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TURKISH VERSION OF THE ACADEMIC MOTIVATION SCALE[1]

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Summary.—The purpose of this study was to adapt the college version of the Academic Motivation Scale (AMS) into Turkish. The participants were 797 college students (437 men, 360 women) with a mean age of 20.1 yr. A seven-factor model of the scale, as well as alternative models (five-, three-, two-, and one-factor models) were investigated and compared through confirmatory factor analysis. The seven-factor model demonstrated adequate fit to the data. The fit indices obtained from the five-factor model were acceptable also. Hancock's coefficient *H* values and test-retest correlation coefficients of the subscales indicated that reliability of the scale was adequate except for the identified regulation subscale. The CFA conducted for the groups of men and women produced more acceptable fit indices values for men than women, but women obtained significantly higher scores from the AMS subscales. Correlations among the seven subscales partially supported the simplex pattern which claims that the neighboring subscales should have stronger positive correlations than the non-neighboring subscales and that the subscales which are the farthest apart should have the strongest negative relationships.

Unlike other contemporary motivation theories, self-determination theory (SDT; Deci & Ryan, 1985) views motivation in terms of varying degrees of self-determination. The theory includes five mini-theories (cognitive evaluation theory, organismic integration theory, causality orientations theory, basic psychological needs theory, and goal contents theory), each of which respectively explains the intrinsic motivation, the extrinsic motivation, the reasons of motivational orientations, the relation between basic psychological needs and motivation, and the intrinsic or extrinsic goals that affect motivation and wellness. The self-determination theory of motivation emphasizes the quality and types of motivation rather than its amount. According to the theory, different types of motivational states are arrayed in descending order on the motivation continuum from the most self-determined (intrinsic motivation) to the least (amotivation) and four types of extrinsic motivation in between them, namely, integrated regulation, identified regulation, introjected regulation, and external regulation. The initial work on intrinsic motivation started with White's (1959) concept of effectance motivation, in which he hypothesized that individuals were driven by needs to be competent and effective because they need to feel effective in their physical and social environment. Deci (1975) embraced White's hypothesis of effectance motivation (competence motiva-

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tion) and defined intrinsically motivated behaviors as "behaviors in which a person engages to provide himself a sense of competence and self-determination." Vallerand, Blais, Brière, and Pelletier (1989) divided the global construct of Deci and Ryan's intrinsic motivation into separate unordered sub-motivations and called them intrinsic motivation to know, intrinsic motivation to accomplish, and intrinsic motivation to stimulate. Then they added these sub-motivations into Deci and Ryan's (1985) original motivation continuum, but they excluded integrated regulation. This model was developed as the Échelle de Motivation en Éducation to measure the motivational states lying on the self-determination continuum from the least autonomous to the highest. Vallerand, Pelletier, Blais, Brière, Senécal, and Vallières (1992) translated the French version of the scale into English; the result was the Academic Motivation Scale (AMS), comprising 28 items in seven subscales with four items per scale.

Intrinsically motivated behaviors are considered autonomous behaviors because they are performed just to take pleasure in performing something. The intrinsic motivation to know is to do something for pleasure while one is learning, exploring, or creating something new. For example, if a student derives pleasure while doing homework, the motivation experienced by the student will be intrinsic motivation to know. The intrinsic motivation to accomplish describes an individual who derives satisfaction while he is accomplishing something. For example, students who solve extra mathematics problems, even though they are not required to do so, display intrinsic motivation to accomplish. In describing the intrinsic motivation to stimulation, it would be acceptable to offer that it is the behavior carried out to observe and experience stimulating sensations as the consequences of activities being engaged in (Cokley, 2000). For instance, a driver exceeding the speed limit to experience stimulating emotions displays an intrinsic motivation to stimulation.

Contrary to intrinsic motivation, extrinsic motivation is partly self-determined. Extrinsically motivated behaviors are driven by external or internal pressures such as expectation of reward or avoidance of punishment, shame, and guilt. They "become self-determined through the closely related developmental processes of internalization and integration" (Deci, Ryan, & Williams, 1996, p. 167). The autonomy levels of the behaviors driven by the different types of extrinsic motivation are different. For instance, the behaviors regulated by the identified and integrated forms of extrinsic motivation are more autonomous than the behaviors regulated by external and introjected types of extrinsic motivation. In other words, introjected and external forms of extrinsic motivation are assumed to be relatively controlled, whereas identified and integrated forms of extrinsic motivation are relatively autonomous (Verloigne, De Bourdeaudhuij, Tanghe, D'Hondt, Theuwis, Vansteenkiste, *et al.*, 2000; Chu, 2012). External regulation, which is the least self-determined type of external motivation, is related to the behaviors done to gain a reward or to avoid punishment. When an individual feels forced to do something or to behave in a certain way, the first type of extrinsic motivation, external regulation, occurs. For example, a student who cheats in an examination in order to obtain higher grades displays external regulation. Introjected regulation, which is more self-determined than external regulation, is the second type of extrinsic motivation. It refers to behaviors done to avoid feelings such as guilt or anxiety, caused by internal pressures. For instance, students completing their homework on time, so as not to feel guilty, display introjected regulation. The third type of extrinsic motivation, identified regulation, is related to behaviors performed for the sake of the positive results of the behavior. When a person finds an activity valuable and important, the motivational orientation of that person will be "identified regulation." When the self fully assimilates the identified regulation, integrated regulation occurs. However, both types of these regulations are still extrinsic to the self because they are instrumental for the behaviors that the individuals want to do since they find them meaningful and important (Deci, *et al.*, 1996; Cokley, Bernard, Cunningham, & Motoike, 2001).

Amotivation, which is neither intrinsic nor extrinsic, refers to lack of motivation. In this case, people find the activities worthless or they find themselves inadequate to do those activities. Furthermore, amotivated persons perceive their behaviors as caused by forces out of their own control (Vallerand, *et al.*, 1992; Fortier, Vallerand, & Guay, 1995).

The psychometric properties of the Academic Motivation Scale have been examined several times in different cultures since the scale was developed. Although most researchers (Vallerand, *et al.*, 1992; Cokley, *et al.*, 2001; Fairchild, Horst, Finney, & Barron, 2005; Honda & Sakyu, 2005; Núñez, Martín-Albo, & Navarro, 2005; Núñez, Martín-Albo, Navarro, & Grijalvo, 2006; Barkoukis, Tsorbatzoudis, Grouios, & Sideridis, 2008; Smith, Davy, & Rosenberg, 2010; Karagüven, 2012; Stover, de la Iglesia, Boubeta, & Liporace, 2012) have reported that the seven-factor configuration of the scale demonstrated the best fit to data, some others attempted to assess the best fit among the alternative models and found support for the three-factor (Baker, 2004; Stover, *et al.*, 2012), four-factor (Smith, Davy, & Rosenberg, 2012), and five-factor models (Grouzet, Otis, & Pelletier, 2006; Alivernini & Lucidi, 2008; Stover, *et al.*, 2012). Vallerand, *et al.*'s (1992) and Cokley, *et al.*'s (2001) interpretations of their findings were not persuasive because Vallerand, *et al.* (1992) added 26 error covariances to the model, and the fit indices reported by Cokley, *et al.* (2001) were somewhat unsatisfactory (CFI = 0.90, NFI = 0.83, RMSEA = 0.08).

These inconsistent findings may be explained by poor translations of the Academic Motivation Scale from the source language to the target language or by different methods and samples used in the different studies. On the other hand, the reasons for the varying fit indices found for different models in various studies may be caused by response styles specific to different cultures, e.g., extreme or moderate response styles.

Previous studies have shown that the subscales of the Academic Motivation Scale display generally acceptable internal consistency for the seven-factor configuration except for the identified regulation subscale (Table 1). Cronbach's α coefficients obtained from some of the studies shown in Table 1 ranged from .60 to .95. As shown in Table 1, the identified regulation subscale produced generally lower alphas than the other AMS subscales.

Studies examining whether the proposed simplex pattern of the scale exists or not have explored the statistically significant correlations among the AMS subscales by taking into consideration the following criteria suggested by Vallerand, Pelletier, Blais, Brière, Senécal, and Vallières (1993) and Cokley (2000): (1) the three unordered types of the intrinsic motivation subscales should have the strongest negative correlations with amotivation; (2) the correlations between the adjacent types of the subscales should be positive and stronger than the anchor types of the subscales; and (3) the intrinsic motivation subscales should display the strongest positive correlations with each other. The results obtained from these studies are summarized in Table 1. As shown in Table 1, results of Ratelle, Guay, Vallerand, Larose, and Senécal (2007) and Alivernini and Lucudi (2008) supported the presence of a simplex pattern, but most of the other researchers examining the simplex pattern of the AMS reported correlations among the subscales that did not fully support a simplex pattern in the scale scores.

The inconsistent findings obtained from the previous researches about the construct validity and the simplex pattern of the Academic Motivation Scale need further investigation on the scale's psychometric properties. On the other hand, the fact that there is no research investigating both the scale's alternative models and simplex pattern in Turkish context supports the necessity of a new research.

Research goals. (1) Compare the original seven-factor model proposed by Vallerand, *et al*. (1992) with five-factor, three-factor, two-factor, and one-factor models to determine the best fit. (2) Examine the simplex pattern of the seven-factor model hypothesized by Vallerand, *et al*. (1993) and Cokley (2000). (3) Assess the internal consistency and the temporal stability of the scale. (4) Investigate sex differences on the AMS subscales.

TABLE 1
PREVIOUS RESEARCH FINDINGS FOR THE RELIABILITY AND SIMPLEX PATTERN OF THE ACADEMIC MOTIVATION SCALE

Study	Cronbach's α: Low and High AMS Subscales	Simplex Pattern	Correlations Among AMS Subscales
Alivernini & Lucidi, 2008	IR .62 IM .86	Fully supported	The higher positive correlations were found among the adjacent types of subscales than the correlations among the anchor types of subscales. The strongest negative correlations were found between the intrinsic motivation subscales and amotivation. The strongest positive correlations were found among the intrinsic motivation subscales.
Ratelle, *et al.*, 2007	IR .67 IM .95	Fully supported	
Vallerand, *et al.*, 1992	IR .62 IM to stimulation .86	Partially supported	The higher positive correlations were found among some of the anchor types of subscales than the correlations among some of the adjacent types of subscales. Weaker negative correlations were found between amotivation and the intrinsic motivation subscales. Moderate intercorrelations were found among the three intrinsic motivation subscales.
Vallerand, *et al.*, 1993	IR .60 AM .86	Partially supported	
Cokley, *et al.*, 2001	IR .70 AM and IntR .86	Partially supported	
Fairchild, *et al.*, 2005	IR .70 IM to accomplish .90	Partially supported	
Núñez, *et al.*, 2005	IM to stimulation .67 IM to accomplish .82	Not investigated	
Barkoukis, *et al.*, 2008	IM to stimulation .63 IM to know .86	Partially supported	
Smith, *et al.*, 2012	IR .74 AM .89	Partially supported	
Karataş & Erden, 2012	IM to stimulation .75 IM to know .86	Not investigated	

Note.—IR = Identified Regulation; IM = Intrinsic Motivation; AM = Amotivation; IntR = Introjected regulation.

METHOD

Participants

The participants of this study were 797 students that were randomly selected among the students (age $M = 20.1$ yr., $SD = 2.0$, range = 18–25) attending Anadolu ($n = 613$) and Osmangazi ($n = 184$) Universities in

Eskişehir, Turkey. Of the participants, 237 were from the Engineering Faculty, 197 were from the Faculty of Science, 99 were from the Faculty of Humanities, and 264 were from the Faculty of Education. As for their educational levels, 202 were freshmen, 190 were sophomores, 184 were juniors, and 219 were seniors.

Measure

The Academic Motivation Scale (AMS: Vallerand, *et al.*, 1992) is the English version of the original Échelle de Motivation en Éducation (Vallerand, *et al.*, 1989). This is a highly popular 28-item measure with seven subscales assessing amotivation, three ordered types of extrinsic motivation (external regulation, introjected regulation, and identified regulation) ranging on the self-determination continuum from the least autonomous to the most autonomous, and three unordered types of intrinsic motivation (intrinsic motivation to know, intrinsic motivation to accomplish, and intrinsic motivation to stimulation). The higher the scores within a subscale are, the higher the specific motivation that subscale assesses.

Procedure

The English version of the Academic Motivation Scale with 28 items was translated into Turkish by following the procedures outlined by Vallerand (1989). In the first phase of the translating procedure, the scale was translated from English into Turkish by a bilingual individual, and this translation was back-translated into English by another bilingual expert who did not see the English version of the scale beforehand. Subsequently, two different independent bilingual individuals repeated once more the same sequence (e.g., translating from English to Turkish, then translating from Turkish to English) described above. At the second phase of the translation process, a committee was formed including the individuals who took part in the original back-translation procedures and two other bilingual individuals (a counselor and a graduate student in counseling psychology). Then, the committee compared the original scale with the back-translated items to provide cultural relevancy, concept equality, and item bias. The back-translated items were considered accurate after this scrutiny, the Turkish translations of each item were considered adequate, and the final Turkish version of the 28-item Academic Motivation Scale was prepared and administered to the participants. Three graduate students carried out the administration procedures during regular course hours in the spring semester of 2011 at Anadolu and Osmangazi Universities in Turkey.

The data were analyzed by conducting confirmatory factor analysis using LISREL 8.53 (Jöreskog & Sörbom, 1993). Since the data are not normally distributed, the diagonally weighted least squares estimation method (DWLS) was used. A variety of fit indices were calculated (Bentler, 1990;

Hu & Bentler, 1995; Tabachnick & Fidell, 2006) including the comparative fit index (CFI), the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the non-normed fit index (NNFI), the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), and χ^2/df. However, absolute fit indices (chi-squared test, the RMSEA, the GFI, the AGFI, and the SRMR) were accepted as the main indices, because they determine how well an *a priori* model fits the sample data and show which model has the most superior fit (McDonald & Ho, 2002). CFI, SRMR, and RMSEA are preferred to understanding model fit, because CFI and SRMR are unaffected by sample size (Bentler, 1990; Hu & Bentler, 1995), and values (0.12; 0.13; 0.18) exceeding 0.10 indicate poor fit for the RMSEA (Brown & Cudeck, 1993; MacCallum, Browne, & Sugawara, 1996; McDonald & Ho, 2002). The internal consistencies of each of the AMS subscales were calculated by the formula of Coefficient *H* (Hancock & Mueller, 2001). The temporal stability of the subscales was assessed via the test-retest reliability coefficient. In order to examine the simplex pattern of the scale, the correlations among the AMS subscales were investigated.

Model Descriptions

The original seven-factor model of the AMS was compared with the four alternative models: (a) a five-factor model containing an amotivation factor, a unified intrinsic motivation factor, and three separate extrinsic motivation factors as defined by Deci and Ryan (1985) and Ryan and Deci, (2000); (b) a three-factor model consisting of an amotivation factor, a unified intrinsic motivation factor, and a unified extrinsic motivation factor; (c) a two-factor model[2] consisting of a unified extrinsic motivation factor and a unified intrinsic motivation factor; and (d) a unified one-factor model.

Results

Before the statistical analyses were carried out, the data were examined to exclude missing values and outliers. The scores falling within three standard deviations from the mean score of a subscale were accepted as outliers. After eliminating the cases of 18 missing values and 25 qualified outliers, the complete analyses were conducted on the remaining 797 valid questionnaires. Normality of the data was examined by kurtosis, skewness, and Kolmogorov-Smirnov tests for each subscale. The test statistics calculated using the Kolmogorov-Smirnov test (range$=$0.06–0.26; ps$>.05$), kurtosis (range$=-$0.74–1.69), and skewness (range$=$0.85–2.28) indicated that the distributions of AMS subscales were not normal. In the study, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.92, and the χ^2 value of Bartlett's sphericity test was significant ($p<.001$, $df=378$).

[2]The two-factor model consists of 24 items.

Factor Validity

The original seven-factor model AMS was compared with the alternative models using the fit indexes as well as the chi-squared difference test. The findings related to these comparisons are presented in Table 2. As shown in the table, the fit indices of the one-factor model were highly lower than the acceptable limits (χ^2_{797} = 2,868.83, *df* = 350, $p < .01$, NNFI = 0.62, CFI = 0.64, AGFI = 0.83, GFI = 0.81, SRMR = 0.14, RMSEA = 0.18). These findings indicate the one-factor model did not fit the data.

Although the CFI, the GFI (0.95), and the AGFI (0.94) for the two-factor model and the GFI (0.94) and the AGFI (0.93) for the three-factor model suggested reasonable model fit, the RMSEA (i.e., 0.13 and 0.12) indicated that they were not acceptable because the models having higher RMSEA values than 0.10 are considered unacceptable for the model fit (Brown & Cudeck, 1993; MacCallum, *et al*., 1996; McDonald & Ho, 2002).

Although χ^2 was significant for the seven-factor model (χ^2_{797} = 1,076.46, $p < .01$) and the five-factor model (χ^2_{797} = 1,251.97, $p < .01$), the values of other goodness-of-fit indices (NNFI, CFI, AGFI, GFI, SRMR, RMSEA) indicated that both the seven-factor and five-factor models showed acceptable fit to the data. However, the value of the RMSEA (0.086) indicated a mediocre fit for the five-factor model because it was above 0.80 (MacCallum, *et al*., 1996). The chi-squared difference test, which is conducted to determine the best model fit, confirmed that the original 28-item seven-factor model fit the data significantly better than a 28-item five-factor model ($\Delta\chi^2$ = 175.51, *df* = 11, $p < .01$).

The standardized residuals were used to examine the local misfits of the AMS with the 28-item scale. Misfitting items were identified by fit residuals of greater than ±2.58 (Joreskog and Sorbom, 1998). Except the standardized residual of Item 1 (2.68), the value of all other standardized residuals were less than 2.56. As seen in Table 4, Item 1, which was the only item having greater standardized residual value than 2.58, was also the only item having the lowest standardized pattern coefficient (γ = .41) among the items of AMS. This misfitting item was excluded from the scale, and the CFA was conducted once more for the 27-item scale. The CFA conducted for the one-, two- (consisting of 23 items), three-, five- and seven-factor models showed acceptable fit to the data for only the seven-factor model (χ^2_{797} = 1.024.88, *df* = 303, $p < .01$, NNFI = 0.96, CFI = 0.97, AGFI = 0.98, GFI = 0.98, SRMR = 0.057, RMSEA = 0.07), and for the five-factor model (χ^2_{797} = 1198.25, *df* = 314, $p < .01$, NNFI = 0.94, CFI = 0.94, AGFI = 0.96, GFI = 0.97, SRMR = 0.069, RMSEA = 0.086) for the 27-item scale. Since the seven-factor model has the lowest AIC value (1642.04), this model was considered as the best model fitting to data for the 27-item AMS.

TABLE 2
FIT INDICES OF THE CONFIRMATORY FACTOR ANALYSES FOR THE 28-ITEM ACADEMIC MOTIVATION SCALE

CFA Model	χ^2	*df*	*p*	$\Delta\chi^2$	Δdf	χ^2/df	AIC	NNFI	CFI	GFI	AGFI	SRMR	RMSEA	RMSEA 90%*CI*
Seven-factor	1,076.46	329	0.01			3.27	1807.13	0.96	0.96	0.98	0.97	0.059	0.071	0.07–0.08
Five-factor	1,251.97	340	0.01	175.51	11	3.68	2469.98	0.93	0.94	0.97	0.96	0.070	0.086	0.08–0.08
Two-factor	1,289.10	251	0.01	212.64	78	5.14	3793.48	0.89	0.90	0.95	0.94	0.091	0.13	0.13–0.14
Three-factor	1,618.33	347	0.01	541.87	18	4.66	4622.28	0.87	0.88	0.94	0.93	0.098	0.12	0.12–0.13
One-factor	2,868.83	350	0.01	1,792.37	21	8.20	9684.10	0.62	0.64	0.83	0.81	0.14	0.18	0.18–0.19

Note—Chi-squared comparisons are performed between the 7-factor model and each one of the alternative models. χ^2 = chi square; $\Delta\chi^2$ = difference chi-squared statistic; Δdf = difference degrees of freedom; critical χ^2_{11} at .01 was $24.71 < 175.51$; critical χ^2_{18} at .01 was $34.81 < 541.87$; critical χ^2_{78} at .01 was $112.33 < 212.64$; critical χ^2_{21} at .01 was $38.93 < 1{,}792.41$.

TABLE 3
Fit Indices of the Confirmatory Factor Analyses For the 27-item Academic Motivation Scale

CFA Model	χ^2	*df*	*p*	χ^2/df	AIC	NNFI	CFI	GFI	AGFI	SRMR	RMSEA	RMSEA 90%*CI*
Seven-factor	1,024.88	303	0.01	3.38	1642.04	0.96	0.97	0.98	0.98	0.057	0.07	0.07–0.07
Five-factor	1,198.25	314	0.01	3.81	2298.31	0.94	0.94	0.97	0.96	0.069	0.086	0.08–0.09
Two-factor	1,209.74	229	0.01	5.28	3582.96	0.90	0.91	0.95	0.94	0.09	0.13	0.13–0.14
Three-factor	1,540.24	321	0.01	4.79	4390.66	0.87	0.88	0.94	0.93	0.098	0.12	0.12–0.13
One-factor	2,757.86	324	0.01	8.51	9185.05	0.62	0.65	0.84	0.81	0.14	0.18	0.18–0.19

TABLE 4
MODEL COMPARISION FOR 27- AND 28-ITEM ACCEPTED MODELS

CFA Model	χ^2	*df*	*p*	χ^2/df	AIC	NNFI	CFI	GFI	AGFI	SRMR	RMSEA	RMSEA 90%*CI*
27-Item 7-Factor	1,024.88	303	0.01	3.38	1642.04	0.96	0.97	0.98	0.98	0.057	0.07	0.07–0.07
28-Item 7-Factor	1,076.46	329	0.01	3.27	1807.13	0.96	0.96	0.98	0.97	0.059	0.071	0.07–0.08
27-Item 5-Factor	1,198.25	314	0.01	3.81	2298.31	0.94	0.94	0.97	0.96	0.069	0.086	0.08–0.09
28-Item 5-Factor	1,251.97	340	0.01	3.68	2469.98	0.93	0.94	0.97	0.96	0.070	0.086	0.08–0.08

To determine the best model fit among the 28-item seven-factor, 28-item five-factor, 27-item seven-factor, and 27-item five-factor models, the AIC indices of the models were compared. As shown in Table 4, the AIC value of the 27-item seven-factor AMS had the lowest AIC value (1642.04) among the models. This finding indicated that the 27-item seven-factor model of the AMS has the best fit to data among all the acceptable models in this study.

The standardized pattern coefficients (factor loadings), the error variances, and the R^2 values for the seven- and five-factor models with 28 items are presented in the Table 5. As shown in the table, all standardized pattern coefficients for the seven-factor and five-factor models were statistically significant. Except for Item 1 ($\gamma = .41$), all standardized pattern coefficients had values at or above .55, with 68% having values at .70 or above. Squaring these standardized pattern coefficients produced the associated R^2 values for each manifest variable, which accounts for the variance in the item by the factor. Except for the R^2 values of Items 1, 10, and 24 (R^2s = .16, .28, and .30), all the R^2 values ranged from .38 to .75.

Reliability

As a reliability measure, Hancock's *H* (Hancock & Mueller, 2001) was used because "applying alpha coefficient in multidimensional cases will produce underestimation" (Widhiarso, 2007). The test-retest correlation coefficient values were calculated for each subscale. As shown in Table 5, the coefficient *H* values of the subscales were adequately high with the exception of the identified regulation subscale ($H = 0.69$). However, the coefficient *H* value of 0.69 was very close to the acceptable limit of 0.70.

The coefficient *H* values of the remaining subscales ranged from 0.79 (intrinsic motivation to know) to 0.89 (amotivation) for the seven-factor model, and from 0.80 (amotivation) to 0.93 (unified intrinsic motivation) for the five-factor model. The test-retest correlations of the subscales obtained from 42 participants within a 1-mo. interval ranged from .74 (identified regulation) to .86 (intrinsic motivation to stimulation). Since the reliability of the identified regulation subscale was slightly lower (coefficient $H = 0.69$) than the acceptable limit (0.70), Item 10, which demonstrated the smallest R^2 with the value of .28, was excluded, and the reliability measure were computed once more for the three item identified subscale. This time, the coefficient *H* value was 0.79.

Sex Differences

To examine whether there were differences across sex, the sample was divided into two sex groups: men ($n = 362$) and women ($n = 432$), and invariance analyses were conducted on the 28-item seven-factor model. Fit indexes supported measurement invariance across the sexes. As seen in

TABLE 5
THE STANDARDIZED FACTOR PATTERN, THE ERROR VARIANCES, AND THE R^2 VALUES (VARIANCES) FOR EACH INDICATOR FOR SEVEN- AND FIVE-FACTOR MODELS

Subscale	Seven-factor Model					Subscale	Five-factor Model				
	Item	γ	ζ	t	R^2		Item	γ	ζ	t	R^2
Amotivation	5	0.74	0.45	36.02	.55	Amotivation	5	0.74	0.45	35.67	.55
	12	0.71	0.49	33.35	.51		12	0.71	0.50	32.40	.50
	19	0.86	0.26	59.16	.74		19	0.86	0.26	59.72	.74
	26	0.86	0.25	62.03	.75		26	0.86	0.25	61.46	.75
External Regulation	1	0.41	0.84	10.36	.16	External Regulation	1	0.41	0.83	10.23	.17
	8	0.77	0.40	30.07	.60		8	0.78	0.40	29.82	.60
	15	0.77	0.40	26.81	.60		15	0.77	0.41	26.32	.59
	22	0.65	0.57	23.26	.43		22	0.66	0.57	22.58	.43
Introjected Regulation	7	0.69	0.52	28.35	.48	Introjected Regulation	7	0.69	0.52	27.93	.48
	14	0.80	0.36	36.95	.64		14	0.80	0.35	37.27	.65
	21	0.70	0.51	29.78	.49		21	0.70	0.52	29.20	.48
	28	0.83	0.31	47.67	.69		28	0.83	0.31	46.97	.69
Identified Regulation	3	0.61	0.62	19.19	.38	Identified Regulation	3	0.61	0.63	19.10	.37
	10	0.53	0.72	16.21	.28		10	0.53	0.72	16.22	.28
	17	0.67	0.56	25.95	.44		17	0.67	0.56	25.84	.44
	24	0.55	0.70	17.59	.30		24	0.55	0.70	18.04	.30
Intrinsic Motivation to stimulation	4	0.71	0.50	30.98	.50	Unified Intrinsic Motivation	2	0.62	0.61	26.42	.39
	11	0.75	0.44	40.40	.56		9	0.74	0.46	40.85	.54
	18	0.77	0.41	43.31	.59		16	0.69	0.52	33.42	.48
	25	0.84	0.29	54.37	.71		23	0.70	0.5	34.01	.48
Intrinsic Motivation to accomplish	6	0.77	0.40	45.78	.60		6	0.75	0.44	43.37	.56
	13	0.80	0.36	50.12	.61		13	0.77	0.41	47.51	.59
	20	0.80	0.37	51.22	.65		20	0.77	0.41	47.41	.59
	27	0.82	0.33	55.54	.66		27	0.79	0.38	51.82	.62
Intrinsic Motivation to know	2	0.66	0.57	27.51	.43		4	0.64	0.59	27.76	.41
	9	0.78	0.39	43.93	.61		11	0.68	0.5	31.99	.46
	16	0.73	0.46	37.00	.54		18	0.69	0.52	34.59	.48
	23	0.74	0.45	38.00	.55		25	0.76	0.43	45.04	.57

the Table 7, the fit indices obtained from the CFA conducted separately on women and men showed acceptable fit to data for the measurement model of women ($\chi^2 = 934.45$, $df = 303$, $p < .01$, NNFI = 0.88, CFI = 0.89, AGFI = 0.82, GFI = 0.86, SRMR = 0.065, RMSEA = 0.072), and men ($\chi^2 = 797.44$, $df = 303$, $p < .01$, NNFI = 0.89, CFI = 0.91, AGFI = 0.82, GFI = 0.86, SRMR = 0.069, RMSEA = 0.067). The invariance analyses also demonstrated that the configural invariance ($\chi^2 = 1886.54$, $df = 673$, $p < .01$, $\chi^2/df = 2.80$, NNFI = 0.95 CFI = 0.96,

TABLE 6
RELIABILITY VALUES (HANCOCK'S AND MULLER'S COEFFICIENT *H*S) OF THE SUBSCALES FOR THE SEVEN- AND FIVE-FACTOR MODELS OF THE AMS

Model	Amotivation	External Regulation	Introjected Regulation	Identified Regulation	Intrinsic Motivation to Stimulation	Intrinsic Motivation to Accomplish	Intrinsic Motivation to Know
Seven-factor	0.89	0.80	0.00	0.69	0.79	0.85	0.79
Five-factor	0.89	0.80	0.86	0.69	0.93*		

*For unified intrinsic motivation.

GFI=0.85, SRMR=0.074, RMSEA=0.068), metric invariance (χ^2=931.00, *df*=694, $p<.01$, χ^2/df=2.78, NNFI=0.95, CFI=0.96, GFI=0.85, SRMR=0.086, RMSEA=0.067), and scalar invariance (χ^2=2463.18, *df*=743, $p<.01$, χ^2/df =3.32, NNFI=0.94 CFI=0.94, GFI=0.81, SRMR=0.010, RMSEA=0.076) have been established. On the other hand, as shown in Table 8, the *t* test results indicated that there were statistically significant differences between the mean subscale scores for men and women in favor of women. In other words, women had statistically significant higher mean scores on the six subscales. Regarding amotivation, women showed significantly lower mean scores than men.

Simplex Pattern

In order to examine the simplex pattern of the scale, the correlations among the subscales were investigated using the criteria by Vallerand, *et al*. (1993) and Cokley (2000), which refers to the expected correlation coefficients among the subscales for the presence of the simplex pattern. Based on the criteria, it can be said that the correlations found among the subscales of the AMS provided limited support for the presence of a simplex pattern. As shown in Table 9, the correlations among the three intrinsic motivation subscales (*r*s = .85, .85, and .83) were consistent with the simplex pattern hypothesized in self-determination theory (SDT). As proposed in SDT, the correlations among the adjacent types of subscales were stronger than the correlations among some of the anchor types of subscales (e.g., introjected regulation vs external regulation, $r=.45$; introjected regulation vs identified regulation, $r=.44$; identified regulation vs intrinsic motivation to stimulation, $r=.45$; external regulation vs intrinsic motivation to stimulation, $r=.13$; external regulation vs intrinsic motivation to accomplishment, $r=.24$; external regulation vs intrinsic motivation to know, $r=.32$). However, in contrast to the simplex pattern, some of the anchor types subscales (e.g., external regulation vs identified regulation, $r=.81$; and external regulation vs three intrinsic motivation subscales, *r*s = .13, .24, and .32) exhibited lower correlations with each other than the correlations

TABLE 7
Fit Statistics For the Seven-factor Model Across Sex

Model	χ^2	df	p	χ^2/df	NNFI	CFI	GFI	AGFI	SRMR	RMSEA	RMSEA 90%CI
Separate analysis											
Men	797.44	303	0.01	2.63	0.89	0.91	0.86	0.82	0.069	0.067	0.06–0.07
Women	983.45	303	0.01	3.24	0.88	0.89	0.86	0.82	0.065	0.072	0.07–0.078
Configural invariance	1886.54	673	0.01	2.80	0.95	0.96	0.85	-	0.074	0.067	0.06–0.07
Metric invariance	1931.00	694	0.01	2.78	0.95	0.96	0.85	-	0.086	0.067	0.06–0.07
Scalar invariance	2463.18	743	0.01	3.32	0.94	0.94	0.81	-	0.100	0.076	0.07–0.08

TABLE 8
MEANS, STANDARD DEVIATIONS, AND COEFFICIENT *H*S FOR MEN AND WOMEN

Subscale	Men			Women			*t*
	M	*SD*	*H*	*M*	*SD*	*H*	
IMTK	4.76	1.21	0.80	5.33	1.16	0.83	6.65*
IMTA	3.97	1.41	0.86	4.64	1.37	0.87	6.79*
IMTS	3.61	1.39	0.86	4.08	1.37	0.84	4.73*
EMID	5.10	1.06	0.73	5.57	0.97	0.69	6.52*
EMIN	3.82	1.57	0.86	4.37	1.55	0.84	4.92*
EMER	5.33	1.18	0.78	5.48	1.13	0.80	1.78
AMOT	2.16	1.41	0.88	1.60	1.03	0.87	6.33*

Note.—*Indicates significant mean differences between men and women. $df = 795$. IMTK = Intrinsic Motivation to Know; IMTA = Intrinsic Motivation to Accomplish; IMTS = Intrinsic Motivation to Stimulation; EMID = Extrinsic Motivation Identified Regulation; EMIN = Extrinsic Motivation Introjected Regulation; EMER = Extrinsic Motivation External Regulation; AMOT = Amotivation.

among the adjacent types of subscales. The correlations that amotivation showed with the three intrinsic motivation subscales (*r*s = –.28, –.11, and .01) and with the extrinsic motivation subscales (*r*s = –.22, .06, and –.46) did not support the simplex pattern. Although amotivation demonstrated negative correlations with the intrinsic motivation to know ($r = -.28$) and with the intrinsic motivation to accomplish ($r = -.11$), unlike the simplex pattern it correlated positively with the intrinsic motivation to stimulation ($r = .10$) and extrinsic motivation introjected regulation ($r = .06$), albeit their values were too low. Moreover, the correlation values between amotivation and the other subscales did not follow descending magnitudes from the farthest scale toward the closest one.

DISCUSSION

The purpose of the current study was to adapt the seven-factor model of the Academic Motivation Scale to Turkish, to compare it with the one-, two-, three-, and five-factor models to determine the best model, to assess the reliabilities of the AMS subscales, to examine the scale's simplex pattern, and to investigate sex differences on the AMS subscales.

CFA results indicated that only the 28-item and 27-item seven-factor and five-factor models fit the data. However, the CFA models with 27 items (i.e., the models without Item 1) slightly better fit the data than the models with 28 items. In other words, excluding Item 1, which had the smallest value of standardized pattern coefficient and the standardized residual, improved the model fits, though improvement was very small. Although the values of goodness-of-fit indices found in the current

TABLE 9
CORRELATIONS, MEANS, AND STANDARD DEVIATIONS FOR THE SEVEN-FACTOR AMS

Sub-factor	1	2	3	4	5	6	7
1. AMOT							
2. EMER	−.22*						
95%*CI*	(−.28, −.15)						
3. EMIN	.06	.45*					
95%*CI*	(−.01, .13)	(.39, .50)					
4. EMID	−.46*	.81*	.44*				
95%*CI*	(−.51, −.40)	(.78, .83)	(.38, .49)				
5. IMTS	.01	.13*	.57*	.45*			
95%*CI*	(−.06, .08)	(.06, .20)	(.52, .61)	(.39, .50)			
6. IMTA	0.01	.24*	.69*	.53*	.83*		
95%*CI*	(−.06, .08)	(.17, .30)	(.65, .72)	(.48, .58)	(.81, .85)		
7. IMTK	−.28*	.32*	.53*	.67*	.85*	.85*	
95%*CI*	(−.34, −.21)	(.26, .38)	(.48, .58)	(.63, .71)	(.83, .87)	(.83, .87)	
Test-retest *r*	.84	.78	.83	.74	.86	.83	.84
M	1.86	5.42	4.12	5.36	3.87	4.33	5.07
SD	1.25	1.16	1.58	1.05	1.40	1.43	1.22

Note.—IMTK=Intrinsic Motivation to Know; IMTA=Intrinsic Motivation to Accomplish; IMTS=Intrinsic Motivation to Stimulation; EMID=Extrinsic Motivation Identified Regulation; EMIN=Extrinsic Motivation Introjected Regulation; EMER=Extrinsic Motivation External Regulation; AMOT=Amotivation. $*p<.05$.

study were more favorable than the fit indices reported by Vallerand, *et al*. (1992) and Cokley, *et al*. (2001), they were slightly smaller than those of Fairchild, *et al*. (2005) and Núñez, *et al*. (2005, 2006). The results obtained from reliability analyses in the current study indicated that AMS subscales displayed adequate internal consistency reliabilities as in previous studies. Although the internal consistency reliability of the identified regulation subscale was higher in the current study than those reported by Vallerand, *et al*. (1992, 1993), just as in the other previous studies (Vallerand, *et al*., 1992, 1993; Cokley, *et al*., 2001; Núñez, *et al*., 2006), it still had the lowest correlation (coefficient $H=0.69$), as well as having the lowest test-retest reliability ($r=.74$). The lower reliability values might result from the lower factor loadings, inappropriate methods, possible translation errors, or from the overlaps between some of the items of the different subscales. Considering all possibilities, it may be thought that repeating the reliability analysis by excluding the items with the lowest factor loadings or by correcting the methodical failures, or by doing both of them, may reveal much better psychometric indicators for the scale's validity and reliability even if the same data was used. However, the CFA conducted for the seven-factor model and alternative models that did not include Item 1, and reliability analysis conducted for the identified subscale that did not include Item 10, had better fit values and a higher coefficient *H* value when compared with the previous analyses.

The identified regulation subscale has had the lowest internal consistency consistently from the AMS's development to the present day, so it would not be wrong to claim that the identified subscale is problematic. Although excluding some items from the scale may produce better fit indices or better reliability values as in the current study, it probably would be much better to continue working to create the best psychometric properties for the scale. For instance, another study following the current one which would use a new sample and new items rewritten instead of Items 1 and 10, so as to keep the number of the items in the original scale or in its subscales as before, could be done. It may be possible to prevent problems resulting from a limited number of scale items that affect the scale's validity and reliability.

Although the seven-factor and five-factor models were supported and the reliability statistics were found adequate, the simplex pattern of the scale was not fully supported by the current study, because some of the correlations among the subscales did not fully meet the criteria for the motivation continuum proposed by Vallerand, *et al*. (1993) and Cokley (2000). However, the supportive correlations for the simplex pattern between intrinsic motivation subscales (*r*s = .85, .85, and .83) obtained in the current study were stronger than those reported by Vallerand, *et al*. (1993), Cokley (2000), and Barkoukis, *et al*. (2008). Stronger positive correlations between the adjacent types of the subscales (i.e., external regulation vs introjected regulation, introjected regulation vs identified regulation, identified regulation vs intrinsic motivation to stimulation; *r*s = .45, .44, and .45) than the correlations between the anchor types of the subscales (i.e., external regulation vs introjected regulation, introjected regulation vs identified regulation vs identified regulation vs intrinsic motivation to stimulation; *r*s = .32, .24, and .21) supported the presence of the simplex pattern. However, strong (*r* = .81) and moderate (*r* = .69, *r* = .54) correlations between the anchor types of the subscales (i.e., external regulation vs identified regulation, introjected regulatiom vs intrinsic motivation to accomplish, introjected regulation vs intrinsic motivation to stimulation) did not support the simplex pattern, because their magnitudes were higher than the correlations between the adjacent types of subscales stated above. The correlation between the closer subscales of introjected regulation and intrinsic motivation to know (*r* = .67) was not contrary to the simplex pattern. On the other hand, most of the correlations between amotivation and the other subscales did not support the proposed simplex pattern for the scale. For instance, the magnitudes of the correlations between amotivation and the subscales of introjected regulation ($r = .08$) and intrinsic motivation to stimulation ($r = .05$) were not negative as expected. The higher negative correlation of amotivation with identified regulation ($r = -.45$) was also another contrast to the simplex pattern. Although amotivation displayed negative correlations with intrinsic motivation to know ($r = -.28$), intrinsic motivation to accomplish ($r = -.24$), identified regulation (–.09) and external regulation (rs = –.24, –.09, –.44, and –.23, respectively) these correlations were not supportive for the presence of simplex pattern because their magnitudes were low, and the magnitudes of the last two correlations were higher than those of the first two. These findings were similar to the previous research findings (Cokley, 2000; Kreishan & Al-Dhaimat, 2013).

In terms of the strengths and limitation of the study, several things were thought to be important. The strength of this study is that this is the first study in Turkey investigating the simplex pattern of the Academic Motivation Scale and comparing alternative models. However, lack of external validity was one of the limitations of the study. The other limitation was that it was impossible to detect participants who dishonestly responded to the scale items, whether intentionally or unintentionally. This problem or limitation is inevitable in most studies using self-report measures. Last, the participants who were selected from only two universities in the study generated another limitation because of their debilitating effect on the generalizability of the findings.

REFERENCES

ALIVERNINI, F., & LUCIDI, F. (2008) The Academic Motivation Scale (AMS): factorial structure, invariance, and validity in the Italian context. *Testing, Psychometrics, Methodology in Applied Psychology*, 15(4), 211-220.

BAKER, S. R. (2004) Intrinsic, extrinsic, and amotivational orientations: their role in university adjustment, stress, well-being, and subsequent academic performance. *Current Psychology*, 23, 189-202.

BARKOUKKIS, V., TSORBATZOUDIS, H., GROUIOS, G., & SIDERIDIS, G. (2008) The assessment of intrinsic and extrinsic motivation and amotivation: validity and reliability of the Greek version of the Academic Motivation Scale. *Assessment in Education: Principles, Policy & Practice*, 15(1), 39-55.

BENTLER, P. M. (1990) Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), 238-246.

BROWN, M. W., & CUDECK, R. (1993) Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models.* Newbury Park, CA: Sage. Pp. 445-455.

CHU, L-C. (2012) The influence of the internalization of emotional regulation on mental health among the Taiwanese people: the moderating effect of cultural fit. *Asia-Pacific Journal of Public Health.* [E-pub ahead of print]

Cokley, K. (2000) Examining the validity of the Academic Motivation Scale by comparing scale construction to self-determination theory. *Psychological Reports*, 86(2), 560-564.

Cokley, K. O., Bernard, N., Cunningham, D., & Motoike, J. (2001) A psychometric investigation of the Academic Motivation Scale using a United States sample. *Measurement and Evaluation in Counseling and Development*, 34, 109-119.

Deci, E. L. (1975) *Intrinsic motivation*. New York: Plenum.

Deci, E. L., & Ryan, R. M. (1985) *Intrinsic motivation and self-determination in human behavior.* New York: Plenum.

Deci, E. L., Ryan, R. M., & Williams, G. C. (1996) Need satisfaction and the self-regulation of learning. *Learning and Individual Differences*, 8(3), 165-183.

Fairchild, A. J., Horst, S. J., Finney, S. J., & Barron, K. E. (2005) Evaluating existing and new validity evidence for the Academic Motivation Scale. *Contemporary Educational Psychology*, 30, 331-358.

Fortier, M. S., Vallerand, R. J., & Guay, F. (1995) Academic motivation and school performance: toward a structural model. *Contemporary Educational Psychology*, 20, 257-274.

Grouzet, M. E., Otis, N., & Pelletier, L. G. (2006) Longitudinal cross-gender factorial invariance of the Academic Motivation Scale. *Structural Equation Modeling*, 13(1), 73-98.

Hancock, G. R., & Mueller, R. O. (2001) Rethinking construct reliability within latent variable systems. In R. Cudeck, S. Du Toit, & D. Söbom (Eds.), *Structural equation modeling: present and future.* Lincolnwood, IL: Scientific Software International. Pp. 195-216.

Honda, K., & Sakyu, M. (2005) The concurrent and construct validity of intrinsic/extrinsic motivation in Japanese EFL learners: a self-determination theory perspective. *Bulletin of Universities and Institutes*, 4, 41-54.

Hu, L., & Bentler, P. (1995) Evaluating model fit. In R. H. Hoyle (Ed.), *Structural equation modeling: concepts, issues, and applications.* London, UK: Sage. Pp. 76-99.

Jöreskog, K., & Sörbom, D. (1993) *LISREL 8: structural equation modeling with the SIMPLIS command language.* Chicago, IL: Scientific Software International.

Karagüven, M. H. U. (2012) The adaptation of Academic Motivation Scale to Turkish. *Educational Sciences: Theory & Practice*, 12(4), 2611-2618.

Karataş, H., & Erden, M. (2012) Akademik Motivasyon Ölçeğinin dilsel eşdeğerlik, geçerlik ve güvenirlik çalışması [The linguistic equivalence, validity and reliability analysis of Academic Motivation Scale]. *e-Journal of New World Sciences Academy*, 7(4), 983-1003.

Kreishan, L. K., & Al-Dhaimat, Y. (2013) Intrinsic and extrinsic motivation, orientation and achievements in L2 of Arab learners of English, French and German: a study from Jordan. *International Education Studies*, 6(12), 52-63.

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996) Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, 1, 130-149.

McDonald, R. P., & Ho, M-H. R. (2002) Principles and practice in reporting structural equation analyses. *Psychological Methods*, 7, 64-82.

Núñez, J. L., Martín-Albo, J., & Navarro, J. G. (2005) Validity of the Spanish version of the Échelle de Motivation en Éducation. *Psicothema*, 17(2), 344-349.

Núñez, J. L., Martín-Albo, J., Navarro, J. G., & Grijalvo, F. (2006) Validación de la Escala de Motivación Educativa (EME) en Paraguay [Validation of the Spanish version of the Échelle de Motivation en Éducation]. *Interamerican Journal of Psychology*, 40(2), 185-192.

Ratelle, R. F., Guay, F., Vallerand, R. J., Larose, S., & Senécal, C. (2007) Autonomous, controlled, and amotivated types of academic motivation: a person-oriented analysis. *Journal of Educational Psychology*, 99, 734-746.

Ryan, R. M., & Deci, E. L. (2000) Intrinsic and extrinsic motivations: classic definitions and new directions. *Contemporary Educational Psychology*, 25, 54-67.

Smith, K. J., Davy, J. A., & Rosenberg, D. L. (2010) An examination of the validity of the Academic Motivation Scale with a United States business student sample. *Psychological Reports*, 106(2), 323-341.

Smith, K. J., Davy, J. A., & Rosenberg, D. L. (2012) An empirical analysis of an alternative configuration of the Academic Motivation Scale. *Assessment in Education: Principles, Policy & Practice*, 19(2), 231-250.

Stover, J. B., de la Iglesia, G., Boubeta, A. R., & Liporace, M. F. (2012) Academic Motivation Scale: adaptation and psychometric analyses for high school and college students. *Psychology Research and Behavior Management*, 5, 71-83.

Tabachnick, B. G., & Fidell, L. S. (2006) *Using multivariate statistics.* (5th ed.) Boston, MA: Allyn & Bacon.

Vallerand, R. J. (1989) Vers une méthodologie de validation transculturelle de questionnaires psychologiques: implications pour la recherche en langue française [Toward a transcultural validation methodology of psychological questions: implications for research in French]. *Psychologie Canadienne* [*Canadian Psychology*], 30(4), 662-689.

Vallerand, R. J., Blais, M. R., Brière, N. M., & Pelletier, L. G. (1989) Construction et validation de I'échelle de Motivation en éducation (EME) [Construction and validation of the Academic Motivation Scale]. *Revue Canadienne des Sciences du Comportement*, 21, 323-349.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Brière, N. M., Senécal, C., & Vallières, E. F. (1992) The Academic Motivation Scale: a measure of intrinsic, extrinsic, and amotivation in education. *Educational and Psychological Measurement*, 52, 1003-1017.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Brière, N. M., Senécal, C., & Vallières, E. F. (1993) On the assessment of intrinsic, extrinsic, and amotivation in education: evidence on the concurrent and construct validity of the Academic Motivation Scale. *Educational and Psychological Measurement*, 53, 159-172.

Verloigne, M., De Bourdeaudhuij, I., Tanghe, A., D'Hondt, E., Theuwis, L., Vansteenkiste, M., & Deforche, B. (2000) Self-determined motivation towards physical activity in adolescents treated for obesity: an observational study. *International Journal of Behavioral Nutrition and Physical Activity*, 8(97), 1-11.

White, R. W. (1959) Motivation reconsidered: the concept of competence. *Psychological Review*, 66, 297-333.

Widhiarso, W. (2007) Estimating reliability for multidimensional measure. Unpublished research summary, Faculty of Psychology, Gadjah Mada Univer., Yogyakarta, Indonesia.

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