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The Indonesian Version of the Exercise Self-Efficacy Scale: Cross cultural Adaptation and Psychometric TestinG

by Sindi Arista

Research Article

The Indonesian Version of the Exercise Self-Efficacy Scale: Cross-cultural Adaptation and Psychometric Testing☆

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SUMMARY

Purposes: The study aimed to translate the Exercise Self-Efficacy Scale (ESES) into Indonesian and test the cultural equivalence, reliability, and validity of the new version for university students.
Methods: The cross-sectional study recruited 379 Indonesian university students using convenience sampling. Phase 1, a culturally appropriate version of the ESES was developed in the Indonesian language. Phase 2, the psychometric properties were determined through exploratory factor analysis, bootstrap factor analysis, and confirmatory factor analysis. The internal consistency reliability was tested using Cronbach's α, whereas the stability using intraclass correlation coefficient to assess.
Results: The students' ages ranged from 17 to 39 years, and 65.0% were women. For translation equivalence, the mean item content validity indexes ranged from 3.5 to 4, and all items were understandable. The 16-item scale exhibited cross-cultural appropriateness and readability, with a three-factor model explaining 62.3% of the variance in exercise self-efficacy. A bootstrap analysis using 100 resamples further confirmed the three-factor model. The indices of the good-fit model that used the three-factor by two-stage least squares method were satisfactory, with $\chi^2/df = 3.3$, goodness of fit index = .88, and root mean-square error of approximation = .05 ($p < .001$). The Cronbach's α was .78, .80, and .92 for factors 1, 2, and 3, respectively. The test–retest reliability was demonstrated with an intraclass correlation coefficient of .91, indicating adequate measurement stability.
Conclusion: The 16-item ESES-I has acceptable validity and reliability; however, a broader application of the scale requires further testing in different populations to confirm its external validity.

Introduction

Promoting physical activity (PA) to maintain wellness and prevent disease is a global health priority [1]. Nearly one-third of the world's population fails to meet the recommended levels of PA to stay healthy [2]. In Indonesia, more than 80.0% of adolescents and almost 25.0% of adults do not meet the recommended levels of PA [3]. These age groups include university students, who are vulnerable to physical inactivity due to academic pressure and the habit of sitting. Promoting PA among Indonesian young people, especially university students, is crucial as the largest group [4], and they are in an opportune period for establishing healthy lifestyles. One strategy to promote PA is to increase an individual's

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exercise self-efficacy [5]. Exercise self-efficacy refers to an individual's belief in his or her ability to perform and succeed in challenging exercise situations [6]. Identifying exercise self-efficacy is fundamental to designing interventions to promote PA; however, there is no available instrument that measures exercise self-efficacy for the Indonesian population.

The most important consideration in using a self-efficacy scale is that it must be tailored to specific activity domains [7]. In addition, the scale assesses the multifaceted ways in which efficacy beliefs operate within the selected activity domain [8]. The 18-item Exercise Self-Efficacy Scale (ESES), developed by Bandura, is a useful measure of exercise beliefs. It describes situations in which it may be difficult to adhere to an exercise routine [8].

To date, the ESES has been adapted and validated in Korean [9], which reported a one-factor structure. Similarly, a study using a sample of elderly Australians undergoing cardiac rehabilitation found a single factor [10]. Conversely, studies in the Netherlands [11] and Iran [12] reported a three-factor structure. Note that the adaptation and validation of the ESES in several countries have been conducted among unhealthy populations [9–12]. In a study of healthy undergraduate students from the United States, a two-factor model emerged [13]. A recent study on Malaysian university students simplified the ESES to 12 items and reported a three-factor structure [14]. Although the original ESES was published as a single dimension, the varied nature of each item (environment, health, and situation) contributes to a multidimensional structure. These studies illustrate possible for cultural differences when measuring exercise self-efficacy.

Purpose of the Study

This study aimed to translate the ESES into Bahasa Indonesia (hereinafter, the ESES-I) and psychometrically test the scale for cross-cultural application among a younger adult population.

Methods

Design

This study has a cross-sectional design and was conducted in two phases. Phase 1 consisted of the translation and cross-cultural adaptation of the ESES, whereas Phase 2 assessed the psychometric properties of the translated instrument.

Setting and Samples

In total, 379 students from an Indonesian university in Yogyakarta were recruited. They were divided into three groups for different purposes to test the validity and reliability of the ESES-I. Group 1 included 33 students who pretested the translated instrument. Group 2 included 312 students who completed the translated instrument to determine the factor structure, validity, and internal consistency. A rule of thumb for factor analysis states that a minimum of 300 cases is considered adequate [15], thus 312 students were recruited to meet that standard. Group 3 included 34 students who provided information for the test–retest reliability by completing the ESES-I twice, 2 days apart. This sample size exceeds the estimated minimum (30 students) needed for a power of 90.0% and an alpha of .05 [16].

Ethical Considerations

The permission to conduct this study was received from the institutional review board of university of Muhammadiyah Yogyakarta (Approval no. 317/EP-FKIKUMY/VI/2018). Before

participating in the study, the students were informed of the purpose of the research and were assured of their right to refuse to participate in the study or withdraw their consent at any stage. The data were collected from July to August 2018.

Measurements/Instruments

The original 18-item ESES describes situations in which it may be difficult to adhere to an exercise routine. The items are responded using an 11-point scale (0–10), with the higher scores indicating higher confidence in one's ability to regularly exercise [6]. This scale was used with Bandura's permission.

Procedure

In Phase 1, the translation and cross-cultural adaptation used the five-step process delineated by Beaton et al. [17], including forward translation, synthesis, back translation, expert committee review, and pretesting (Table 1). Six bilingual experts of exercise self-efficacy (three nursing education specialists, a psychologist, a health promotion specialist, and a nursing teacher) formed an expert review panel to evaluate the cross-cultural validity and content validity index at the item-level (I-CVI). During pretesting, 33 university students rated the instructions and scale items as clear or unclear. They were also asked to suggest modification or elimination of items. In Phase 2, the psychometric assessment of the construct validity was conducted through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).
In addition, the reliability of ESES-I was assessed through Cronbach's α and the intraclass correlation coefficient (ICC). SPSS AMOS 18.0 (IMP Corp., Armonk, NY, USA) was used to conduct the EFA and applied an oblique promax rotation to the factors, whereas the CFA and reliability test were computed using SAS version 9.2 (SAS Institute Inc, Cary, NC).

Data Analysis

In Phase 1, the cross-cultural validity was assessed based on the consideration of semantic, idiomatic, conceptual, and experiential equivalence. Each item was rated from 1 (not equivalent) to 4 (highly equivalent) by each expert. If any item received a score below 3, it was discussed by the group. The mean score of each item was calculated. Furthermore, the I-CVI was calculated by the number of scores that were three or four, divided by the total number of experts [18].
In Phase 2, the EFA was conducted by applying the following: Kaiser's stopping rule, scree plot examination to determine the number of factors, a priori criterion using eigenvalue ≥1 and a

Table 1 Cross-Cultural Translation and Adaptation Processes of The ESES into Bahasa Indonesia.

Process	Step and Roles
Forward translation	• The original language (English) translate into two Bahasa Indonesian versions independently (T1 & T2) Translators aware, but naïve to the outcome measure
Synthesis	• Bahasa Indonesian versions T1 & T2 synthesized into T12 Research team and two translators
Back translation	• Independent translation of the Indonesian T12 back into English versions (BT1 & BT2) Two native English native bilingual professionals
Expert committee review	• Analysis of semantic, idiomatic, experiential, and conceptual equivalence Six content experts
Pretesting	• Complete the scale to analyze understanding of items 34 Indonesian university students

Table 2 Factor Loading and t Statistic of 3- and 2-Factor Model of The ESES-I (N = 312).

Item	3-Factor model						2-Factor model			
	Factor 1		Factor 2		Factor 3		Factor 1		Factor 2	
	T	FL	t	FL	T	FL	t	FL	t	FL
1	−0.54	−.09	1.59	.18	**16.79**	**.71**	1.18	−.04	**29.74**	**.79**
2	−0.32	−.06	−0.54	−.15	**27.39**	**.93**	−0.13	−.20	**66.06**	**.89**
3	−0.9	−.12	2.13	.25	**17.33**	**.72**	1.46	−.03	**2.40**	**.83**
4	−0.06	−.14	**5.10**	**.89**	0.40	−.04	2.86	.37	1.31	.28
5	2.14	.28	−0.47	−.21	**9.32**	**.72**	1.95	.12	**8.57**	**.65**
6	**5.72**	**.52**	1.40	.15	1.67	.19	**17.07**	**.59**	1.27	.22
7	0.72	.16	1.06	.31	2.37	.36	3.19	.31	3.42	.47
8	0.88	.18	1.24	.42	1.38	.19	4.79	.41	1.92	.34
9	0.89	.04	**8.39**	**.68**	2.44	.15	4.66	.41	2.22	.39
10	1.19	.11	**6.84**	**.74**	0.83	.00	**7.64**	**.52**	1.40	.26
11	1.54	.23	**3.99**	**.68**	−0.77	−.16	**11.99**	**.62**	0.25	.06
12	**21.83**	**.76**	−0.45	−.16	2.01	.23	**19.10**	**.66**	0.31	.14
13	**47.55**	**.88**	0.21	−.06	−0.40	.01	**21.15**	**.86**	−1.33	−.05
14	**7.24**	**.59**	0.30	-.01	1.71	.22	**9.36**	**.57**	0.72	.19
15	**32.76**	**.89**	2.28	.15	−3.78	−.18	**36.21**	**.99**	−2.81	−.17
16	**44.91**	**.94**	0.75	.00	−2.09	−.09	**21.54**	**.96**	−1.98	−.14
17	**27.54**	**.89**	1.18	.05	−1.53	−.08	**25.73**	**.94**	−1.81	−.11
18	**6.92**	**.61**	1.01	.12	−0.04	.00	**32.34**	**.69**	−0.65	.02

Note. FL = factor loading.
Factor loading ≥ 0.5 and t statistic > 0.2 in bold.

maximum of 25 rotation iterations, the percent of cumulative variance to identify the model, and a parallel analysis to provide a visual comparison of the results. A bootstrap factor analysis was conducted to test the stability of the two- and three-factor models using a nonparametric approach. Resamples (n = 100) were drawn with replacement; each resample had the same size as the original [19]. When testing the stability across resamples, the expectation is that the t-value exceeds 2.0 [20].

The first-order CFA was analyzed using maximum likelihood estimation (MLE), the robust procedure of two-stage least squares (2SLS), and five-fold cross-validation. The five-fold cross-validation was performed to evaluate the model fit through 100 repetitions. The total sample was randomly divided into five subsets; then, the model fit was tested for each subset. The average value of 500 goodness-of-fit indices (GFIs) was obtained. Good construct validity is achieved when the fitness indices reach the required level; fitness indices indicate how well the items measure their respective latent constructs [21]. The model is considered a good fit when the probability level of GFI value is >.9, standardized root mean square residual (SRMR) < .05, and the comparative fit index (CFI) ≥ .90. A χ^2/df ratio of <5 indicates a good fit between the observed and reproduced correlation matrices [22]. Akaike Information Criteria (AIC) was used to perform model comparisons, and the model with a lower AIC was considered to be better [23].

The scale reliability was evaluated by measures of internal consistency using Cronbach's α with acceptable score ≥ .7 [24]. For ICC analysis, the test–retest reliability was determined 2 days after the first assessment to get an acceptable compromise between recollection bias and unwanted clinical change [25]. A two-way mixed-effects model was used because repeated measurements cannot be regarded as randomized samples [26]. The absolute agreement definition was adopted because the measurements would be meaningless if there was no agreement between repeated measurements. ICC values < .5, .5–.75, .75–.9, and >.9 indicate poor, moderate, good, and excellent reliability, respectively [26].

Results

Participant Demographics

A total of 379 Indonesian university students provided the data for the factor analysis and test–retest procedures. Their ages ranged from 17 to 39 years, with a greater number of women participating (66.5%, n = 252).

Phase 1: Translation and Cross-Cultural Appropriateness

The translational equivalence and cross-cultural appropriateness of the scale were assessed by the six experts' ratings of the level of agreement between the Indonesian and the original version. There were no deleted or modified items; the mean item CVIs ranged from 3.5 to 4.0. All items in the ESES-I were rated as understandable during pretesting by the 33 university students.

Phase 2: Psychometric Assessment

The 18-item scale had a dimensional structure as indicated by the inter-item correlation matrix. The weakest correlation (r ≤ .3) was between items 2 and 11, "When I am feeling pressure from work" and "When I have too much work to do at home," whereas the strongest correlation (r ≥ .8) was between items 15 and 16, "Without support from my family or friends" and "During a vacation." For the inter-item correlation matrix, some were highly correlated with each other and poorly correlated with items in other groups. Thus, it was necessary to explore the construct validity.

The EFA yielded three factors with eigenvalues of 8.816, 1.490, and 1.068. However, the screen test revealed only two factors above an eigenvalue of 1.00. The percent of cumulative variance tests indicated that the three-factor model had higher cumulative variance (63.2%) compared with the two-factor model (57.3%). Thus,
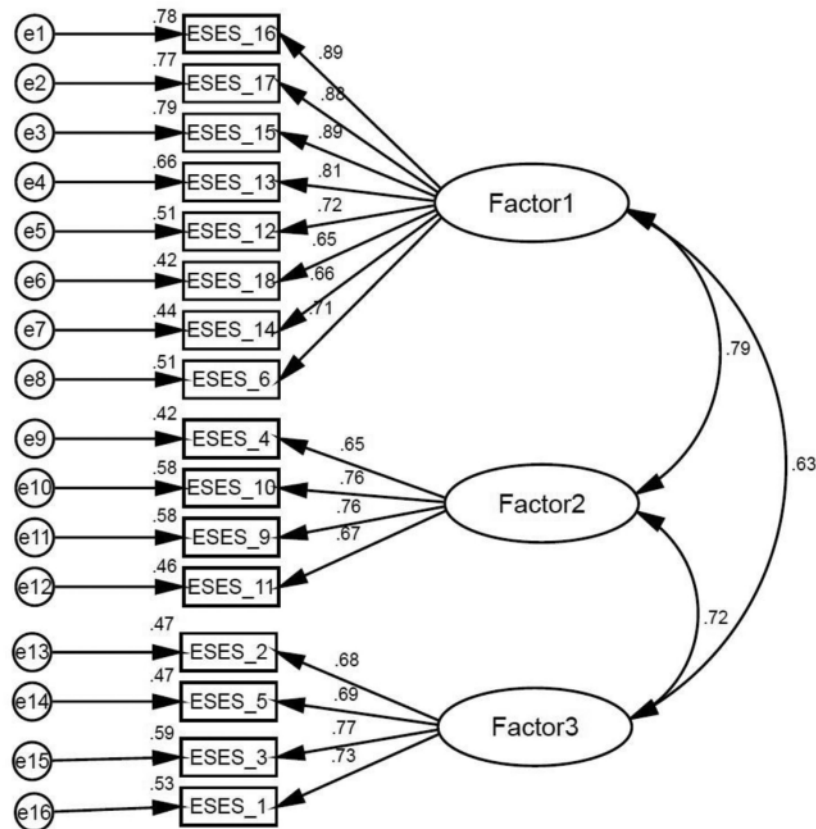
Chi-square=304.060
Degree of Freedom=101
P value=.000
Normed chi square=3.010
GFI=.898
AGFI=.862
CFI=.931
RMSEA=.080
NNFI=.918
IFI=.932

Figure 1. Confirmatory factor analysis by Maximum Likelihood Estimation.

the three-factor model was preferred[27]. Using plot displays, a parallel analysis identified two retained factors whose actual eigenvalues were above or along the lines representing the randomly generated eigenvalues. The bootstrap analysis testing the stability of the two- and three-factor models using 100 resamples further confirmed that the three-factor model was appropriate (Table 2). The result of bootstrap analysis for the two-factor model[11] showed that Item 7 was found to be cross-loading, and many items had a factor loading below 0.50 (i.e., Items 4, 7, 8, and 9); the three-factor model showed that Items 7 and 8 had low factor loadings and *t*-statistic values.

According to the EFA, both the two- and three-factor models were plausible to be included in the CFA. Initially, the MLE procedure was used, which revealed that the two-factor model without Item 7 showed a poor fit (χ^2/df = 3.9, SRMR = .06, GFI = .83, CFI = .88, AIC = 535.05). As shown in Figure 1, the three-factor model without Items 7 and 8 resulted in a good model fit (χ^2/df = 3.01, SRMR = .06, GFI = .89, CFI = .93, AIC = 304.06). Item 7 ("When I am feeling anxious") and Item 8 ("After recovering from an illness that caused me to stop exercising") were removed from further analysis because of their low factor loadings.

Table 3 Original and Bahasa Indonesia Versions of ESES.

Number of item	Original Version	Number of Item	Bahasa Indonesia Version
1	When I am feeling tired		**Situational/interpersonal**
2	When I am feeling under pressure from work	6	Ketika saya sedang merasa tertekan
3	During bad weather	12	Ketika sedang ada tamu
4	After recovering from an injury that caused me to stop exercising	13	Ketika ada hal menarik lainnya untuk Dikerjakan
5	During or after experiencing personal problems	14	Jika saya tidak mampu mencapai target olahraga saya
6	When I am feeling depressed	15	Tanpa dukungan dari keluarga atau teman saya
7	When I am feeling anxious	16	Selama liburan
8	After recovering from an illness that caused me to stop exercising	17	Ketika saya memiliki janji yang lain
9	When I feel physical discomfort when I exercise	18	Setelah mengalami masalah keluarga
10	After a vacation		**Competing demands**
11	When I have too much work to do at home	4	Setelah sembuh dari cedera yang menyebabkan saya berhenti berolahraga
12	When visitors are present	9	Ketika saya merasa tidak nyaman dengan badan saya saat berolahraga
13	When there are other interesting things to do	10	Setelah liburan
14	If I do not reach my exercise goals	11	Ketika saya memiliki banyak pekerjaan dirumah
15	Without support from my family or friends		**Internal feelings**
16	During a vacation	1	Ketika saya sedang merasa lelah
17	When I have other time commitments	2	Ketika saya sedang mengalami tekanan dalam pekerjaan
18	After experiencing family problems	3	Selama cuaca buruk
		5	Selama atau setelah mengalami masalah pribadi

Considering the non-normal distribution of the data, a robust 2SLS was performed to analyze the fit of the three-factor model. The fit indices of both the MLE and 2SLS procedures were similar, indicating that the distribution of the data did not influence the model fit analysis (χ^2/df = 3.3, SRMR = .05, GFI = .88, CFI = .93, = 404.68). In addition, the five-fold cross-validation also showed that the three-factor model was appropriate for the 16-item ESES-I (SRMR = .05, GFI = .88, CFI = .92). Based on the results of the EFA and CFA, the first-order three-factor structure (Figure 1) was selected as the final model applied to the ESES-I.

According to the item-component of the three-factor model of ESES-I, the name and description of each factor are as follows (Table 3): Factor 1 (8 items), "situational/interpersonal," explained 48.9% of the variance and includes items that are "situational or interpersonal influences" on exercise self-efficacy; Factor 2 (4 items), "competing demands," explained 8.3% of the variance and represents situations in which the participants have little control; Factor 3 (4 items), "internal feelings," explained 5.9% of the variance and represents emotions that influence exercise.

As for the reliability, the 34 participating students demonstrated clear test–retest reliability (ICC = .91, 95% confidence interval = 0.82–0.95). Cronbach's α was .78, .80, and .92 for Factors 1, 2, and 3, respectively, based on the 312 respondents' data.

Discussion

The cross-cultural adaptation of ESES to Bahasa Indonesia resulted in a three-factor model with 16 items. The EFA and CFA analyses with MLE, 2SLS, and five-fold cross-validation showed that the three-factor model had the best fit. Among the fit indices, only the Chi-squared p-value in both the MLE and 2SLS procedures showed significance, indicating that there was a difference between the model-inferred population covariance and the observed sample covariance. However, the Chi-squared statistic is very sensitive to sample size and no longer relied on as a basis for acceptance or rejection. The larger the sample size, the more likely a model will fail to fit using the Chi-squared goodness-of-fit test [27]. Although the GFI was below .9, it is also known to depend on the sample size [28].

In the CFA with first-order, three-factor structure of the final model of ESES-I, two items (Items 7 and 8) were deleted. Feeling anxious (Item 7) does not influence Indonesian students'

confidence to exercise. A previous study has found that students who exercise regularly have less anxiety than those who do not [29]. The low factor loading of Item 8 indicated that the students responded inconsistently on this item. Healthy students may have struggled to comment on exercising after an injury if they had not experienced any injury.

Although a study conducted in the United States reported a single factor [13], most of the studies conducted in Asian countries have found that the ESES is multidimensional. The differences in psychological constructs between Eastern and Western cultures [30] may have contributed to such differences in beliefs about exercise habits. Regarding the number of factors, the 16-item ESES-I is similar to the other translated versions, but the number of items differs from the 18-item Korean [7], the 17-item Iranian [10], and the 12-item Malaysian [14] versions. Four items in the ESES-I (Items 6, 11, 14, and 15) loaded onto different factors compared with the Korean, Iranian, and Malaysian versions. Although the Korean [7] and Iranian [10] versions include Item 6 in Factor 2, the ESES-I agrees with the Malaysian study [14] that belongs to Factor 1. Being depressed (Item 6) was deemed a situational factor as students face academic stressors, which might influence their exercise behavior. The placement of Items 14 and 15 in Factor 1 of the ESES-I is different from the other studies that include it in Factor 2 [7,10,14]. Failure to achieve one's exercise goals (Item 14) was more of a situation than a competing demand that influences one's confidence to exercise. Item 15 was considered as a situational/interpersonal factor because the support from family or friends requires interpersonal relationships, communications, or interactions, which could influence exercise self-efficacy. The placement of Item 11 is inconsistent among various studies. Although the study population was similar, a study in Malaysia includes it in Factor 3, whereas the ESES-I retains it in Factor 2. The students interpreted "work at home" as completing school assignments at home, which competed with their time and ability to exercise. The number and placement of items are different among the studies on Asian populations. This study provides a more valid cross-cultural adaptation because it was conducted from a comprehensive approach and with recommended procedures rather than a simple translation.

This study found that Indonesians have different and specific views of engaging in exercise compared with other populations. As a multicultural country, the variety of cultures, religions, and

worship observances may be some factors affecting people's exercise self-efficacy. This study found that exercise self-efficacy varied among Indonesian university students at the item level. The lowest score belonged to item 12 ("When visitors are present"), which indicated that, for students, receiving visitors was more important than exercising. In Indonesia, treating visitors is an obligation, and consequently, other activities are abandoned for politeness. According to Muslim practices, people are encouraged to visit each other and "glorify" their guests [31]. Item 4 ("After recovering from an injury that caused me to stop exercising") had the highest score, indicating that students were not deterred by an injury. Perhaps they had been taught the importance of exercising when recovering from an injury to restore health. The unstable results of the various studies adapting the ESES suggest the need for a factor analysis when making a new version of the scale.

Limitations

The present study examined the ESES-I in the context of Indonesian university students only; thus, the scale should be validated when used with other populations. The EFA and CFA were conducted using the same sample; the scale needs to be validated using an independent sample. Moreover, the test–retest reliability was conducted over a short interval. A future study should examine the stability of the ESES-I over a longer period to ensure longitudinal reliability.

Conclusions

The three-factor, 16-item ESES-Indonesian version demonstrates cultural equivalence, reliability, and validity when used with university students. The differences in the number of factors and item placements, when compared with the scale's other language versions, may reflect the cultural differences among the countries.

Conflict of interest

All authors declare no conflicts of interest in this study.

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