Reliability and validity of academic motivation scale for sports high school students'

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Abstract. This study was designed to test validity and reliability of Academic Motivation Scale (AMS) for sports high school students. The research conducted with 357 volunteered girls (n=117) and boys (n=240). Confirmatory factor analysis showed that Chi square ($\chi 2$), degrees of freedom (df) and $\chi 2$/df ratio were 1102.90, 341 and 3.234, respectively. Goodness of Fit Index, Comparative Fit Index, Non-normed Fit Index and Incremental Fit Index were between 0.92-0.95. Additionally, Adjusted Goodness of Fit Index, An Average Errors Square Root and Root Mean Square Error of Approximation were 0.88, 0.070 and 0.079, respectively. Subscale reliability coefficients were between 0.77 and 0.86. Test-retest correlations of AMS were found between 0.79 and 0.91. Results showed that scale was suitable for determination of sports high school students' academicals motivation levels.

Keywords: Self-determination theory; construct validation; intrinsic and extrinsic motivation ; motivation

1 Introduction

Motivation has been defined academically as "production of energy required for academic works" [20]. Successful process while accomplishing those necessary responsibilities throughout his academic life, however lack of motivation may cause inappropriate academic behaviors, such as giving up immediately against challenges, impatience, lack of perseverance, not enjoying the work done [1, 2].

Requirements affecting motivation can be divided into three parts; autonomy, efficiency and social relations [3, 8, 9 and 16]. As a result of interaction between these requirements and environment, three different motivation types emerge: i) İntrinsic motivation; it is a drive that sustains an activity just to get enjoyed and satisfied, ii) : Extrinsic Motivation; it is a situation where an individual gets the work done without deciding himself and being controlled by external forces, iii) Amotivation is a situation where the desire and drive for

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execution does not exist, since a likely relationship could not be established between behaviors and activity [1, 17].

The significant part of children who are interested in sportive activities in secondary school, give precedence to those organizations that provide training in sports domain when making preferences related to high school and university education. Therefore, the sports high schools are the primary education institutes preferred by sportive students after secondary school. That's why; it is remained that determining the academic motivation levels of students receiving education in sports high schools and taking certain precautions according to relevant results are important. This study was therefore carried out to adapt a scale that determines the academic motivation levels and directions, into Turkish by revealing the findings related to its language equivalency, and to test its validity and reliability.

2 Methodology

2.1 Participants

Research was carried out with a total of 357 students (girls, n=117; boys, n=240; mean age 15,98 ± 1,04 years) who attend ninth, tenth, eleventh and twelfth grades in sports high schools located at cities of Izmir and Bursa.

2.2 Study Design

After necessary approvals were obtained from National Education Provincial Directorates and Ege University Publication Ethics Committee, Academic Motivation Scale (AMS) was translated through a cross-sectional scale translation method. Therefore, traditionally three steps were taken. Then, a pilot study -the Turkish version of scale- was applied to 38 students receiving education at the first grade of sports high school (Cronbach's Alpha α: 0.86). In order to determine the fit between the applications performed in the main study at different time points, the scale was applied to 65 students who attend first, second, third and fourth grades in sports high schools with three-week intervals, and then, its test-retest reliability was checked.

2.3 Instruments

In this study, the original "Academic Motivation Scale" developed by Vallerand et al. in [1] for high schools was used (AMS-HS 28). Scale involves following seven different dimensions (each one comprises of four items) and 28 items; i) intrinsic motivation to know (IMK), intrinsic motivation to accomplish (IMAC) and intrinsic motivation to experience stimulation (IMTE); ii) extrinsic motivation into external regulation (EMER), extrinsic motivation into introjected regulation (EMIN), and extrinsic motivation into identified regulation (EMID); iii) amotivation (AM). The items of the scale prepared in the type of Likert with 7 were developed by marking seven grades between 1 (not appropriate) and 7 (very appropriate). Individual's assessment score for each subscale was found through dividing the total scores obtained from relevant subscale by the item count in the scale.

2.4 Procedure

Prior to starting a theoretical course where all students from each grade level are together, students were provided comprehensive information related to research. All participants signed an "informed consent form". Subsequently, explanations were made concerning completion of the scale which includes personal data and 28 items.

2.5 Statistical Analyses

LISREL 8.54 was used for statistical analysis. In order to determine whether the factor structure in original scale could be verified through the data obtained from the sampling of this study, confirmatory factor analysis (CFA) was performed. In order to test the fit of data, values of the followings were examined; a goodness fit index (GFI), a corrected goodness fit index (AGFI), a comparative fit index (CFI), an non-normalized fit index (NNFI), an average errors square root (S-RMR), an incremental fit index (IFI) that provides SRMR value independent of sampling, the mean square root of proximate errors (RMSEA) [7, 12 and 14]. A Cronbach's Alpha was used to determine the reliability of items that reflect scale's "internal motivation", "external motivation" and "lack of motivation" dimensions. P value ≤ 0.05 was considered for statistically significant.

3 Results

The results of the CFA showed that the $\chi 2$ was found as 1102.90 and the fd as 341 ($p=0.00$). Besides, $\chi 2/fd$ was found as 3.234 (Table 1). Results demonstrated that the factor loads of IM, EM and AM were in acceptable range (Table 2). All factor loads were statistically significant ($p<0.05$).

Table 1. The fit goodness index of the model tested as a result of DFA analysis performed for AMS-HS 28

χ^2	*fd*	χ^2/fd	p	CFI	NNFI	GFI	AGFI	IFI	S-RMR	RMSEA	%90 GA RMSEA
1102.90	341	3.234	p=0.00	.95	.94	.92	.88	.95	.070	.079	.074 -.084

χ^2: Chi-square; *fd*: freedom degree; CFI: a comparative fit index; NNFI: an non-normalized fit index; GFI: a goodness fit index; AFGI: a corrected goodness fit index; S-RMR: an average errors square root; IFI: an incremental fit index that provides SRMR value independent of sampling; RMSEA: the mean square root of proximate errors.

Table 2. As a result of DFA analysis performed for AMS-HS 28 sampling, the estimated item factor loads, t and R2 values

		IM					EM					AM			
IMK	Items	2	9	16	23	EMER	Items	1	8	15	22	Items	5	12	19	26
	Factor load	0.67	0.64	0.66	0.68		Factor load	0.50	0.72	0.70	0.65	Factor load	0.65	0.48	0.80	0.82
	t	12.11	11.01	11.28	11.50		t	12.30	8.30	8.20	7.94	t	12.61	8.70	16.03	16.53
	R^2	0.44	0.42	0.44	0.46		R^2	0.25	0.52	0.50	0.43	R^2	0,42	0.23	0.64	0.67
IMAC	Items	6	13	20	27	EMID	Items	3	10	17	24					
	Factor load	0.67	0.58	0.61	0.62		Factor load	0.58	0.61	0.68	0.66					
	t	12.72	10.14	10.60	10.80		t	11.96	8.75	9.41	9.20					
	R^2	0.45	0.33	0.37	0.8		R^2	0.33	0.37	0.47	0.44					
IMTE	Items	4	11	18	25	EMIN	Items	7	14	21	28					
	Factor load	0.45	0.35	0.54	0.75		Factor load	0.61	0.64	0.71	0.72					
	t	12.51	5.10	6.64	7.63		t	11.72	9.40	10.15	10.27					
	R^2	0.21	0.12	0.29	0.56		R^2	0.37	0.40	0.51	0.53					

AM: Amotivation; AMS-HS 28: Academic Motivation Scale for High Schools; EM: Extrinsic Motivation; EMER: Extrinsic Motivation into External Regulation; EMIN: Extrinsic Motivation into Introjected Regulation; EMID: Extrinsic Motivation into Identified Regulation; IM: Intrinsic Motivation; IMK: Intrinsic Motivation to Know; IMAC: Intrinsic Motivation to Accomplish; IMTE: Intrinsic Motivation to Experience Stimulation.

The data related to Cronbach's α and retest reliability are given in Table 3.

Table 3. Cronbach's α values and re-test reliability correlations between general and sub-dimensions of AMS-HS 28

	Mean±SD		Cronb α	Cronb α	Re-test
AMS-HS 28	Pre-test (n=65)	Post-test (n=65)	Pre-test	Post-test	Correlations
IMK	5.76 ±1.2	5.77 ±1.2	.79	.83	.82
IMAC	5.21 ±1.2	5.21 ±1.2	.71	.73	.86
IMTE	4.40 ±1.4	4.55 ±1.2	.68	.56	.83
EMER	5.67 ±1.3	5.50 ±1.3	.77	.77	.82
EMID	6.01 ±1.1	5.87 ±1.1	.79	.76	.84
EMIN	4.95 ±1.4	4.91 ±1.3	.72	.71	.79
IM	5.12 ±1.1	5.18 ±1.0	.86	.85	.91
EM	5.54 ±1.0	5.43 ±1.0	.85	.86	.86
AM	2.18 ±1.3	2.25 ±1.4	.69	.81	.80
General	4.88 ±0.8	4.87 ±0.8	.85	.86	.91

AM: Amotivation; AMS-HS 28: Academic Motivation Scale for High Schools; EM: Extrinsic Motivation; EMER: Extrinsic Motivation into External Regulation; EMIN: Extrinsic Motivation into Introjected Regulation; EMID: Extrinsic Motivation into Identified Regulation; IM: Intrinsic Motivation; IMK: Intrinsic Motivation to Know; IMAC: Intrinsic Motivation to Accomplish; IMTE: Intrinsic Motivation to Experience Stimulation.

Table 4. Correlations between general and sub-dimensions of AMS-HS 28; Cronbach's α, Mean±SD values (N=357)

	AMS-HS 28 General	AM	EMER	EMIN	EMID	IMAC	IMTE	IMK	Cronb α	Mean±SD
AMS-HS 28 General	1								.88	4.61 ±0.9
AM	.056	1							.77	2.59 ±1.6
EMER	.722**	-.072	1						.64	5.40 ±1.3
EMIN	.817**	-.026	.508**	1					.77	4.57 ±1.6
EMID	.739**	-.271**	.572**	.514**	1				.72	5.68 ±1.2
IMAC	.833**	-.170**	.507**	.668**	.612**	1			.71	4.75 ±1.4
IMTE	.742**	-.099	.374**	.578**	.477**	.594**	1		.59	3.95 ±1.3
IMK	.802**	-.283**	.545**	.555**	.689**	.747**	.608**	1	.76	5.35 ±1.3

**p=0.01
AM: Amotivation; AMS-HS 28: Academic Motivation Scale for High Schools; EMER: Extrinsic Motivation into External Regulation; EMIN: Extrinsic Motivation into Introjected Regulation; EMID: Extrinsic Motivation into Identified Regulation; IMK: Intrinsic Motivation to Know; IMAC: Intrinsic Motivation to Accomplish; IMTE: Intrinsic Motivation to Experience Stimulation.

4 Discussion

The aim of this study was to adapt AMS to Turkish, which was developed to determine the academic motivation levels and the directions that affect the learning status of students receiving education in sports high schools, by revealing the findings related to AMS's language equivalency, validity and reliability. Higher statistical values were obtained from the CFAs. According to the findings obtained GFI 0.92 (≥0.90), AGFI 0.88 (≥0.90), CFI 0.95 (≥0.90), NNFI 0.94 (≥0.90) and S-RMR 0.070 (≤ 0.08) were within desired intervals. However, IFI that provides SRMR value independent of sampling was found as 0.95 (≥0.90) and RMSEA as 0.079 (≤ 0.08) ($p<0.05$) and the 90 % confidence interval (CI) was between 0.074 – 0.084 [6, 7, 11, 12, 14, 15 and 23].

In CFA, the significance level of $\chi 2$ test is expected to be greater than 0.05 significance value [10]. A considerably lower significance level obtained in our study ($\chi 2$ value, 1102.90; $p=0.000$) might have resulted from excessive subject count (n=357), because a $\chi 2$ value lacking a good fit index is closely related to subject count. Fit increases as the number of participants increases [21]. Furthermore, $\chi 2/fd$ =3.234 found in this study may be considered a good value ($\chi 2/fd<5$). Therefore, it was shown that it has demonstrated sufficient level of fit with the data of the model and possessed a structural validity, and also it has correctly evaluated the seven sub-dimensions of the items comprising Turkish scale and the sub-dimensions of the original scale (see Table 1).

When the motivational tools such as AMS will be used to determine their effects on cultural motivational processes in different countries, to test their intercultural validity is important [19]. In limited literature, it seems that this scale which was originally developed in French by Vallerand in Canada [3] was used in 7 different countries by translating into 6 different languages. The success of AMS in subject countries varies depending on the different socio-economic and cultural structures of those countries. For example, in studies carried out by Vallerand et al. in [1] and [3] they attempted to adapt AMS to English. The results of this study demonstrated lower internal fit levels for majority of sub-dimensions of the scaled adapted (α=0.62). Thus, AMS had to be used by modifying according to structures of different countries.

In a study by Tsorbatzoudis et al., the Canada version of original AMS was adapted to Greek and its validity and reliability were tested, but lower validity (CFI<0.90) and reliability (α<0.70) levels were found [4]. Tsorbatzoudis et al., have carried out a new study in 2001 to adapt AMS to Greek and modified the scale by removing certain questions (1, 5, 12, and 13) that evaluate scale's cultural sensitivity. They reported that modified scale has gained higher retest reliability (α=0.68 – 0.73) and validity levels (CFI=0.91; p>0.90). In that study the Cronbach's α values demonstrating internal fit and similarity of the scale items were found as 0.67 and 0.81, respectively [5]. The findings obtained from this series are the important indicatives of the degree to which the scale translated into another language could be influenced by the differences in cultural structure. Indeed, Barkoukis et al., have adapted the original AMS published by Vallerand et al., in [1], to Greek in 2008. This adaptation has demonstrated higher validity levels compared to previous ones (CFI=0.901). In that study the $\chi 2$ value was found as 679.987 (p<0.001); the Cronbach's Alpha value was found between 0.55 – 0.79, and the retest reliability was considerably higher (between 0.74 – 0.83) [22]. In 2008s, the European Integration process where the Greece took place and the revisions made in education system associated with this process, might have tailored AMS adaptation more suitable to Greek culture by affecting the cultural structure significantly within a 10-year period. This situation can be explained through scale's reduced validity and reliability values as a result of increased difference between a scale adapted to other languages and the cultural structure of the country it was adapted. Therefore, the success of a scale adapted to another language is characterized by the cultural similarities between the country the scale was adapted and its origin.

Whole factorial structure of AMS-HS 28 seemed highly reliable with Cronbach's Alpha value (Cronbach's α=0.88) (Can, 2014). Similarly, Vallerand et al., [1, 2], Cokley et al., [18], Barkoukis et al., [22] and Karagüven, [13] in their studies found significantly higher Cronbach's Alpha values. In our study it was found that IMTE which is a sub-dimension of IM had lower reliability value (Cronbach's α= 59). This situation shows similarity with Barkoukis et al.'s study [22] (Cronbach's Alpha = 55). The test and retest reliability of the scale was found at considerably higher values when its fit among the applications performed at different time points was evaluated (Cronbach's α=0.79 – 0.91). These results are consistent with the results of those carried out by Vallerand et al., [1], Barkoukis et al., [22] and Karagüven, [13].

In conclusion, according to the findings obtained from this study it can be said that the 7-factored structure related to AMS-HS 28 which was developed from Vallerand and his colleagues' 7-factored scale (1992) is highly successful in determining the motivation levels of sports high school students. Furthermore, the findings obtained from this study related to reliability of scale demonstrated that the internal fit of sub-factors was sufficient. Therefore, it was suggested that AMS-HS 28 can be used to determine academic motivation levels and directions that affect the learning status of those students attending sports high schools. In addition, AMS-HS 28 can be used by teachers and administrators working in sports high schools to reveal students' estranging behaviors from school. Furthermore, results of AMS-HS 28 may help teachers and administrators to improve academic motivation levels of students through prospective planning.

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