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The Turkish Version of the Exercise Addiction Inventory: Validity and Reliability

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Main Points

- This study provided a valid and reliable measurement tool for the assessment of exercise addiction in Turkish culture.
- Since the adapted scale contains few items, it can be easily applied and contribute to more accurate answers by the participants.
- Conducting it on a university sample has contributed to the emergence of an assessment tool that allows the determination of exercise addiction in the emerging adult population.
- Conducting research that covers not only the emerging adult population but also different age ranges can help determine the population affected by this type of addiction.

Abstract

Exercise addiction is a growing area of research interest, and many psychometric scales have been developed for its measurement. One of the most widely used instruments is the Exercise Addiction Inventory, which has been translated and validated in several languages but not in Turkish. Therefore, the present study aimed to translate and validate the Exercise Addiction Inventory into Turkish for promoting exercise addiction research in Turkiye. The sample comprised 665 university students with ages ranging from 17 to 47 years [491 females and 174 males; M_{age} = 21.23 years, standard deviation = 3.16]. A confirmatory factor analysis confirmed the one-dimensional structure of the scale (χ^2/df = 2.98, [Goodness of Fit Index] GFI = 0.98, [Comparative Fit Index] CFI = 0.98, [Adjusted Goodness of Fit Index] AGFI = 0.96, [Root Mean Square Error of Approximation] RMSEA = 0.05). The scale's reliability was very good in terms of both the omega coefficient (0.81) and alpha coefficient (0.80). The Turkish Exercise Addiction Inventory showed good concurrent reliability with the Exercise Addiction Scale and Sport Engagement Scale. These findings suggest that the Turkish Exercise Addiction Inventory is a valid and reliable instrument for assessing exercise addiction among Turkish university students.

Keywords: Exercise addiction, Exercise Addiction Inventory, exercise dependence, psychometrics, Turkiye, validation

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Introduction

Exercise is a subcluster of planned, structured, and repeated physical activities (Caspersen et al., 1985). It is designed to improve or sustain physical fitness but is also an activity that may be used for mental health preservation and treatment (VandenBos, 2015). For example, exercise can reduce anxiety symptoms (Kandola & Stubbs, 2020). In addition, an experimental study reported that aerobic exercise interventions reduced the severity of obsessive-compulsive disorder symptoms (R. A. Brown et al., 2007). Another study found that exercise programs given to inpatients effectively improved outcomes for individuals with various mental health disorders (Stanton & Happell, 2014).

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Furthermore, exercise is known to increase the quality of life. However, excessive exercise may cause health problems (Lichtenstein, et al., 2014). For example, a moderate degree of exercise has a protective effect related to the direct impact of exercise on the immune system. In contrast, repeated exhaustion may disrupt immune functions (Brolinson & Elliott, 2007). Additionally, excessive exercise appears to have negative effects on cardiovascular health (Sharalaya & Phelan, 2019). Moreover, despite the many beneficial effects of sporting activities on health, excessive exercise may result in exercise addiction which many scholars view as a form of behavioral addiction (Vansteene et al., 2022).

Exercise addiction is defined as the loss of control over exercise behavior that has become a habit, compulsive, and causes problems in the individual's health, social, and professional life (Szabo et al., 2015). One of the most difficult topics in defining exercise addiction is how to distinguish exercise addiction from healthy exercise (Freimuth et al., 2011). Compared to other behaviors such as addictions to alcohol and gambling, exercise is socially acceptable behavior, even if overused. The effort of individuals to be physically fit is perceived as a criterion of a healthy lifestyle. Consequently, the social acceptability of exercise may encourage individuals to continue the addiction cycle (Lichtenstein et al., 2017). Many exercise addicts focus on myths surrounding specific exercises they perform or may have irrational phobias related to taking a break from physical activity (Landolfi, 2013). For example, they may think that if they stop exercising, even for a short time, their performance will markedly drop, and their muscles will suffer.

Some claim exercise addiction comprises two distinct types such as primary exercise and secondary exercise addiction (Blaydon & Lindner, 2002). In primary exercise addiction, the focus of the addiction is the exercise itself. On the contrary, in secondary exercise addiction, excessive exercise is secondary to another disorder (such as eating disorders) where the aim is often to lose weight and/or reach a perceived ideal body and reach the target desired through over-exercise (Berczik et al., 2014). Many symptoms and outcomes appear to be similar between primary and secondary exercise addiction (Berczik et al., 2012).

Exercise addiction has also been described as when an intense physical activity becomes a compulsive behavior (Godoy-Izquierdo et al., 2021). Therefore, identifying individuals at risk for exercise addiction can be considered essential for preventive mental health services (Costa et al., 2013). A meta-analysis reported that individuals with exercise addiction have a lower health profile than those not addicted to exercise (Simón-Grima et al., 2019). It has also been reported that individuals with exercise addiction were at risk of developing adverse psychological effects due to the deterioration of the amount of exercise because of the restrictions related to the coronavirus disease 2019 (COVID-19) pandemic (Syed et al., 2022). Moreover, there is increasing evidence that individuals at risk of exercise addiction may have a range of mental health and/or other problems (Colledge et al., 2020). For example, associations have been found between exercise addiction and (i) depressive symptoms (Alcaraz-Ibáñez et al., 2022), (ii) narcissism (Zeigler-Hill et al., 2021), (iii) body image anxiety, (iv) alexithymia (Gori et al., 2021), (v) body dissatisfaction (Freire et al., 2020), (v) food addiction (Hauck et al., 2020), (vi) eating disorders, (vii) compulsive shopping (Müller et al., 2015), and psychological rigidity (Alcaraz-Ibáñez et al., 2018).

When the relevant literature is assessed, exercise addiction is a phenomenon that requires further study. If research concerning exercise addiction is to progress, it is important to know when this behavior represents an addiction rather than being secondary to another disorder. Like other behavioral addictions, exercise addiction has been viewed as compulsive or impulsive (Freimuth et al., 2011), but primarily as compulsive (Szabo & Demetrovics, 2022). The fifth edition of the Diagnostic and Statistical Manual for Mental Disorders does not include diagnostic criteria for exercise addiction (Godoy-Izquierdo et al., 2021). Clinicians know about exercise addiction, but due to insufficient clinical cases reported there is a difficulty of gathering evidence for its inclusion in a diagnostic reference outlet (Anandkumar et al., 2018; Egorov & Szabo, 2013; Freimuth et al., 2011).

In addition to accurately identifying the features and behaviors characterizing exercise addiction, the development of effective screening tools is important (Gori, Topino, & Griffiths, 2021). The international literature shows that the validity and reliability of various psychometric instruments related to exercise addiction have been tested. Such instruments include the Exercise Beliefs Questionnaire (Loumidis & Wells, 1998), Obligatory Exercise Questionnaire (OEQ) (Pasman & Thompson, 1988), Exercise Dependence Questionnaire (Ogden et al., 1997), Exercise Addiction Inventory (EAI) (Terry et al., 2004), Revised EAI (Szabo et al., 2019), and Exercise Dependence Scale-21 (EDS-21) (Hausenblas & Downs, 2002b).

One of the most popular instruments is the EAI which has been used to estimate the prevalence of exercise addiction in various countries. More specifically, the EAI has been adapted into Hungarian (Demetrivics & Kurimay, 2013; Mónok et al., 2012), Spanish (Sicilia-Camacho et al., 2013), Danish (Lichtenstein, et al., 2014), Italian (Gori, et al., 2021), Mexican (Salazar et al., 2021), and Persian languages (Akbari et al., 2022). The EAI and the EDS (Hausenblas & Downs, 2002a, 2002b) were used in a study assessing a nationally representative sample (aged 18 – 64 years) in Hungary (Mónok et al., 2012). It was found that the prevalence of exercise addiction was 0.3 – 0.5% of the general adult population and that the Hungarian EAI was a reliable instrument for assessing exercise addiction (Mónok et al., 2012; Szabo, 2021). Griffiths et al. (2015) combined datasets from studies in Hungary, the UK, Spain, the US, and Denmark. They concluded that the EAI was an effective assessment tool to examine the covariates of exercise addiction across cultures. However, the EAI has not been validated in Turkish.

Sicilia et al. (2022) rigorously examined psychometric instruments assessing problematic exercise and found wide variation in the components of addiction studied across the many different instruments. However, Alcaraz-Ibáñez et al. (2022) reported in a recent meta-analysis that reliability testing among instruments assessing problematic exercise needed to be improved. The EAI has also been adapted for youth (EAI-Y) (Lichtenstein et al., 2018), and a recent Persian validation study reported that both the EAI and EAI-Y were reliable (Akbari et al., 2022). Exercise addiction among students has been studied in different disciplines such as sports sciences and psychology. Consequently, the

EAI has also been used among these different student groups (Li et al., 2015; Scully, 1998; Szabo, 2018; Szabo & Griffiths, 2007). The literature above demonstrates that there are many assessment tools for assessing exercise addiction. Moreover, the EAI is a widely used scale with its validity and reliability being evaluated in different countries and cultures.

When the Turkish literature concerning exercise addiction is examined, there are a few scales that assess exercise addiction, such as the 17-item Exercise Addiction Scale (EAS; Tekkurşun Demir et al., 2018), the 21-item EDS (Yeltepe & İkizler, 2007) and 10-item Sport Engagement Scale (SES; Kayhan et al., 2020). However, the validation of the EAI in Turkish would have some benefits. First, the existing Turkish scales are arguably long, whereas the EAI comprises only six items. The use of short psychometric scales in psychology and other disciplines is practical. Therefore, they are frequently preferred measurement tools, particularly in overcoming survey fatigue (Ziegler et al., 2014). Second, because the EAI has been validated in several languages, adapting the EAI into Turkish, international comparisons would be easier. Third, the existing Turkish scales were developed using tiny sample sizes. Indeed, the Turkish EDS was validated with only 124 individuals (Yeltepe & İkizler, 2007). The Turkish EAS was developed with only 178 individuals (Tekkurşun Demir et al., 2018). One rule of thumb is that there should be at least 10 – 20 participants for each scale item (Comrey, 1988; T. J. Kline, 2005; Thompson, 2004). Others suggest that sample sizes over 300 are considered good for scale development and validation (Anthoine et al., 2014). Fifth, confirmatory factor analysis (CFA) was not performed on the Turkish EDS (Yeltepe & İkizler, 2007). A CFA should be used to analyze the validity of constructs in already established scales (T. A. Brown, 2015; Gaur & Gaur, 2006). Given all these factors, there is a good rationale for adapting the EAI into Turkish. Consequently, the present study aimed to adapt the EAI to Turkish culture among a study group comprising adult participants and to test its validity and reliability.

Material and Methods

Design

A cross-sectional study was conducted to carry out the psychometric validation, and the methodological guidelines of COnsenus-based Standards for the selection of health status Measurement of INstruments (COSMIN) were followed (Gagnier et al., 2021). An online survey was used to collect the data for the study.

Sample

The sample comprised 665 undergraduate students attending 10 different universities with ages ranging from 17 to 47 years (491 females and 174 males; M_{age} = 21.23 years, standard deviation = 3.16). The data collection was based on the information that the participants exercised regularly. Considering that the minimum sample size required for CFA is 200 and a minimum of 10 – 20 participants per scale item, the sample size of 665 people was acceptable (R. B. Kline, 2016).

Translation Process

The present study followed the steps suggested by Beaton et al. (2000). First, necessary permissions were obtained from the scale developers. The translation of the items in the original form of the scale was carried out by four Turkish authors. Then, inconsistencies between translations were discussed and corrected. Finally, an independent bilingual translator back-translated the scale. The original developers then approved the back translation of the scale.

For the Turkish EAI verification, the necessary examinations were made by two experts in the field of Turkish Language and Literature on semantic equivalence, idiomatic equivalence, experiential equivalence, and conceptual equivalence, and the scale was given its final form before the application. Therefore, the intelligibility and fluency of the scale in the Turkish language and the preservation of the psychological meanings of the items were ensured. In addition, it was carried out by two psychological counselors to evaluate the content validity of the scale. As a result, a fluent, understandable, and ready-to-use form of Turkish EAI was created.

Measures

The data collection tools included the following: (i) a personal information form created by the research team, (ii) the EAI (Terry et al., 2004), and (iii) the EAS (Tekkurşun Demir et al., 2018), and Sports Addiction Scale (Kayhan et al., 2020) to test the criterion validity.

Personal information form

This was prepared by the researchers to obtain information related to the age, gender, academic unit, and region of participants. This information is presented in Table 1.

Exercise Addiction Inventory

The six-item EAI (Terry et al., 2004) was used to assess exercise addiction. Items (e.g., "Over time I have increased the amount of exercise I do in a day") are rated on a 5-point scale from 1 (definitely disagree) to 5 (definitely agree). The total scores range from 6 to 30. A score of 24 or more indicates the individual is at risk of exercise addiction. The Cronbach's alpha reliability coefficient for the original scale was 0.84. The psychometric properties of the Turkish EAI are presented in the Results section.

Exercise Addiction Scale

The 17-item EAS (Tekkurşun Demir et al., 2018) was used to test the concurrent validity of the EAI. The EAS comprises three factors: (i) over-focus and emotion change, (ii) delaying individual-social needs and conflict, and (iii) tolerance development and passion. Items (e.g., "I look forward to the time to exercise") are rated on a 5-point scale from 1 (definitely disagree) to 5 (definitely agree). The total scores range from 17 to 85. The cut-off scores are 18 – 34 (low addiction risk group), 35 – 51 (risk group), 52 – 69 (dependent group), and 70 – 85 (highly dependent group). The Cronbach's alpha in the present study was 0.93.

Sport Engagement Scale

The 12-item SES (Guillén & Martínez-Alvarado, 2014) [Turkish version: (Kayhan et al., 2020)] was used to test the concurrent validity of the EAI. The SES comprises two sub-dimensions: vigorousness and focusing. Items (e.g., "I am energetic and strong in my sporting activity") are rated on a 7-point rating from 1 (never) to 7 (always). The Cronbach's alpha reliability coefficient for the original scale was 0.90 and 0.91 for the Turkish version. The Cronbach's alpha in the present study was 0.96.

Table 1.
Demographic Features of the Sample

Variable		*n*	%
Gender			
	Male	174	26.16
	Female	491	73.83
	Total	665	100
Academic unit			
	Institute of Social Sciences	4	.60
	Faculty of Education	507	76.24
	Faculty of Health Sciences	13	1.95
	Faculty of Sport Sciences	12	1.80
	Faculty of Economics and Administrative Sciences	14	2.11
	Faculty of Arts and Sciences	12	1.80
	Faculty of Islamic Studies	10	1.50
	Faculty of Engineering	14	2.11
	Other faculties*	10	1.50
	Vocational school	69	10.38
	Total	665	100
Age group			
	17 – 20 years	314	47.22
	21 – 23 years	279	41.95
	24+ years	72	10.83
	Total	665	100
Region			
	Central Anatolia	556	83.60
	West Black Sea	97	14.58
	Other regions**	12	1.80
Total		665	100.0

Note: *Faculty of Medicine; Faculty of Art, Design, and Architecture; Faculty of Agriculture; Faculty of Forestry.
**Aegean, Mediterranean.

Ethics

In all stages of the study, all ethical principles were applied. Ethical permission was approved by the first author's university ethics committee. Participation in the research was voluntary, and all participants were told they had the right to withdraw from the research at any stage. No information was requested that could identify the participants included in the study. Confidentiality and anonymity were assured. The study was conducted in line with the principles of the Declaration of Helsinki, which was revised in 1989. All procedures were approved by the Ethics Committee of Kırşehir Ahi Evran University (E-5145010 3-050.01.04-00000382928).

Procedure

The target population was individuals engaged in sports. The inclusion criteria were (i) being regularly engaged in sports and exercise activities, (ii) volunteering to participate in the study, and (iii) being fluent in the Turkish language. Participants were recruited during classroom teaching. Those who were interested in participating were then sent an online link to the survey on a social media app (WhatsApp). The research team informed potential participants about the purpose of the study. Informed consent was obtained from all participants before data collection. Participants were asked to answer the questions online and were informed that the survey would take no longer than 25 minutes to complete. Along with the personal information form, the participants were asked "Do you regularly engage in sports or exercise?" Only individuals who answered "yes" to this question were included in the study. Six individuals said they did not and their responses were removed from the dataset.

Data Analysis

To test construct validity, the item total, item residue, and item discrimination, analyses were completed for the total sample and a CFA was carried out. For criterion validity (and more specifically concurrent validity) of the scale, the correlation values between the total scores on the EAS and SES with the EAI were calculated. To determine the internal reliability of the scale, the Cronbach's alpha and omega coefficients were calculated. The Average Variance Extracted values were calculated for composite reliability.

Results

Translation Validity

To determine the degree to which items in the Turkish EAI reflected the meaning of the English EAI, the scores given out of 10 by the experts were investigated and items with scores above the cut-off of 7 were accepted. As the total number of experts participating in the translation process was four, the Lawshe content validity coefficient (Lawshe, 1975) was used (Figure 1). Consensus was obtained between all experts participating in the study and a coefficient of 1.00 indicating 100% compatibility was reached. When the number of experts used in calculating the Lawshe content validity coefficient is four, the valid compatibility coefficient is 0.99.

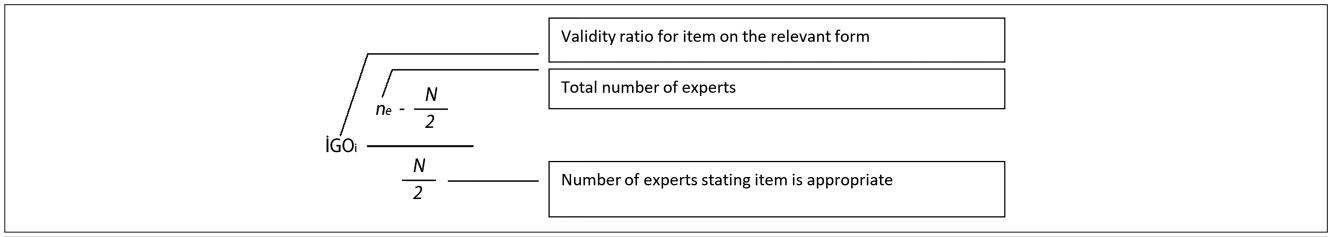

Figure 1. Formula 1-Lawshe Content Validity Formula.

Construct Validity

To determine the construct validity of the Turkish EAI, item analysis, item discrimination, and CFA were performed. The results related to the analyses are reported in the next three sections.

Item Analysis

Before beginning the analysis of the Turkish EAI, the data were examined to see if they were suitable for further analysis. First, extreme values were identified for points obtained from the Turkish EAI. Within this scope, seven participants outside the limits of +3 to −3 in the *z* scores were removed from the analysis. Then all data underwent Cronbach's alpha analysis with the aim of identifying items without correlation to the whole EAI according to corrected item residual correlation values. As a result of the analysis, all EAI items were determined to have strong correlation values (Table 2). In the second stage, item total analysis was performed. The correlation of each item with the whole Turkish EAI was determined. According to the results obtained, all the EAI items had significant correlations ranging from .52 to .78 (Table 3).

Item Discrimination

To determine the degree of discrimination between the desired attribute and unwanted attributes by items on the Turkish EAI, an item discrimination analysis was performed. First, the data related to each item were listed from big to small, and the cut-off values for the lower 27% and upper 27% were identified. Scores of the lower and upper groups were compared using independent group's *t*-tests. There was a $p < .01$ level of significance between the points obtained from the upper and lower 27% groups and the mean points for all test items as a result of the independent group's *t*-test. The values are presented in Table 4.

Confirmatory Factor Analysis

To determine whether the structural integrity of the EAI's original form was preserved during the adaptation, CFA was performed. The obtained results indicated structural integrity was present and the Turkish EAI adaptation results were compatible with the original EAI items ($\chi^2/df = 2.98$, GFI = 0.98, CFI = 0.98, AGFI = 0.96, RMSEA = 0.05). The obtained results and limit values for the fit indexes are shown in Table 5.

The factor loads obtained as a result of CFA were identified to vary between 0.36 and 0.78. The obtained values being within this

Table 2.
Item Residual Analysis Values for Turkish Exercise Addiction Inventory Items

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item—Total Correlation
Item 1	11.64	17.02	.63**
Item 2	12.41	19.51	.34**
Item 3	11.42	16.92	.53**
Item 4	11.71	16.15	.65**
Item 5	12.19	16.53	.63**
Item 6	11.81	17.21	.57**

Note: $^{**}p < .01$.

Table 3.
Item Total Analysis Values for Turkish Exercise Addiction Inventory Items

Item	Mean	Standard Deviation	Item—Total Correlation
Item 1	2.59	1.08	.75**
Item 2	1.83	1.06	.52**
Item 3	2.81	1.22	.70**
Item 4	2.52	1.19	.78**
Item 5	2.04	1.16	.76**
Item 6	2.43	1.12	.72**

Note: $^{**}p < .01$.

Table 4.
Independent Groups T-Test Results with the Aim of Determining Discriminant Power of the Exercise Addiction Inventory

Item		*X*	SD	*t*	*p*	Cohen's d Effect Size
Item 1	$Upper_{27\%}$	3.87	.68	40.77	<.01	4.34
	$Lower_{27\%}$	1.33	.47			
Item 2	$Upper_{27\%}$	3.27	.90	33.79	<.01	3.56
	$Lower_{27\%}$	1.00	.00			
Item 3	$Upper_{27\%}$	4.35	.47	60.42	<.01	6.44
	$Lower_{27\%}$	1.32	.47			
Item 4	$Upper_{27\%}$	4.12	.56	57.44	<.01	6.11
	$Lower_{27\%}$	1.17	.39			
Item 5	$Upper_{27\%}$	3.65	.76	46.59	<.01	4.93
	$Lower_{27\%}$	1.00	.00			
Item 6	$Upper_{27\%}$	3.82	.69	48.55	<.01	5.15
	$Lower_{27\%}$	1.09	.29			

Note: $n = 180 + 180 = 360$. X: Mean, SD: Standart deviation.

Table 5.
Confirmatory Factor Analysis Results

Fit Indices	EAI	Interval	Reference
χ^2/df	2.98	⩽3.00 perfect fit	R. B. Kline, 2016
RMSEA	0.05	⩽0.06 good fit	Hu & Bentler, 1999; Thompson, 2004
GFI	0.98	⩾0.90 good fit	Hooper et al., 2008; R. B. Kline, 2016
CFI	0.98	⩾0.90 good fit	Tabachnick & Fidell, 2007
AGFI	0.96	⩾0.90 good fit	Hooper et al., 2008

Note: EAI = Exercise Addiction Inventory. χ2/d: Chi square/degrees of freedom, RMSEA: Root Mean Squared Error of Approximation, GFI: Goodness of Fit Index, CFI: Comperative Fit Index, AGFI: Adjusted Goodness of Fit Index.

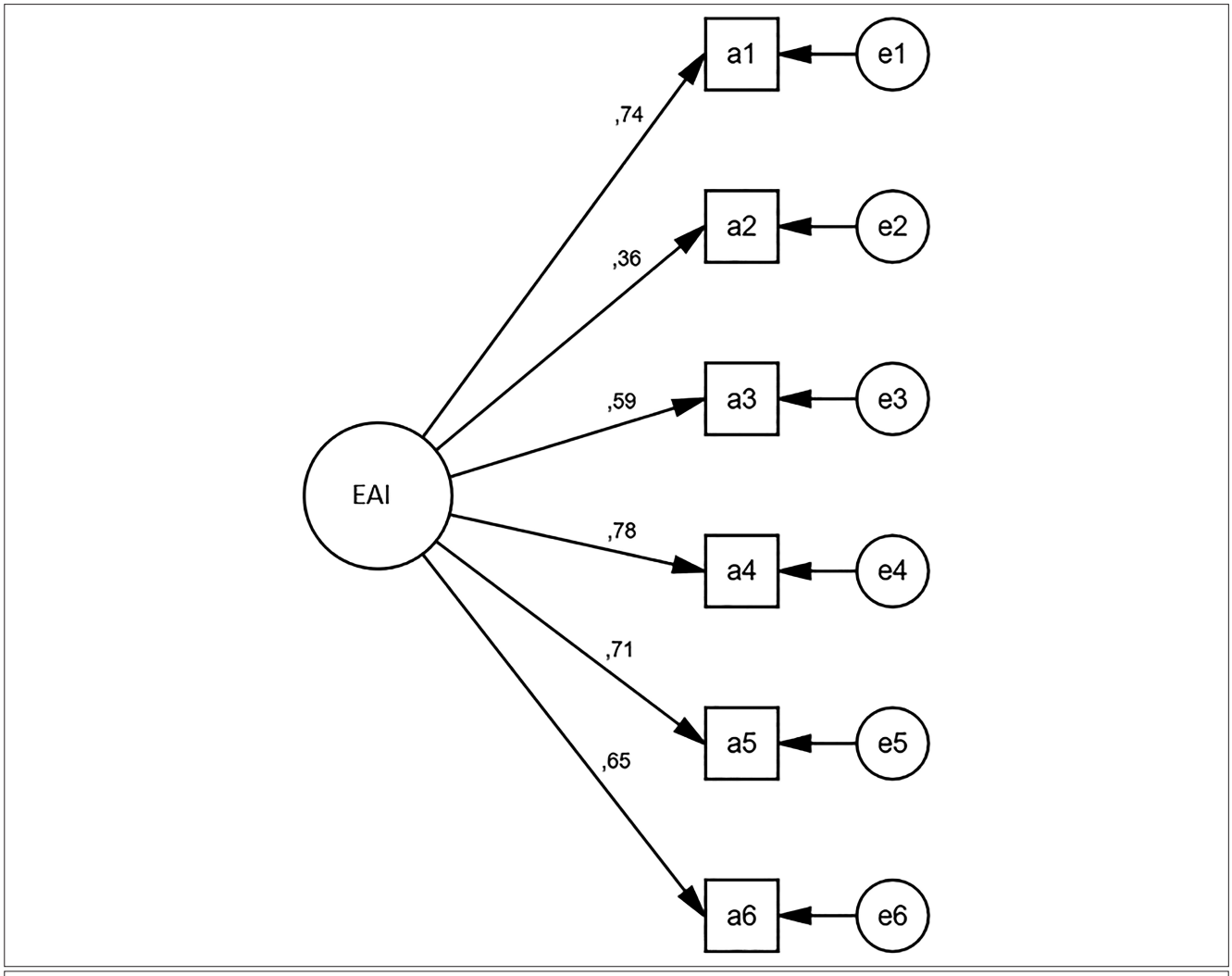

Figure 2. Confirmatory Factor Analysis Diagram for the Turkish Exercise Addiction Inventory. EAI: Exercise Addiction Inventory.

interval showed that there was no low correlation with values below .30 and no problems with measuring the same attribute with values above .90. The factor loads related to this analysis are presented in Figure 2.

Criterion (Concurrent) Validity

To determine the criterion validity (and more specifically concurrent validity) values for the EAI, the correlations between the total score obtained from the EAI with the total scores of the EAS and SES were calculated. Significant correlations were identified between the Turkish EAI and the EAS and the SES. The results are summarized in Table 6.

Table 6.
Correlation Analysis Results for Criterion Validity of the Exercise Addiction Inventory

	1	2	3
Exercise Addiction Inventory	1		
Exercise Addiction Scale	.79**	1	
Sport Engagement Scale	.66**	.77**	1

Note: $^{**}p < .01$.

Reliability

Three different analyses were performed to determine the reliability values for the Turkish EAI (i.e., Cronbach's alpha internal consistency coefficient, McDonald's omega, and composite reliability values). Based on the results of the three analyses, the Turkish EAI was determined to have a reliable structure. For the whole EAI, the alpha value (α) was 0.80, the omega value (ω) was 0.81 and the composite reliability value was 0.86.

Discussion

The present study conducted a translation and validation of the EAI (Terry et al., 2004) into Turkish culture. First, to determine the degree of meaning from the original structure reflected in the EAI items translated to Turkish, four experts were requested to give values out of 10 and items remaining above the cut-off value of 7 were accepted. As a result, there was consensus among all the experts participating in the study. Then, for semantic validity, two experts provided consensus, and full compatibility was obtained.

The item totals, item residuals, and item discrimination indexes for items on the Turkish EAI were calculated. The corrected item—total correlation values for the EAI were found to be moderate. These values were determined to be within the acceptable

limits of 0.30 and 0.70 (De Vaus & de Vaus, 2013). Additionally, the independent group's *t*-tests were performed with the aim of determining the discrimination of items on the EAI. Values between points obtained by the upper and lower 27% groups and mean points identified that all items were significant.

A variety of fit indexes commonly used in research to determine the goodness of fit of a tested model in CFA were investigated. When the CFA is examined, the fit indexes of the single-factor Turkish EAI appear to be within acceptable limits ($\chi^2/df = 2.98$, GFI = 0.98, CFI = 0.98, AGFI = 0.96, RMSEA = 0.05). These CFA results were similar to the Hungarian EAI ($\chi^2/df = 2.24$; CFI = 0.97; [Tucker Lewis index] TLI = 0.95; RMSEA = 0.05; [Standardized Root Mean Squared Residual] SRMR = 0.02) (Mónok et al., 2012), the Spanish EAI ($\chi^2/df = 2.13$; CFI = 0.98, TLI = 0.96, [Incremental Fit Index] IFI = 0.98, RMSEA = 0.04) (Sicilia-Camacho et al., 2013), the Italian EAI ($\chi^2/df = 1.18$; [Non-Normed Fit Index] NNFI = 0.98; CFI = 0.99; SRMR = 0.02; RMSEA = 0.02) (Gori, Topino, & Griffiths, 2021), the Mexican EAI ($\chi^2 = 31.57$; gl = 9; RMSEA = 0.06; CFI = 0.98; NNFI = 0.97; TLI = 0.97; SRMR = 0.04) (Salazar et al., 2021), and the Persian EAI (CFI = 0.99, TLI = 0.99, RMSEA = 0.01, SRMR = 0.02) (Akbari et al., 2022).

The results of correlation analysis performed to determine the criterion validity identified positive significant correlations between the Turkish EAI with the EAS ($r = .79$) and the SES ($r = .66$). The original form of the EAI had significant negative correlation ($r = -.81$) with the EDS (Hausenblas & Downs, 2002b) (scores for the EDS are reverse scored) and a positive correlation ($r = .80$) with the OEQ (Pasman & Thompson, 1988). These correlations were statistically significant like the original EAI.

The alpha value is a measure of the internal reliability (consistency) of the items (Howitt & Cramer, 2008), and values between 0.70 and 0.80 indicate good reliability while values from 0.80 to 0.90 indicate very good reliability (DeVellis, 2016). The values in the present study in the latter category. The alpha value for the Turkish EAI was therefore very good. The original EAI reported an alpha of 0.84, whereas the alpha value for the (i) Spanish EAI was 0.70 (Sicilia-Camacho et al., 2013), (ii) Italian EAI was 0.71 (Gori, Topino, & Griffiths, 2021), (iii) Persian EAI was 0.71 (Akbari et al., 2022), (iv) Mexican EAI was 0.81 (Salazar et al., 2021), (v) Danish EAI was 0.66 (Lichtenstein, Christiansen, Bilenberg, et al., 2014), and (vi) Hungarian EAI was 0.72 (Mónok et al., 2012). Therefore, the alpha value for the Turkish EAI was close to the original EAI and higher than the Italian, Persian, Danish, Hungarian, and Spanish adaptations. While the alpha value for the Turkish EAI was close to the original EAI it was lower than that of the Mexican adaptation.

The factor loadings obtained as a result of CFA for the Turkish EAI were between 0.36 and 0.78. The factor loadings were all above 0.30, which represents the lower limit for the criterion related to validity (Field, 2009). The upper limit value for this is 0.90, with values above this indicating that the concepts assessed by the items have almost the same meaning and are therefore problematic in terms of validity. The factor loadings of the Spanish EAI (0.41 – 0.59), Persian EAI (0.41 – 0.71), Hungarian EAI (0.38 – 0.72), Danish EAI (0.43 – 0.71), and Mexican EAI (0.51 – 0.79) versions were similarly acceptable (Akbari et al., 2022; Lichtenstein, et al., 2014; Mónok et al., 2012; Salazar et al., 2021; Sicilia-Camacho et al., 2013).

Limitations and Directions/Suggestions for Future Research

There are a number of limitations to the present study. The study sample comprised individuals aged from 17 to 47 years attending undergraduate education in a variety of Turkish universities and therefore is not a representative Turkish adult population. Consequently, future research should be performed with different cohorts and study groups (e.g., adolescents, professional/non-professional sports people). The data were collected during the COVID-19 pandemic, and this could have affected the physical exercise behavior of university students during this period (Pan & Lu, 2022). In the present study, exercise addiction was assessed based on the self-report of individuals. Self-report scales may contain bias, and assessments made by clinicians may be more effective (Maxwell et al., 2020). Consequently, assessing addiction based on self-report can be considered as a limitation of the study. In addition to psychological symptoms, physiological symptoms are also seen in exercise addiction (Weinstein & Weinstein, 2014). In this respect, clinician consultation is important in assessing exercise addiction (Bamber et al., 2003). The lack of a physiological measurement can also be considered as a limitation. The data collection was based on the information that the participants exercised regularly. However, information on the volume, frequency, and content of this exercise was not collected. The fact that data with different qualities of regular exercise habits were assessed together can be seen as a limitation that may have affected the results. The unequal distribution of gender in the study group is also a limitation (i.e., 74% females). Finally, the test – retest reliability of the scale was not examined and should be addressed in future studies.

The Turkish EAI has a single-factor structure comprising six items, similar to the original English EAI, and appears to be a valid and reliable scale based on its psychometric properties. The Turkish EAI contributes to the relevant literature and the implementation field and could advance exercise addiction research in Turkiye. Nevertheless, further testing is necessary, and the fact that the scale was validated in a female-majority student sample should be kept in perspective.

Ethics Committee Approval: Ethics committee approval was obtained from the Clinical Research Ethics Committee of Kırşehir Ahi Evran University (Approval no: E-51450103-050.01.04-00000382928).

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