

Validity and reliability of the Polish version of the Academic Motivation Scale: a measure of intrinsic and extrinsic motivation and amotivation

BACKGROUND

The Academic Motivation Scale (AMS) is a measure of motivation in education. The AMS is based on the self-determination theory, which subdivides motivation into amotivation, extrinsic motivation and intrinsic motivation. The main purpose of this study was to examine the validity and reliability of the Polish version of the AMS and to identify motivation to study of Polish university students.

PARTICIPANTS AND PROCEDURE

The first sample consisted of 1592 Polish university students (653 males, 939 females) majoring in physical education, physiotherapy, tourism and recreation, sport or sport and tourism management. The second sample consisted of 49 Polish university students (13 males, 36 females) of tourism and recreation. The AMS was validated using exploratory and confirmatory factor analysis. Cronbach's α was used to estimate reliability and internal consistency of the scale.

RESULTS

The AMS showed adequate levels of internal consistency (Cronbach α values above .78) and temporal stability (mean test-retest correlation = .88). Additionally, the fit indices of CFA were satisfactory ($\chi^2/df = 4.95$, GFI = .927, AGFI = .910, RMSEA = .050). Female students scored higher than males on four motivation subscales and lower on amotivation.

CONCLUSIONS

The results confirmed the original seven-factor and 28-item structure of the Polish version of the AMS. The results support the use of the Polish version of the AMS as a tool for assessing university students' motivation.

KEY WORDS

sport; factor analysis; physical education; AMS; validation

ORGANIZATION – The Jerzy Kukuczka Academy of Physical Education in Katowice, Poland

AUTHORS' CONTRIBUTIONS – A: Study design · B: Data collection · C: Statistical analysis · D: Data interpretation · E: Manuscript preparation · F: Literature search · G: Funds collection

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BACKGROUND

Motivation is the lifeblood of human activity. Identification and analysis of the causes of human behaviour is the foundation of motivation theory, which describes these causes in the simplest possible way. Analysis of motivation should be based on a specific theory. One of the current and dynamically developing theories is the self-determination theory (SDT) by Edward Deci and Richard Ryan, which has its origin in the research on intrinsic motivation (e.g. Deci, 1971, 1972, 1975; Deci & Ryan, 1985, 1990, 2000, 2008; Deci, Vallerand, Pelletier, & Ryan, 1991; Ryan & Deci, 2000a, 2000b; Ryan, Soenens, Vansteenkiste, & Deci, 2019). The self-determination theory proposes the concept of three basic psychological needs which are innate and universal in human life: the needs for competence, relatedness and autonomy (Deci & Ryan, 1985; Deci et al., 1991; Vallerand, 2000). The concept of basic psychological needs allows one to analyse the context and conditions needed to strengthen the development, motivation and performance of an individual (Deci et al., 1991). The fulfilment of those needs enhances well-being and motivation, as well as persistence, creativity and efficiency. Whether the social environment supports or hinders basic need satisfactions has an immense impact on people's well-being. Various types of psychopathology, anxiety, alienation and depression can be interpreted as an effect of ignoring and neglecting those basic needs (Deci & Ryan, 1985; Ryan & Deci, 2000a, 2000b). Basic psychological needs are of great importance for motivation in education, both for students and teachers, as well as for administrators and politicians who reform educational structures (Ardeńska et al., 2016).

According to the SDT, there are three main types of motivation which are tied to every human activity: amotivation, extrinsic motivation and intrinsic motivation (Deci & Ryan, 1985). Motivation could form a continuum from amotivation through controlled extrinsic motivation, to autonomic intrinsic motivation due to the transformation in the process of internalisation (introjection and integration). Introjection refers to the internalisation in which an individual assumes a value without identifying with it and integration occurs when the person identifies with the value of an activity and fully accepts it (Deci, Eghrari, Patrick, & Leone, 1994). Amotivation (AM) is the lack of willingness to act. It occurs in a situation when an individual finds no value in the activity or does not see the connection between his actions and the results. An amotivated individual might not experience a sense of competence, because they lack either the skill or the knowledge needed to carry out the activity (Ryan, 1995; Ryan & Deci, 2000a; Ryan, Williams, Patrick, & Deci, 2009). Extrinsic motivation (EM) embodies every activity done in order to achieve one's goals. It can be subdivided into three categories:

external regulation (reward and punishment), introjected regulation and identified regulation. External regulation comprises activities performed to fulfil the external demand or to gain a reward, both material (e.g. money) and non-material (e.g. praise). Introjected regulation represents a type of internal regulation that is controlling as well, as it refers to performing tasks out of pressure, to avoid the feeling of guilt and anxiety or to feel proud. Identification is the most self-determined type of extrinsic motivation. It is regulation through internalization (identification, integration). In this example, an individual has identified with the personal value of the behaviour and accepted its regulation as their own. On the other hand, intrinsic motivation describes an activity performed for its sole pleasure, without the need to achieve a specific result. People intrinsically motivated perform the activity for pure fun or challenge, not because of external pressure or for rewards (Ryan & Deci, 2000a). Therefore, even when rewards are offered for good performance, they still have a negative effect on intrinsic motivation (Deci, Koestner, & Ryan, 1999).

Vallerand et al. (1992) created the Academic Motivation Scale, a measure of motivation in education. It has been widely used by researchers in many countries and in various educational contexts (e.g. Cokley, Bernard, Cunningham, & Motoike, 2001; Fairchild, Horst, Finney, & Barron, 2005; Barkoukis, Tsorbatzoudis, Grouios, & Sideridis, 2008; Alivernini & Lucidi, 2008; Faye & Sharpe, 2008; Komarraju, Karau, & Schmeck, 2009; Horyna & Bonds-Raacke, 2012; Karagüven, 2012; Stover, de la Iglesia, Boubeta, & Liporace, 2012; Wilkesmann, Fischer, & Virgilito, 2012; Guay, Ratelle, Larose, Vallerand, & Vitoro, 2013; Maican & Lixandrou 2015; Orsini et al., 2015; Tóth-Király et al., 2017; Litalien et al., 2017). The AMS is based on seven-factor structure: amotivation, three types of extrinsic motivation and three types of intrinsic motivation. Extrinsic motivation is divided into external regulation (related to rewards and punishments), external introjected motivation (accepted in the processes of internalization by introjection) and external identified motivation (an acceptance following internalization by identification, considered as his or her own by the individual; the closest to intrinsic motivation). Intrinsic motivation, as described above, pertains to practising an activity for itself, just for pleasure and satisfaction (Deci, 1975; Deci & Ryan, 1985; Vallerand et al., 1992). A behaviour correlated with interest, enjoyment and perceived feeling of choice reflects this autonomous type of motivation (Ryan, Koestner, & Deci, 1991). The taxonomy of intrinsic motivation was suggested by Vallerand, Blais, Brière, and Pelletier (1989) and Vallerand et al. (1992), who recognized that the previous descriptions of internal motivation revealed its complex structure and

Validity and reliability of the Polish version of the Academic Motivation Scale

indicated the presence of three types of this motivation. Therefore, intrinsic motivation was subdivided into three categories: motivation to know, motivation toward accomplishments, motivation to experience stimulation. Motivation to know is described as engagement in an activity performed for pleasure and satisfaction, which are derived from learning, exploration and the process of trying to understand a new concept. Intrinsic motivation to know refers to exploration, curiosity, intellectual pursuit, motivation to learn, the search for meaning, epistemic need for knowledge and understanding. Motivation toward accomplishments is about performing an activity for pleasure and satisfaction that stems from an attempt to accomplish something or to create something. Motivation to accomplish occurs when an individual focuses more on the achievement process than on the results. Motivation to experience stimulation is described as engagement in the activity for stimulating experiences (e.g. sensory pleasure, fun and excitement) which are derived from that activity (Vallerand et al., 1992). The holistic feeling of flow (Csikszentmihalyi, 1990), feelings of excitement and aesthetic stimulating experiences indicate the presence of this subtype of intrinsic motivation (Vallerand et al., 1992). Although the intrinsic motivation is the most important form of motivation, most activities performed by people are not intrinsically motivated. The freedom to be intrinsically motivated is significantly impaired in early childhood because of social roles and other social demands; thus individuals have to assume responsibility for external demands (Ryan & Deci, 2000a).

In the Vallerand (2000) study, the hierarchical model of motivation was proposed. The hierarchical model describes two horizontal impact processes, where the motivation of one level influences the motivation of another level in the hierarchy (Vallerand & Lalande, 2011). Vallerand, Pelletier & Koestner (2008) emphasized that motivational research is still dynamic, and the self-determination theory allows for a better understanding of processes related to human activity in the areas of education, work, recreation, parental responsibilities, sport and health.

Along with the development of the theories of motivation, a statistical tool was created, which allows systematization of different, sometimes very complex sets of needs. This tool was a factor analysis (Cattell, 1971; Eysenck, 1991, 1992; Costa & McCrae, 1992), which allows reduction of the number of factors to the desired minimum. Exploratory factor analysis (EFA) is performed to explore the possible underlying factor structure of a set of observed variables. Confirmatory factor analysis (CFA) is used to test the hypothesis that a relationship between the observed variables and their underlying latent construct exists (Suhr, 2006).

PARTICIPANTS AND PROCEDURE

PARTICIPANTS

Sample 1 comprised 1592 Polish university students, 653 males aged 19-34 ($M = 21.56$, $SD = 2.17$) and 939 females aged 18-33 ($M = 21.52$, $SD = 1.90$). Their overall mean age was 21.54 years ($SD = 2.02$), ranging from 18 to 34. Students were enrolled in either the physical education, physiotherapy, tourism and recreation, sport or tourism management degree programme at universities in southern and western Poland. Sample 2 comprised 49 university students of tourism and recreation, 13 males and 36 females.

MEASURE AND PROCEDURE

The Academic Motivation Scale (AMS) was used (Vallerand et al., 1992). This tool is accessible for research purposes on the Research Laboratory on Social Behavior (RLSB) website. The AMS was translated from English to Polish with the back-translation procedure. The Polish version of the AMS, similarly to the original, consists of 28 items assigned to seven subscales (four items per each subscale) described in the self-determination theory: amotivation, extrinsic motivation (external regulation, introjected regulation, identified regulation), and intrinsic motivation (to know, to accomplish and to experience stimulation). All items were assessed on a 7-point Likert scale (1 – *strongly disagree*, 2 – *disagree*, 3 – *slightly disagree*, 4 – *don't know*, 5 – *slightly agree*, 6 – *agree*, 7 – *strongly agree*). The survey was conducted in the years 2013-2018 by the use of paper-and-pencil questionnaires as well as web-based questionnaires. Participants were informed that the survey is anonymous and voluntary. After being translated, the AMS was subjected to a validation procedure. Validation of the research tool, i.e. the evaluation of the theoretical validity of the questionnaire after translation into Polish, was performed in several stages, using exploratory factor analysis and confirmatory factor analysis. Validation is one of the stages of cultural adaptation of the research tool after its translation (Hornowska & Paluchowski, 2011). In order to assess the temporal stability, a test-retest technique was used. According to Hornowska (2018), while determining the time period between pretest and retest, two contradictory conditions should be taken into consideration. First, the time period should be long enough for the respondents to forget their answers. Second, the time period should be short enough to avoid the change of respondents' subjective assessments measured by the scale, for e.g. resulting from the learning process. There is even a specific variant of the test-retest statistical technique, with no time period between the tests. In the present study, the

Table 1

EFA for the 7-factor AMS ($N = 1592$)

Factor	Eigenvalue	% of variance	Cumulative eigenvalue	Cumulative % of variance
1	9.98	35.65	9.98	35.65
2	2.64	9.45	12.63	45.10
3	2.48	8.85	15.10	53.94
4	1.38	4.92	16.48	58.86
5	0.95	3.39	17.43	62.25
6	0.89	3.16	18.31	65.41
7	0.74	2.63	19.05	68.04

Validity and reliability of the Polish version of the Academic Motivation Scale

chosen time period was quite short but the pretest and retest were divided by lectures and the stressful experiences of taking an exam.

DATA ANALYSIS

All statistical analyses were performed with the STATISTICA package (version 13.1). First, the factor analyses were done, such as an exploratory factor analysis (EFA) in the multidimensional analyses module and a confirmatory factor analysis (CFA) in the structural equation modelling module. EFA was used to study the AMS structure through the Kaiser criterion and Cattell's scree plot (Cattell, 1966). CFA was performed to evaluate the goodness of fit of the assumed five models using the generalized least squares (GLS) technique, and to evaluate the factor loadings of the best fitting model. Cronbach's α statistics were used to estimate the reliability of the Polish version of the AMS. In order to assess the temporal stability of the AMS, a second sample comprising 49 university students completed the AMS twice, before and after the lectures and stressful exams. Likert data were collected from 28 items divided into seven subscales (four items per subscale), and descriptive statistics such as means and standard deviations were calculated to examine motivation of university students from sample 1 (Likert, 1932; Boone & Boone, 2012). In order to compare male and female students' motivation in each of the seven subscales, the one-way ANOVA was applied. The assumed significance level was set at $\alpha < .05$.

RESULTS

First, an exploratory factor analysis for 28 variables (28 questionnaire items) was performed. Due to the Kaiser criterion, the eigenvalues for the correlation matrix were computed (Table 1). The eigenvalues

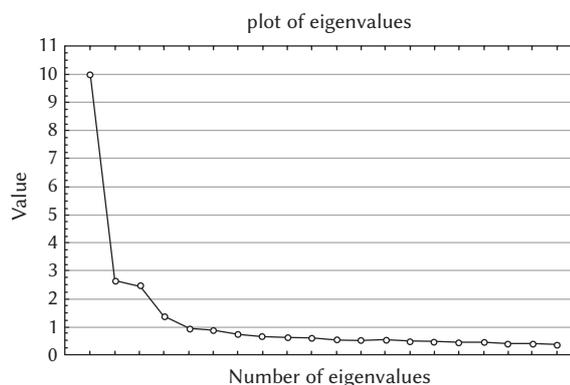


Figure 1. Cattell's scree plot.

of four factors were greater than 1.00 and they explained 58.86% of the total variance. Seven factors explained 68.04% of the total variance, but the eigenvalues for the fifth, sixth and seventh factor were below 1.00. The last substantial drop in the magnitude of eigenvalues was determined from the fourth factor, through examination of Cattell's scree plot (Figure 1).

Next, the data was subjected to confirmatory factor analysis (CFA). The generalized least squares (GLS) method was used. Because exploratory factor analysis did not confirm the seven-factor structure of the AMS, five models were tested and compared (Table 2). In *Model 1* and *Model 5*, seven factors were postulated, which corresponded to the seven subscales: amotivation, extrinsic motivation (external regulation, introjected regulation, identified regulation), and intrinsic motivation (IM-to know, IM-accomplishment and IM-stimulation). In *Model 1* seven uncorrelated factors were postulated. In *Model 2* three factors were postulated; these factors corresponded to the three types of motivation: amotivation, extrinsic motivation and intrinsic motivation. In *Model 3* four factors were postulated because of

Table 2

Fit statistics of the CFA for the alternative AMS models ($N = 1592$)

Fit indices	Model 1 7-factor uncorrelated	Model 2 3-factor correlated	Model 3 4-factor correlated	Model 4 5-factor correlated	Model 5 7-factor correlated
Discrepancy function	1.585	1.572	1.387	1.232	1.024
χ^2	2521.03	2500.73	2206.41	1959.38	1629.19
df	350	347	344	340	329
χ^2/df ratio	7.20	7.21	6.41	5.76	4.95
p	.000	.000	.000	.000	.000
SRMR	.346	.122	.222	.213	.097
RMSEA	.062	.062	.058	.055	.050
GFI	.887	.888	.901	.912	.927
AGFI	.869	.869	.883	.895	.910

Note. GLS – generalized least squares; χ^2 – chi square; df – degrees of freedom; SRMR – standardized root mean-square residual; RMSEA – root mean square error of approximation

Magdalena
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the results of EFA (eigenvalues of four factors greater than one and the analysis of Cattell's scree plot). In *Model 4* five factors were postulated; these factors corresponded to amotivation, external regulation, introjected regulation, identified regulation and intrinsic motivation. In *Model 5* seven correlated factors were postulated. None of the models reached statistical non-significance ($\chi^2 p < .01$), but considering that the χ^2 value is strongly adversely influenced by large samples due to excessive power, the alternative fit indices should be examined (Sagan, 2003a, 2003b; Barkoukis et al., 2008). The 7-factor correlated *Model 5* reached acceptable fit levels. First, root mean squared error of approximation (RMSEA) was .05. Second, standardised root mean square residual (SRMR) and the discrepancy function were the smallest of the other models. Finally, the goodness of fit index (GFI) and adjusted goodness of fit index (AGFI) values were satisfactory, over .90. Loadings from the 7-factor correlated *Model 5* are displayed in Table 3. The covariance between latent variables is presented in Table 4. All factor loadings and all covariances were statistically significant ($p < .001$). The 7-factor correlated *Model 5* yielded satisfactory fit values and fits the data reasonably well.

The internal consistency of the seven-factor structure of the AMS was measured using Cronbach's α , which indicated that the subscales demonstrate adequate internal consistency (Table 5). Cronbach α values were above .78 in all cases. Alpha values for the whole AMS ($\alpha = .87$) are presented in the first column of Table 5. Alpha values after removing the items were lower than .87 for all items of motivation sub-

scales. Alpha values were higher after removing all items of amotivation. Cronbach α coefficients, which were computed separately for the amotivation scale (4 items) and motivation scale (24 items), are shown in the second column of Table 5. Alpha values after removing the items of amotivation were lower than .86 in all cases. Alpha values for items of the motivation subscale were lower than .93, except for the item *external regulation 1*, which was .93. Alpha for each of the seven subscales of the AMS are presented in the third column. All alpha values after removing the items (the fourth column) were lower than alpha for all seven subscales.

In order to test the temporal stability of an instrument, the Polish version of the AMS was completed twice by 49 university students, before and after lectures and exams. The test-retest coefficients were higher than .70 for all subscales (Table 6). Results from the test-retest correlations were high, ranging from .85 to .92, with a mean value of .88, which are considered high and all were statistically significant.

Means of students' (sample 1, males and females, $N = 1592$) motivation in each subscale from highest to lowest, were: external regulation ($M = 5.29$, $SD = 1.19$), identified regulation ($M = 5.19$, $SD = 1.19$), IM-to know ($M = 5.14$, $SD = 1.16$), introjected regulation ($M = 4.59$, $SD = 1.42$), IM-accomplishment ($M = 4.43$, $SD = 1.28$), IM-stimulation ($M = 3.67$, $SD = 1.28$), and amotivation ($M = 2.52$, $SD = 1.41$). Means and standard deviations for each subscale of motivation according to sex are presented in Table 7. The analyses of variance revealed signifi-

Table 3

Factor loadings from the confirmatory factor analysis

Item	Loading	SE	<i>t</i> statistic	<i>p</i>
Amotivation 5	1.10	.04	27.97	< .001
Amotivation 12	1.08	.04	25.57	< .001
Amotivation 19	1.21	.03	35.72	< .001
Amotivation 26	1.31	.04	37.54	< .001
External Regulation 1	0.83	.05	18.12	< .001
External Regulation 8	1.13	.03	34.24	< .001
External Regulation 15	1.06	.03	33.11	< .001
External Regulation 22	1.10	.03	35.77	< .001
Introjected Regulation 7	1.22	.04	28.15	< .001
Introjected Regulation 14	1.15	.04	29.60	< .001
Introjected Regulation 21	1.29	.04	3.16	< .001
Introjected Regulation 28	1.23	.04	33.12	< .001
Identified Regulation 3	0.90	.04	25.32	< .001
Identified Regulation 10	1.00	.04	28.13	< .001
Identified Regulation 17	0.94	.03	28.86	< .001
Identified Regulation 24	0.95	.03	27.70	< .001
IM – to Know 2	0.80	.04	23.08	< .001
IM – to Know 9	0.90	.03	27.01	< .001
IM – to Know 16	1.03	.03	3.21	< .001
IM – to Know 23	0.96	.03	28.95	< .001
IM – Accomplishment 6	1.04	.04	27.93	< .001
IM – Accomplishment 13	1.13	.04	3.17	< .001
IM – Accomplishment 20	1.06	.04	28.99	< .001
IM – Accomplishment 27	0.88	.04	24.79	< .001
IM – Stimulation 4	0.76	.04	18.46	< .001
IM – Stimulation 11	1.17	.04	31.71	< .001
IM – Stimulation 18	1.19	.04	33.56	< .001
IM – Stimulation 25	1.11	.04	28.85	< .001

*Validity and
reliability of the
Polish version
of the Academic
Motivation Scale*

Note. IM – intrinsic motivation

cant differences in motivation between males and females. Significant sex differences were found for five subscales: amotivation, IM-to know and all subscales of extrinsic motivation. The results revealed that female students scored higher than males on external regulation, introjected regulation, identified regulation and IM-to know. Furthermore, female students scored lower than males on amotivation. However, the results indicated that there are no significant sex differences in IM-accomplishment and IM-stimulation.

DISCUSSION

The aim of the study was to provide and examine the validity of the Polish version of the AMS. This study also examined students' motivation according to the self-determination theory, with regard to gender differences. The AMS is a tool commonly used for assessing motivation in the education environment.

The AMS scale was originally created in French by Vallerand et al. (1989). After a few years, the AMS was translated into English and validated in Canada

Table 4
Covariance between latent variables

Latent variables	Covariance	SE	<i>t</i> statistic	<i>p</i>
Amotivation – External Reg.	–.42	.03	–15.91	< .001
Amotivation – Introjected Reg.	–.32	.03	–10.66	< .001
Amotivation – Identified Reg.	–.53	.03	–20.78	< .001
Amotivation – IM to Know	–.50	.03	–19.41	< .001
Amotivation – IM Accomplishment	–.35	.03	–11.91	< .001
Amotivation – IM Stimulation	–.26	.03	–8.40	< .001
External Reg. – Introjected Reg.	.66	.02	32.21	< .001
External Reg. – Identified Reg.	.79	.02	45.82	< .001
External Reg. – IM to Know	.44	.03	15.97	< .001
External Reg. – IM Accomplishment	.45	.03	16.47	< .001
External Reg. – IM Stimulation	.31	.03	10.37	< .001
Introjected Reg. – Identified Reg.	.60	.03	24.32	< .001
Introjected Reg. – IM to Know	.55	.03	21.05	< .001
Introjected Reg. – IM Accomplishment	.78	.02	44.23	< .001
Introjected Reg. – IM Stimulation	.53	.03	21.10	< .001
Identified Reg. – IM to Know	.76	.02	39.46	< .001
Identified Reg. – IM Accomplishment	.62	.03	24.91	< .001
Identified Reg. – IM Stimulation	.59	.03	23.06	< .001
IM to Know – IM Accomplishment	.75	.02	39.58	< .001
IM to Know – IM Stimulation	.73	.02	36.92	< .001
IM Accomplishment – IM Stimulation	.73	.02	37.96	< .001

Note. Reg. – regulation; IM – intrinsic motivation

(Vallerand et al., 1992). Later research supported the concurrent and construct validity of the English version of the AMS (Vallerand et al., 1993). Through the years, the AMS has been used in many studies for many different purposes, e.g. to examine students' motivation in education (Fortier, Vallerand, & Guay, 1995); to study the impact of the sense of competence and identity on the motivation to study (Faye & Sharpe, 2008); to analyse the correlation between personality traits (neuroticism, extroversion, openness, agreeableness and conscientiousness) and motivation to study (Komarraju et al., 2009); to study the mechanism of strengthening autonomy and motivation through the existence of supporting interpersonal relationships between students, their parents and teachers (Guay et al., 2013); or to confirm the existence of a motivation continuum (Litalien et al., 2017).

The AMS has been translated into many different languages: Greek (Barkoukis et al., 2008), Italian (Aliv-

ernini & Lucidi, 2008), Turkish (Karagüven, 2012), Spanish (Stover et al., 2012) German (Wilkesmann et al., 2012), Romanian (Maican & Lixandriou, 2015), Spanish (Orsini et al., 2015), Hungarian (Tóth-Király et al., 2017). However, the Polish version has never been appropriately adapted and validated. Although an attempt to adapt the Polish version of the AMS has been made, the sample size in that study was too small, models were not assessed and the seven-factor structure was not supported (Ardeńska et al., 2016).

The present study is based on the SDT construct of motivation. An exploratory factor analysis (EFA) confirmed three main types of motivation in the AMS: amotivation, extrinsic and intrinsic motivation. The Kaiser criterion was appropriately applied, the eigenvalues of four factors were greater than 1.00 and explained 58.86% of total variance. According to Cattell's scree plot five factors were "over the scree", the fifth factor eigenvalue was .95 and five factors explained 62.25% of total variance. Therefore, five mod-

Table 5

Internal consistency values (Cronbach α), sample 1 ($N = 1592$)

Item	AMS $\alpha = .87$	Amotivation $\alpha = .86$ Motivation $\alpha = .93$	Subscales	
	Alpha after removing the item	α	Alpha after removing the item	
Amotivation 5	.88	.83	.86	.83
Amotivation 12	.88	.85		.85
Amotivation 19	.88	.82		.82
Amotivation 26	.88	.80		.80
External Regulation 1	.87	.93	.78	.82
External Regulation 8	.86	.92		.68
External Regulation 15	.86	.92		.70
External Regulation 22	.86	.92		.69
Introjected Regulation 7	.86	.92	.82	.79
Introjected Regulation 14	.86	.92		.78
Introjected Regulation 21	.86	.92		.76
Introjected Regulation 28	.86	.92		.76
Identified Regulation 3	.86	.92	.82	.78
Identified Regulation 10	.86	.92		.77
Identified Regulation 17	.86	.92		.77
Identified Regulation 24	.86	.92		.79
IM – to Know 2	.86	.92	.82	.79
IM – to Know 9	.86	.92		.76
IM – to Know 16	.86	.92		.76
IM – to Know 23	.86	.92		.79
IM – Accomplishment 6	.86	.92	.83	.77
IM – Accomplishment 13	.86	.92		.77
IM – Accomplishment 20	.86	.92		.79
IM – Accomplishment 27	.86	.92		.79
IM – Stimulation 4	.86	.92	.81	.83
IM – Stimulation 11	.86	.92		.72
IM – Stimulation 18	.86	.92		.72
IM – Stimulation 25	.86	.92		.75

Validity and reliability of the Polish version of the Academic Motivation Scale

Note. IM – intrinsic motivation

els were tested using a confirmatory factor analysis (CFA). In the Karagüven (2012) study, an EFA was used and distinguished only five factors with eigenvalues greater than 1.00, accounting for 58.06% of the total variance. Wilkesmann et al. (2012) used only a principal component analysis instead of a CFA and found only four factors instead of the original seven factors.

In the present study, confirmatory factor analysis (CFA) supported the seven-factor and 28-item structure of the Polish version of the AMS. The 7-factor correlated *Model 5* yielded satisfactory fit values and all factor loadings were statistically significant. Similarly, CFA confirmed the 7-factor model in the studies conducted by Vallerand et al. (1989, 1992), Cokley et al. (2001) and Barkoukis et al. (2008). Vallerand

Table 6

Internal consistency values (Cronbach α) and test-retest correlations ($N = 49$)

Subscales	α		Test-retest correlations
	Pretest	Posttest	
Amotivation	.83	.94	.85
External Regulation	.73	.80	.87
Introjected Regulation	.84	.92	.92
Identified Regulation	.88	.85	.87
IM – to Know	.78	.82	.88
IM – Accomplishment	.82	.87	.90
IM – Stimulation	.86	.90	.89

Note. IM – intrinsic motivation

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Table 7

Means and standard deviations for males and females ($N = 1592$)

Subscales	Males ($n = 653$)		Females ($n = 939$)		ANOVA	
	M	SD	M	SD	F	p
Amotivation	2.70	1.42	2.40	1.40	17.14	< .001
External Regulation	5.13	1.29	5.39	1.11	18.89	< .001
Introjected Regulation	4.40	1.48	4.71	1.36	18.37	< .001
Identified Regulation	4.97	1.26	5.34	1.10	37.81	< .001
IM – to Know	5.01	1.22	5.24	1.11	15.34	< .001
IM – Accomplishment	4.37	1.28	4.46	1.27	1.81	.179
IM – Stimulation	3.65	1.27	3.68	1.30	0.26	.609

Note. IM – intrinsic motivation

et al. (1989) reported fit values of $\chi^2 = 668.8$, $df = 323$, $p < .001$, GFI = .930, AGFI = .921 in the study of the original French version of the AMS, and fit values of $\chi^2 = 748.64$, $df = 303$, $p < .001$, GFI = .94, AGFI = .91 in the study of the original English version of the AMS (Vallerand et al., 1992). In the Cokley et al. (2001) study on the United States sample, the fit values were $\chi^2 = 709.155$, $p < .001$, χ^2/df ratio = 2.1, RMSEA = .07, SRMR = .08, CFI = .90, NFI = .83. In the Barkoukis et al. (2008) study, reported fit values were $\chi^2 = 1032.40$, $p < .001$, $df = 326$, χ^2/df ratio = 3.16, GFI = .894, AGFI = .869, RMSEA = .057, SRMR = .059. Karagüven (2012) examined the factorial structure of the 7-factor model in the original scale and obtained fit values of $\chi^2 = 1017.74$, $df = 329$, $p < .001$, $\chi^2/df = 3.094$, GFI = .84, AGFI = .81, RMSEA = .73, SRMR = .65.

Cronbach's α was used to estimate reliability, with the expectation to reach values above 0.7 (Nunnally, 1978; Nunnally & Bernstein, 1994). The results from

this study revealed that Cronbach α values were high for the AMS, as well as for all the subscales. These findings were similar to those reported by Vallerand et al. (1992), Cokley et al. (2001), Fairchild et al. (2005), Barkoukis et al. (2008), and Karagüven (2012). In the Vallerand et al. (1992) study, α values ranged from .83 to .86, with the exception of the identified regulation, which had an α of .62. In the Cokley et al. (2001) study, Cronbach α values ranged from .70 for identified regulation to .86 in the case of amotivation. Results from the Fairchild et al. (2005) study revealed values ranging from .77 (identified regulation) to .90 (IM-accomplishment). In the Ratelle, Guay, Vallerand, Larose, & Senecal (2007) study on college students, Cronbach α values ranged from .75 (identified regulation) to .95 (all IM subscales). Alpha values reported in the Barkoukis et al. (2008) study were between .72 (identified regulation) and .79 (IM-to know), with the exception of IM-stimulation, which had an α value of .55. In the Karagüven (2012) study, the Cronbach α

value was .67. Wilkesmann et al. (2012) distinguished four factors in the structure of the AMS and reported Cronbach α values of .85 for the 'intrinsic motivation' factor, .77 for 'identified motivation', .75 for 'extrinsic motivation', and .80 for 'amotivation'. Furthermore, in the present study, the α value for motivation was .93 after removing all items of the amotivation subscale. These results support internal consistency of the scale and subscales of the Polish version of the AMS.

The temporal reliability of the scale is supported by the high test-retest values. Alpha coefficients reached acceptable values, as they were consistently higher than .70 for all subscales. These results were in accord with the findings from the French AMS study by Vallerand et al. (1989), which revealed values ranging from .70 to .89 in pretest and from .82 to .93 in posttest, as well as their English AMS study (Vallerand et al., 1992), which showed values ranging from .72 to .91 in pretest and from .78 to .90 in posttest. Similarly, in the Barkoukis et al. (2008) study, reported values were higher than .70 in general.

Results from this study regarding the test-retest correlations were high ranging. These results were higher than those found in the French AMS study (Vallerand et al., 1989), which revealed values ranging from .69 to .81, as well as the English AMS study (Vallerand et al., 1992), which showed values ranging from .71 to .83.

The results of the study support the reliability, internal consistency and validity of the seven-factor model of the Polish version of the AMS.

The second aim of the present study was to examine motivation of students enrolled in physical education, tourism and recreation, physiotherapy, sport, or sport and tourism management. Motivation is especially important to students of those fields, because of the necessity to combine intellectual skills and physical fitness in order to succeed in higher education. Students of physical education, sport and other faculties of physical activity constitute a valuable social potential, because of the well-established awareness of the importance of human activity for people's well-being and public health. Physical activity and sport are also important in the prevention of health-threatening behaviours (Jochimek, Krokosz, & Lipowski, 2017). University authorities should monitor students' motivation to study, and the AMS tool may prove useful for the assessment of different levels of motivation. The value of motivation is noted by many Polish researchers; e.g. the motivational function of goals in physical activity, recreation and sport is recognized by Lipowski & Zaleski (2015), the authors of the Inventory of Physical Activity Objectives, a high reliability tool (Cronbach's $\alpha = .78$).

The present analysis of student motivation revealed significant gender differences regarding 5 subscales. Female students scored higher than males on

external regulation, introjected regulation, identified regulation and IM-to know. The importance of intrinsic motivation should be particularly appreciated (Ryan, Vallerand, & Deci, 1984). Similar findings were reported in Canadian (Vallerand et al., 1992), Greek (Barkoukis et al., 2008) and United States (Horyna & Bonds-Raacke, 2012) samples. In the study carried out by Vallerand et al. (1992) females reported higher levels than males on 5 subscales (IM-knowledge, IM-accomplishment, IM-stimulation, identified regulation, introjected regulation). Results from the Barkoukis et al. (2008) study revealed that females scored higher on IM-to know, and in the study conducted by Horyna & Bonds-Raacke (2012), females scored higher than males on external regulation and identified regulation.

Furthermore, results from this study revealed that female students scored lower on amotivation than males. Similar findings were also obtained in previous studies conducted in Greece (Barkoukis et al., 2008), the United States (Horyna & Bonds-Raacke, 2012) and Turkey (Turkmen, 2013). On the other hand, in the Wilkesmann et al. (2012) study, female students scored lower on extrinsic motivation than males, while Cokley et al. (2001) found no significant gender differences in motivation.

CONCLUSIONS

The findings from this study support the seven-factor structure of the Polish version of the Academic Motivation Scale (AMS) which was proposed by Vallerand et al. (1989, 1992). The fit indices in the confirmatory factor analysis (CFA) were satisfactory and all factor loadings were statistically significant for the 7-factor scale. The Cronbach α coefficients obtained from this study were high for all the subscales, confirming the high internal consistency and reliability of the scale. Furthermore, the test-retest values support reliability and temporal stability of the Polish AMS.

The results reveal significant differences between males and females regarding motivation. Female students showed higher levels in self-determined types of motivation as well as a lower level in amotivation than male students.

In conclusion, because of the evidence of high reliability and validity of the Polish version of the AMS, it can be considered a suitable instrument for determining different types of motivation of Polish university students. The Polish AMS may be useful to teachers and researchers, not only as a measure of student motivation but also to identify complex motivational problems. Furthermore, the findings of the AMS may be valuable to administrators and politicians who reform the educational system, which should always promote a more self-determined approach to learning.

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