do not meet the global recommended levels of PA, and therefore the World Health Organization (WHO) has recommended a minimum of 150–300 minutes of moderate-intensity PA per week (2). Insufficient levels of PA are one of the major contributing factors to the rising trend of non-communicable diseases (NCDs). Excessive body weight is a serious health issue and a risk factor for many NCDs. Even though the aetiology of obesity and overweight is multifactorial, a healthy weight can be achieved through behavioural modifications (3).

Among the insufficient PA categories in the world, women are less active than their male counterparts (4). A study conducted across 142 countries has shown that only a slight increase in women's PA levels would achieve the WHO world target of reducing physical inactivity by 10% in 2025 (5). The level of PA of a person is determined by many factors, such as sex, age, previous level of physical activity, health status, motivation and self-efficacy of an individual (6).

Self-efficacy is an individual's belief in his or her capacity to execute behaviours necessary to produce a desired behaviour (7). It has a major role in an individual's confidence level in achieving and maintaining the desired behaviour (7). According to Bandura's Social Cognitive Theory, self-efficacy has a major impact on people's adaptation to PA. This theory appears to provide a greater opportunity to mediate behaviour through cognitive control than when behaviour has become more habitual (7). Self-efficacy is important in Social Cognitive Theory as it

is used as a psychological tool to assess individual behaviour change (8). A person with low self-efficacy can easily give up on their abilities when they have challenging situations in their life (9). In general, doing regular exercise is a very challenging task for women due to their role and responsibility in the family. Hence, there is a positive outcome of self-efficacy on one's health (10).

The concept of self-efficacy was first proposed in 1997 by an influential social cognitive psychologist, Albert Bandura to provide a unified theory of behaviour change. He was the first to design an appropriate self-efficacy scale for measuring exercise behaviour in diabetic patients (11). This original 18-item Exercise Self Efficacy (ESE) scale showed a high Cronbach's alpha of 0.89, indicating good internal consistency. It is also translated into Korean (12) and other languages, including Persian, Dutch, Arabian and Malay (13-16). However, there is no version translated into local languages in Sri Lanka. Also, to the best of our knowledge, there is no other tool being validated to assess the self-efficacy in PA of women in Sri Lanka. Therefore, our aim was to translate ESE into Sinhala language and validate it among adult women in Sri Lanka.

Methods

A validation study was conducted in the MOH area of Panadura in Kalutara District in the Western Province between January and March 2018.

The English version of ESE was translated to Sinhala using the standard protocol of forward-backward translation, ensuring the required cultural adaptations to the questions. The translated items were reviewed by a panel of six experts in public health, clinical psychology and sports medicine. The face validity was assessed by the panel for appropriateness of translated items to the Sri Lankan context and there were no changes. The content validity was assessed using the Delphi technique. The panel was expected to rate each item in ESE using a five-point ordinal

scale ranging from 1 to 5, in which 5 represented 'very important' and 1 represented 'not important'. If items were rated as 3 or less, the experts were asked to give their suggestions for modifications or elimination. As Bandura emphasized that perceived self-efficacy measures should align with specific domains of functioning, suggesting that scale items should focus on "can do" rather than "will do" (7) ,consequently, all items in the scale in the present study were revised to replace phrases like "I will do" with "I can do." Two modified Delphi rounds were conducted among the expert panel to finalize the items. Hence, none of the items were rated 3 or less, thus the final adapted version had all 18 items retained. The scoring format from the original scale (0-100) was retained for this study, with 0 indicating 'low confidence' in their ability to engage in regular exercise in a particular situation, 100 indicating 'high confidence' and 50 denoting 'moderate certainty' in exercise engagement.

The principal investigator (PI) conducted a pilot study to assess the feasibility and clarity of the final version of Sinhala ESE using a purposive sample of 20 women in Panadura MOH area who self-reported to be engaging in exercise as part of a healthy lifestyle. The results were favourable and required no major modifications.

For assessing the construct validity of ESE, a purposefully selected sample of adult women aged 18 years or older who had an interest in maintaining a healthy lifestyle or had a specific motivation related to weight management were invited to participate in the study. Individuals with severe illnesses or diagnosed psychiatric conditions were excluded. The primary data collection was done by PI led by the PHMs who were trained in an orientation program to identify eligible participants at the household level. If multiple eligible participants were present in one household, selection was conducted using lots. Subsequently, the PI screened these women for eligibility at a community centre on a prearranged day convenient for participants. Recruitment

continued until the desired number of participants was reached.

The sample size for the study was calculated at 1:10 ratio per item as per the rule of thumb (17) and a 20% non-response rate. The final sample size was therefore taken as 225. Data were collected through a self-administered questionnaire that included sociodemographic information and the frequency of weekly exercise engagement. In the current study, exercise was operationally defined as any PA lasting more than twenty minutes at a moderate or vigorous intensity, undertaken with the intention of managing one's weight or promoting overall health, whether on a planned or unplanned basis. Self-reported PA data were collected in the absence of any registers, records or databases providing this information. In the questionnaire, participants were inquired about their engagement in PA lasting over twenty minutes or more per day and were categorized as follows; "regular" (three or more days per week), "intermittent" (less than three days per week) and "not at all." To assess the test-retest reliability of ESE, the questionnaire was administered to 20 randomly selected participants, followed by a re-administration two weeks later.

Data analysis
The data were analysed using the Statistical Package for the Social Sciences (SPSS) version 20.0. The construct validity of the questionnaire was assessed using exploratory factor analysis (EFA). Exploratory principal component analysis (PCA) was conducted using the Kaiser criterion and scree plots. Internal consistency of the ESE was measured by Cronbach's alpha.

Results

A total of 225 eligible women were recruited for the study. The response rate was 100%. The mean age of study participants was 39.39 years (SD=7.9). Characteristics of the participants are given in Table 1.

Table 1: Distribution of the participants by demographic characteristics (N=225)

Socio Demographic characteristics		No.	%
Age categories	25-29	17	7.6
(Years)	30-34	53	23.6
	35-39	48	21.3
	40-44	45	20.0
	45-49	33	14.7
	50-54	22	9.8
	55-60	7	3.1
Ethnicity	Sinhala	204	90.6
	Tamil	8	3.6
	Muslim	13	5.8
Religion	Buddhist	192	85.3
	Hindu	3	1.3
	Roman Catholic	17	7.6
	Islamic	13	5.8
Marital status	Unmarried	23	10.2
	Married	196	87.1
	Divorce	4	1.8
	Widowed	2	0.9
Level of education	Up to GCE O/L*	121	53.8
	Up to GCE A/L**	68	30.2
	Technical/Professional education	36	16.0
Monthly income (LKR)	≤ 15 000	23	10.2
	15 001- 50 000	137	60.9
	> 50 000	65	28.9
Occupational category	Professional job	37	16.4
	Clerical	19	8.4
	Self-employed	15	6.8
	Housewife	154	68.4
Frequency of exercise	Regularly	38	16.9
	Intermittent	84	37.3
	Never	103	45.8

*General Certificate of Education (Ordinary Level); ******General Certificate of Education (Advanced Level**)**

During EFA, the Kaiser-Meyer -Olkin measure of sampling adequacy was 0.925. Bartlett's test of sphericity was statistically significant (χ^2=3131.1; df=153; p=0.0001). Therefore, no items were removed from the analysis. The PCA extracted three factors with Eigen values over 1, ranging from 1.392 to 9.409 (Table 2). The scree plot of ESE is shown in Figure 1. The three-factor model explained 70.59% of the total variance of the model. The first sub factor with eight items was named "interpersonal or situational"; the second sub factor was named "competing demands", where participants had little control over the given situation to stop engaging in exercise; and the third sub factor with four items was named "internal feeling", as these factors are more interrelated with emotions (Table 3). Cronbach's alpha of the three sub factors were 0.92, 0.91 and 0.89 respectively, which were above the threshold

level of 0.7. The mean scores of sub-factors indicated the highest for situational/interpersonal sub factor (mean=277.36; SD=165.36) followed by competing demands (mean=135.03; SD=121.47) and internal feelings (mean=107.24; SD=94.35).

Table 2: Total variance explained by the model in the ESE questionnaire

Component	Initial Eigenvalues			*Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.409	52.271	52.271	**9.409**	**52.271**	**52.271**
2	1.905	10.584	62.855	**1.905**	**10.584**	**62.855**
3	1.392	7.736	70.591	**1.392**	**7.736**	**70.591**
4	0.82	4.558	75.149			
5	0.651	3.618	78.767			
6	0.573	3.183	81.951			
7	0.490	2.722	84.673			
8	0.415	2.305	86.978			
9	0.355	1.975	88.953			
10	0.297	1.652	90.604			
11	0.277	1.538	92.143			
12	0.262	1.453	93.596			
13	0.240	1.332	94.928			
14	0.218	1.214	96.142			
15	0.199	1.106	97.247			
16	0.192	1.067	98.315			
17	0.157	0.871	99.186			
18	0.147	0.814	100.000			

Discussion

The primary objective of the study was to translate Bandura's ESE into Sinhala language and then assess its psychometric properties to provide a scale to measure the level of self-efficacy in PA among adult women in Sri Lanka. A three-factor solution was identified through the EFA.

To the best of our knowledge, no tool has been validated in the local setting to understand one's self-efficacy for engaging in regular exercise in the general population. The instrument was translated and validated in many countries to assess the self-efficacy of participation in PA among diverse populations. Mainly, it was validated among people with chronic diseases and diabetes mellitus in clinical settings (12-15). Hence, in the present study, the target population was selected from a non-clinical setting. The study did not take into account the participants' overall comorbidities except those considered under exclusion criteria. Being selected from a non-clinical setting often provides access to a more diverse sample with less selection bias. Nevertheless, recruiting participants from non-clinical settings can be more challenging, as it requires significant effort to identify and engage potential participants particularly for studies based

on specific conditions. Thus, among the published studies, the Malay version of the ESE was conducted in a non-clinical setting. The scale was validated among undergraduate students at the University Sains Malaysia (16).

Table 3: Factor structure and exploratory factor loading of the items in the Sinhala version of ESE questionnaire

Factor	Domain			Factor loading
1	Interpersonal/ Situational	10	After a vacation	0.732
		11	When I have too much work to do at home	0.696
		12	When visitors are present	0.696
		14	If I do not reach my exercise goals	0.673
		15	Without support from my family or friends	0.732
		16	During a vacation	0.777
		17	When I have other time commitments	0.775
		18	After experiencing family problems	0.714
2	Competing demands	04	After recovering from an injury that caused me to stop exercising	0.848
		06	When I am feeling depressed	0.72
		07	When I am feeling anxious	0.758
		08	After recovering from an illness that caused me to stop exercising	0.845
		09	When I feel physical discomfort when I exercise	0.749
		13	When there are other interesting things to do	0.655
3	Internal feeling	01	When I am feeling tired	0.821
		02	When I am feeling under pressure from work	0.791
		03	During bad weather	0.794
		05	During or after experiencing personal problems	0.525

The study utilized the original scoring format (0-100) from the ESE scale after replacing "I will do" with "I can do" in all 18 items of the scale. The age range of participants in the study was 25-60 years, with a mean age of 39.4 (SD=7.9). Other studies on the ESE scale typically recruited older participants, possibly due to focusing on chronic diseases more prevalent among older adults. While most studies assessed psychometric properties in both genders, the present study exclusively focused on adult women.

In our study, age and gender could influence lower levels of perceived self-efficacy in the third sub-factor related to internal feelings. This may be due to the cultural values of Sri Lankan women, who often prioritize their family's needs over their own well-being.

Bandura's ESE scale was a one-factor model, consistently observed in Arabic, Malay, and Dutch versions (14-16). However, the present study revealed a three-factor model explaining 70.59% of

total variance, similar to the high total variance explained by original Bandura, Korean, and Malay versions (12, 16-18). The current study found that item No. 3 associated with the internal feeling subfactor focused on 'during bad weather'. This

reflects the emotional impact of being unable to engage in routine activities during unexpected weather conditions, similar to findings from the Korean and Iranian versions.
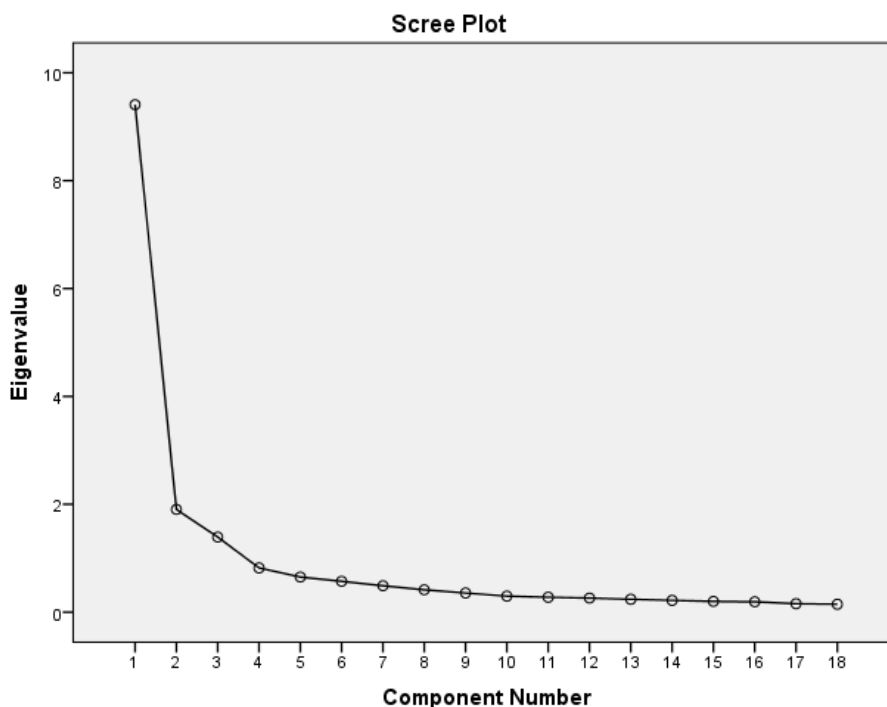

Figure 1: Scree plot in principal component analysis of the Sinhala version of ESE questionnaire

The present study did not observe ceiling or floor effects. The absence of ceiling effects suggests that the exercise-related items are appropriately challenging for the target population (17). High inter-item correlation, particularly between Items 4 and 8, indicates possible redundancy due to participants' difficulty in distinguishing between injury and illness. This aspect went unnoticed in the pilot testing. It is essential to acknowledge a limitation of pilot studies; due to their relatively smaller scale, they may yield less precise hypotheses or predictions compared to larger-scale surveys, even though they offer valuable insights into potential responses. Similar issues were noted in an Australian validation study (17). To address this, using a more general term like "illness" in the scale may be beneficial (17). A significant inter-item correlation of 0.771 was found between items No. 14 (regarding exercise goals) and

No. 15 (related to family support).This observation suggests that participants may have considered their expectations and goals, largely influenced by the support received from their families. Consequently, family's moral support played a crucial role in their achievements. Overall, this expected correlation appears acceptable for Sri Lankan women. The mean scores within subfactors revealed that the study attained its highest score in the situational/interpersonal factor (277.4; SD=165.4), with the lowest score observed in the internal feelings factor (107.2; SD=94.4). The items in the third subfactor primarily addressed anxiety and depression, which hindered women's exercise engagement due to low self-efficacy levels. This pattern echoes results from the Iranian version of the ESE, where internal feelings also exhibited low self-efficacy scores (13). Consequently, the factor of

competing demands emerged with the highest score in that study.

The original ESE demonstrated good internal consistency. Similarly, high Cronbach's alpha was observed in Korean (0.9), Iranian (0.9) and Dutch (0.9) versions (12-14). In this study, Cronbach's alpha for the three sub-factors was 0.92, 0.91 and 0.89, respectively, indicating the stability of the Sinhala version of the ESE scale over time. Further, it indicated the validated scale was comparatively stable enough to be used among people living in a different country from the original (13).

The present study, while having several strengths, also faces limitations. These include the absence of more objective measures for assessing physical activity levels during recruitment, reliance on self-reported activity which may distort the relationship with self-efficacy levels, and the use of purposive sampling from a specific MOH area, limiting generalizability. However, the tool can still be utilized by women with similar characteristics. Additionally, the study's non-clinical setting suggests the need for replication among a more diverse population. Although Exploratory Factor Analysis showed a strong three-sub factor structure, Confirmatory Factor Analysis is necessary in future studies to establish and confirm this structure's fit to the data.

Conclusions & Recommendations

The Sinhala-translated and culturally adopted ESE scale used in this study is appropriate for use among Sinhala-speaking adult women in Sri Lanka. Further testing is recommended for a diverse population that is interested in having a healthy lifestyle. This scale may provide significant insights into the dynamics of self-management of regular physical activity under the various circumstances listed and can be recommended as a basic screening tool in primary care settings.

Author contributions: DCKH conducted the research as principal investigator; KTAAK contributed as the technical supervisor of the research project.

Public Health Implications

- Exercise behaviour is an important component of a healthy lifestyle. The assessment of the self-efficacy level of a person to improve their physical activity level is important, as it helps to understand the individual's belief in their ability to engage in regular exercise to achieve the desired outcome. The Sinhala version of the exercise self-efficacy scale for women was determined to have a high level of validity and reliability and helps to determine the changes needed in self-efficacy levels to improve health-promoting levels of physical activity.

Author Declarations

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