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The assessment of intrinsic and extrinsic motivation and amotivation: Validity and reliability of the Greek version of the Academic Motivation Scale

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Self-determination theory provides an integrated conception of school- and academic motivation. The theory proposes a continuum comprising three types of motivation: intrinsic motivation (IM), extrinsic motivation (EM), and amotivation (AM), characterised by seven dimensions (IM = to know, to accomplish and to experience stimulation, EM = external regulation, introjection and identification, and Amotivation). The purpose of the present study was to examine the psychometric properties of the Academic Motivation Scale (AMS) with Greek high school students. Two studies were conducted to examine the factorial, construct, concurrent and predictive validity of the scale along with its reliability properties. Confirmatory factor analyses supported the proposed seven-factor structure. The scale showed satisfactory levels of internal consistency and temporal stability. Additionally, indices of the scale's construct, concurrent, and predictive validity were in the desired direction. These findings support the use of the Greek version of the AMS for the assessment of intrinsic motivation, extrinsic motivation, and amotivation.

Motivation is thought to be one of the most important aspects of human behaviour and has been extensively studied in education and other contexts. For many years intrinsic motivation was conceived to be a variable that influences both cognitive and affective states experienced in the classroom, including academic performance (Deci and Ryan 1985). However, other behaviours may be governed by other types of motivation, such as extrinsic states, or its absence (termed amotivation). Both extrinsic motivation and amotivation have been hypothesised to be associated with maladaptive regulatory systems, although the end product (goal attainment) may be achieved (Deci and Ryan 2000). Self-determination theory (SDT) provides a comprehensive theoretical framework seeking to explain human behaviour through the understanding of human motivation.

Self-determination theory

Deci and Ryan's (1985) self-determination theory identifies the important facets of motivated behaviour in humans. According to their theory, motivation should not be viewed from a unidimensional perspective. Instead, three dimensions of motivation need to be examined: *intrinsic* and *extrinsic* motivation and *amotivation*. Intrinsic motivation (IM) refers to the engagement in an activity for the pleasure and satisfaction of performing it. Intrinsically-motivated individuals voluntarily participate in an activity without experiencing external or internal pressures to do so and without expecting rewards (Deci and Ryan 1985; Deci et al. 1991; Vallerand and Bissonnette 1992; Vallerand et al. 1992; Frederick and Ryan 1995). Vallerand et al. (1992) supported the

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notion that IM is a global construct that can be differentiated into three more specific motives, the *intrinsic motivation to know*, to *accomplish,* and to *experience stimulation*.

Intrinsic motivation to know refers to the engagement in an activity 'for the pleasure and satisfaction that one experiences while learning, exploring, or trying to understand something new' (Vallerand et al. 1992, 1005). This type is representative of intrinsic motivation in education since it is related to constructs such as curiosity, exploration, and the epistemic need to know and understand, (typical in educational settings). *Intrinsic motivation towards accomplishment* is defined as engagement in an activity for the pleasure and satisfaction derived when trying to excel, to reach a new standard, or to create something new. Individuals with IM toward accomplishment focus on the *process* rather than the *outcome* of an activity and seek to feel competent and creative. Finally, *intrinsic motivation to experience stimulation* represents involvement with an activity for the experience of fun, excitement, and positive sensations (Vallerand et al. 1992).

In contrast, involvement in an activity to obtain rewards is referred to as extrinsic motivation (EM). Being engaged in activities because of external or internal pressures is considered an extrinsic form of motivation. In such instances, behaviour operates as a *means to an end* and not for its own sake (Deci and Ryan 1985; Deci et al. 1991; Vallerand and Bissonnette 1992; Vallerand et al. 1992; Frederick and Ryan 1995). Deci and Ryan (1985) view extrinsic motivation as a multidimensional construct, as well. Three types of extrinsic motivation are defined in the self-determination theory tradition: *external regulation*, *introjection,* and *identification* (Deci and Ryan 2000).

External regulation is the most representative type of extrinsic motivation. It refers to the involvement in an activity to gain rewards or to avoid punishment. Furthermore, behaviour is the result of experiencing external or internal pressures. The second type of extrinsic motivation, *introjection*, refers to a more 'internalised' involvement with an activity, one in which the self is 'more' involved. At this stage, behaviour is not yet self-determined, but the individual is beginning to internalise the reasons for her/his actions. *Identification* is a more self-determined type of extrinsic motivation than external regulation because behaviours are valued, and considered important and, thus, engagement is perceived as chosen by the individual itself. *Integrated regulation* refers to the most self-determined type of extrinsic motivation regarding internalisation. At this level, behaviour is still performed for external reasons, although it is considered as part of the self and goal-directed behaviours may be consistently pursued. The absence of intrinsic reasons is why behaviours, that are the outcome of integrated regulation, are not considered fully self-determined.

The third dimension of motivation identified in SDT is *amotivation*. This dimension refers to the absence of a contingency between one's actions and outcomes. Amotivated individuals do not seem to have specific purposes and goals and they don't seem to approach ends in a systematic fashion. Amotivated individuals simply do not demonstrate the intent to engage in an activity. Amotivation has been related to learned helplessness, where individuals withdraw effort because of perceptions of incompetence and loss of control. The involvement in an activity is not a result of their will (Deci and Ryan 1985; Deci et al. 1991; Vallerand and Bissonnette 1992; Vallerand et al. 1992; Frederick and Ryan 1995). Like intrinsic and extrinsic motivation, one can distinguish four different types of amotivated behaviour: (a) the belief concerning the lack of ability to perform an activity, (b) the belief that the adopted strategies will not produce the desired outcomes, (c) the belief that the activity is too demanding for the individual, and (d) the belief that even high effort is not adequate for successful task performance.

Intrinsic and extrinsic motivation have been previously considered to delineate a bipolar continuum of motivation. However, this approach has been proven problematic and was criticised as being too simplistic to describe and explain human behaviour. The distinction of intrinsic and extrinsic motivation led to the idea that different motives may correspond to different

levels of self-determined actions. According to their levels of self-determination, these types of motivation are located at various points along a continuum, termed the self-determination continuum. In this continuum the types of intrinsic motivation, (i.e. intrinsic motivation to know, to accomplish and to experience stimulation) represent high levels of self-determination, extrinsic motivation represent intermediate levels of self-determined behaviour and amotivation represent low self-determination. Thus, the proposed continuum is posited to run from amotivation to intrinsic motivation, for behaviours to become self-determined (Deci and Ryan 2000).

Until recently, there was no instrument to evaluate all aspects of the self-determination continuum. Vallerand (1997) criticised past research for using affective or behavioural criteria on the basis that such measures may be confounded by their antecedents and consequences that are manipulated at the time of measurement. Thus, they may not represent pure, trait-like forms of motivation. Furthermore, these approaches fail to answer 'why'-type questions (i.e., relationship between behaviours and innate psychological needs) (Deci and Ryan 2000). To overcome these limitations, Vallerand and colleagues (Vallerand et al. 1992, 1993) proposed an integrative theoretical framework for the multidimensional estimation of motivation within SDT. Their instrument, the Academic Motivation Scale (AMS), was designed to assess all three dimensions of motivation that range from least to most determined by the self. In total, the AMS includes seven sub-scales which are defined by 28 items (4 items per sub-scale).

Vallerand (1997) described in detail the systematic procedures that led to the development of the items and the construction of the scale. The psychometric properties of the English version of the scale were from borderline to adequate across various studies (see Vallerand et al. 1992, 1993). However, several problems emerged regarding the support of the *identification* sub-scale. For example, although analyses revealed high internal consistency coefficients for most sub-scales, the identification sub-scale reflected relatively low consistency (e.g., alphas of .62). Information regarding the construct and concurrent validity of the scale with Canadian samples were, at times, borderline (Vallerand et al. 1993). Thus, given the widespread use and premise of SDT it is important that instruments with adequate psychometric properties exist to assess these specific aspects of motivated behaviour.

Recently, Cokley and colleagues (Cokley 2000; Cokley et al. 2001) examined the psychometric properties of the AMS with a sample from the United States. Cokley et al.'s (2001) results were consistent with those reported by Vallerand et al. (1992) regarding the factorial validity of the scale (CFI = .90), suggesting partial support of the scale's multidimensionality. Cokley (2000) implied that a more clear distinction among the intrinsic motivation sub-scales is needed. Furthermore, Cokley failed to replicate the Vallerand et al. (1992) findings with regard to gender. Those findings imply that cultural differences may account for the motivational differences across gender.

The AMS was developed to assess high school students' academic motivation. It is considered an extremely useful instrument towards assessing the multidimensional nature of motivated behaviour in high school. Its purpose was to provide for a more thorough understanding of the 'whys' of high school student's behaviour (Vallerand 1997). The validation of such an instrument is important as motivated behaviour has been linked to both positive (e.g., grades) and negative outcomes (e.g., delinquency, and aggression). Furthermore, the validation of a theory-based instrument such as AMS in states with different cultures would offer further support on the generalisation of the SDT theory. Only recently, Nunez et al. (2004) validated the AMS in the Spanish language. The necessity of validating such an instrument would be much greater in countries like Greece, which recently attempted to reorganise its educational system. Measurements of motivation would provide valuable information on the psychological profile of Greek students, and would assist towards identifying adaptive and maladaptive motives and goals, which may assist in the development of effective interventions for at-risk behaviours.

In this vein, Tsorbatzoudis et al. (1999) and Tsorbatzoudis et al. (2001) attempted to translate and adapt the AMS in the Greek culture. Tsorbatzoudis et al. (2001) described the complete procedure for the translation and adaptation of the scale into Greek. In short, the procedure proposed by Vallerand (1989) was followed for the translation and adaptation of the scale. The translation procedure was based on the guidelines of Brislin et al. (1973). The pilot studies with exploratory factor analyses confirmed the existence of the three basic dimensions of motivation (Tsorbatzoudis et al. 1999) whereas confirmatory factor analyses with high school participants supported the existence of seven dimensions. Unfortunately, model fit was not acceptable when trying to fit the original model (i.e., CFI = .849). This inadequacy was due to the fact that several items (i.e., 1, 5, 12 and 13) did not fit the hypothesised simple structure. A qualitative inspection of these items suggested that those items may highlight important cultural differences between the Greek and Canadian education systems. Confirmatory factor analyses without the 'culturally-sensitive' items produced adequate, although borderline, fit (CFI = .905). Moreover, the analyses demonstrated high internal consistency (ranging from .67 to .81) and test-retest coefficients (ranging from .68 to .73) for all sub-scales (Tsorbatzoudis et al. 2001).

The findings described above provided partial support for the factorial validity and reliability of the Greek version of the AMS. However, this version was not identical to the original one since four items were excluded from the original scale. In order not to deviate substantially from the conceptual definition of the AMS sub-scales and along with the goal of enhancing content validity, an attempt was made to modify and incorporate those items in the revised Greek version of the AMS (modifications targeted at paralleling the respective concepts in the two educational systems). Thus, the aim of the present study was to examine further the psychometric properties of the Greek version of the AMS. In particular, this study was designed to examine the construct, concurrent, and predictive validity of the scale and examine the presence of gender differences.

Study 1

Method

Participants

The sample of the first study consisted of 911 high school pupils ranging in age from 12 to 16 years (mean age 13.9 years, standard deviation .76). The students of the sample were attending the eighth and ninth grades of five high schools in an urban city of Northern Greece.

Measurement

The Greek version of the adapted for school AMS was used after the modifications made to the items deleted in the Tsorbatzoudis et al. (2001) study. This version, similar to the original one, consists of seven factors with four items each: intrinsic motivation to know (example item: Because I experience pleasure and satisfaction while learning new things), intrinsic motivation towards accomplishment (example item: For the pleasure I experience while surpassing myself in my studies), intrinsic motivation to experience stimulation (example item: For the high feeling that I experience while reading about various interesting subjects), identification (example item: Because I think that a high school education will help me prepare better for the career I have chosen), introjection (example item: To show myself that I am an intelligent person), external regulation (example item: Because I need at least a high school degree in order to find a high-paying job later on), and amotivation (example item: Honestly, I don't really know; I really have the impression that I am wasting my time). Participants responded to the stem 'Why do you attend school?'. Responses were given on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*exactly*).

In order to examine the concurrent validity of the scale, the AMS was administered with the Task and Ego in Sport Questionnaire (TEOSQ) (Duda and Nicholls 1992) and the Intrinsic Motivation Inventory (IMI) (McAuley et al. 1989). The motivational constructs assessed by these questionnaires are similar to those used by Vallerand et al. (1993). Both questionnaires had been translated into Greek and had been validated earlier (cf. Papaioannou and McDonald 1993; Digelidis and Papaioannou 1999). The TEOSQ was designed for the estimation of the two basic goal orientations, *task* (e.g., 'I feel most successful in physical education when I learn something that is fun to do') and *ego* (e.g., 'I feel most successful in physical education when the others can't do as well as me'). Responses were given on a 5-point Likert scale ranging from totally disagree (1) to totally agree (5). The IMI includes the estimation of four sub-scales: interest-enjoyment (e.g., I enjoy PE lessons very much), perceived competence (e.g., I think I am pretty good in PE lessons), effort (e.g., I put a lot of effort in PE lessons) and tension-pressure (e.g., I feel tense while playing in PE lessons). Responses are given on a 4-point Likert scale from totally disagree (1) to totally agree (4).

Procedure

Permission from the Ministry of Education was granted to conduct the study. Informal consent was obtained by the school principals and the students themselves to participate in the study. The subjects completed the Greek version of AMS during regular school hours under the supervision of the researchers. Both oral and written instructions were given to students regarding the completion of the scale. They were assured about the confidentiality of their responses and they were encouraged to ask any questions regarding the understanding of the items of the scale. The completion of the scale lasted approximately 10 minutes.

Statistical analyses

Analyses were conducted via EQS, 5.7b structural equation modelling computer program (Bentler 1998). Confirmatory factor analysis was used in order to test the factorial validity of the scale. The maximum likelihood method was applied since values for kurtosis (range: –1.110 to .499) and skewness (range: 1.137 to 1.307) were minimal, verifying the presence of multivariate normality. The comparative fit index (CFI) was used as a focal index of goodness-of-fit, because of its desirable statistical properties, such as its standardised 0–1 range, small sample variability, and stability with various sample sizes (Joreskog and Sorbom 1981; Bentler 1990). Recently, Hu and Bentler (1999) proposed that the CFI should approximate .95 to represent adequate model fit. However, lower scores have been reported in the literature (Battin-Pearson et al. 2000; Yeung et al. 2000) and values above .90 have also been considered acceptable (Bentler, 1990; Hays et al. 1994). Furthermore, the goodness-of-fit χ^2, the Non-Normed Fit Index (NNFI), the Adjusted Goodness of Fit Index (AGFI), the Standardised Root Mean-square Residual (SRMR) and the Root Mean-Square Error of Approximation (RMSEA) were used along with the CFI for the examination of model fit (Marsh et al. 1988; Hu and Bentler 1999). Among them, the SRMR and CFIs are preferred because they are unaffected by sample size and provide an intuitive approach (focus on residuals) to understanding model fit (Bentler 1990; Hu and Bentler 1995).

Model description

In the present study four models were tested: (a) a 7-factor uncorrelated measurement model, (b) a 7-factor correlated measurement model as proposed by Vallerand et al. (1992), (c) a 5-factor correlated model assuming that only the intrinsic motivation dimensions of the scale comprise a

higher order factor as proposed by the self-determination continuum, and (d) a 2-factor hierarchical model structure assuming that the intrinsic and extrinsic motivation dimensions of the scale constitute two distinct higher order factors.

Results

Factorial validity of the scale

As expected the measurement model produced poor fit to the data due to its orthogonal nature. The hierarchical model (see Table 1) produced significantly better fit to the measurement model but was still at unacceptable levels. Thus, the two higher order structures of IM and EM do not appear to account adequately for the variability of the respective sub-constructs. A 5-factor correlated model offered substantially improved fit compared to the hierarchical model but was still at unacceptable levels given recent recommendations regarding acceptable fit (e.g., Bentler 1990; Hu and Bentler 1999). Thus, we will discuss in more detail the 7-factor correlated model, which produced a better fit.

As shown in Table 1, only the 7-factor correlated model reached acceptable fit levels. Although its χ^2 was significant ($\chi^2_{(326)} = 1032.402$, $p < .001$), most fit indices were at acceptable levels. Given that the chi-square is heavily influenced (adversely) by large samples (due to excessive power, see Onwuegbuzie et al. 2003), the fit indices were solely used for evaluation of model fit. Consideration of those indices suggested that the 7-factor correlated model produced adequate model fit, although borderline. Nevertheless, several other forms of information contribute to the support of the 7-factor structure. First, the average standardised residual was .045, which is desirably small. Second, all factor loadings were statistically significant at .01 and all but one exceeded .50 in standardised values, thus contributing significantly to the assessment of the construct of interest. Third, the standardised root mean squared residual was quite small (.059) with correspondingly narrow 90% confidence intervals (ranging between .053 and .061). Lastly, this model was nested in model 3 (the 5-factor correlated model) and produced significantly better fit from that model (as demonstrated through the difference Chi-square statistic). Thus, the 7-factor model offered the closest fit to the data (see also Table 2).

Reliability of the scale

Table 1. Fit indices of the confirmatory factor analyses for the Academic Motivation Scale in Study 1.

Models	χ^2	*df*	χ^2 / *df* ratio	NNFI	CFI	GFI	AGFI	SRMR	RMSEA	$\Delta\chi^2$	Δdf
Model 1: 7-factor uncorrelated	3223.04*	347	9.28	.605	.637	.717	.669	.239	.111		
Model 2: 2-factor hierarchical	1567.68*	332	4.72	.823	.844	.850	.816	.102	.074	1655.36* M1 vs. M2	15[a]
Model 3: 5-factor correlated	1356.68*	331	4.09	.852	.871	.864	.833	.080	.068	211.00* M2 vs. M3	1[b]
Model 4: 7-factor correlated	1032.40*	326	3.16	.897	.911	.894	.869	.059	.057	324.28* M3 vs. M4	5[c]

Note: * = $p < .001$; χ^2 = chi square; NNFI = Non-Normed Fit Index; CFI = Comparative Fit Index; GFI = Goodness of Fit Index; AGFI = Adjusted Goodness of Fit Index; RMSR = Standardized RMR; RMSEA = Root Mean Squared Error of Approximation, $\Delta\chi^2$ = difference chi-square statistic, Δ d.f.= difference degrees of freedom, [a]critical $\chi^2(15)$ at .05 was 24.996 < 1655.36, [b]critical $\chi^2(1)$at .05 was 3.84 < 211.00, [c]critical $\chi^2(5)$at .05 was 11.0

Table 2. Decomposition of the Academic Motivation Scale produced in Study 1.

	Parameter estimate	*SE*	Standardised estimate	*T*	R^2
External regulation 1	1.116	.074	.563	15.02	.31
IM to know 1	1.237	.059	.729	21.10	.53
Identification 1	1.095	.059	.660	18.45	.43
IM to exp. stimulation 1	1.196	.071	.631	16.91	.39
Amotivation 1	1.072	.066	.633	16.16	.40
IM to accomplish 1	1.218	.063	.693	19.24	.48
Introjection 1	1.266	.074	.642	17.19	.41
External regulation 2	1.165	.054	.743	21.39	.55
IM to know 2	1.371	.055	.817	24.84	.66
Identification 2	1.059	.052	.715	20.46	.51
IM to exp. stimulation 2	.337	.079	.176	4.27	.03
Amotivation 2	1.048	.069	.601	15.10	.36
IM to accomplish 2	1.175	.059	.714	20.00	.51
Introjection 2	1.126	.061	.679	18.45	.46
External regulation 3	1.077	.056	.685	19.18	.46
IM to know 3	1.274	.057	.764	22.53	.58
Identification 3	1.118	.053	.727	20.97	.52
IM to exp. stimulation 3	1.068	.072	.566	14.77	.32
Amotivation 3	1.175	.066	.686	17.68	.47
IM to accomplish 3	1.265	.065	.700	19.49	.49
Introjection 3	1.236	.074	.630	16.68	.39
External regulation 4	1.287	.060	.743	21.37	.55
IM to know 4	1.294	.057	.771	22.83	.59
Identification 4	1.135	.053	.744	21.60	.55
IM to exp. stimulation 4	1.193	.066	.673	18.06	.45
Amotivation 4	1.233	.065	.733	19.09	.53
IM to accomplish 4	1.239	.062	.717	20.14	.51
Introjection 4	1.189	.071	.636	16.84	.40

Cronbach alpha was used to estimate the internal consistency of the scales. The coefficients were high for all the sub-scales, with the exception of the IM to experience stimulation sub-scale that had a value of .55.

In order to test the temporal stability of the scale, 52 high school pupils from our sample completed the Greek version of the AMS again after a six-week period. The test-retest coefficients were consistently higher than .70 for all sub-scales, which are considered acceptable. Cronbach alphas and test-retest coefficients are shown in Table 3.

Gender differences

A number of separate students' t-tests were conducted in order to examine gender differences on the AMS sub-scales. The analyses revealed significant differences between males and females on intrinsic motivation to know ($t_{(588)} = -4.09$, $p < .001$) and amotivation ($t_{(695)} = 7.94$, $p < .001$). As far as intrinsic motivation to know is concerned, females showed higher values ($M = 5.36$, $SD = 1.24$) than males ($M = 4.92$, $SD = 1.34$). Regarding amotivation females showed lower

Table 3. Means, standard deviations, Cronbach alphas and test-retest coefficients of the variables in Study 1.

	Males		Females			
	Mean	*SD*	*Mean*	*SD*	Cronbach α	Test-retest Coefficients
IM to know *	4.92	1.34	5.36	1.24	.79	.83
IM toward accomplishment	4.81	1.33	4.88	1.30	.73	.80
IM to experience stimulation	4.16	1.18	4.22	1.24	.55	.77
External regulation	5.29	1.28	5.23	1.31	.73	.79
Introjection	4.48	1.32	4.31	1.40	.74	.75
Identification	5.33	1.24	5.49	1.15	.72	.74
Amotivation *	2.76	1.44	1.96	1.20	.73	.77

Note: *Indicates mean differences between males and females.

values ($M = 1.96$, $SD = 1.20$) than males ($M = 2.76$, $SD = 1.44$). Means and standard deviations of males and females in each sub-scale are shown in Table 3.

Discussion

The results of Study 1 imply that the earlier modifications of the AMS that deleted four culturally sensitive items were inappropriate. Modifying those items to reflect sensitivities of the Greek educational system was a fair addition to the 7-factor model, which adequately accounted for the hypothesised relations (Tsorbatzoudis et al. 2001). Therefore, these findings seem to support the validity and reliability of the full model with Greek high school students.

The fit indices produced by the confirmatory factor analysis for the 7-factor model were at acceptable, although borderline levels. It should be noted that the CFI, as well as the other indices, did not reach the revised criteria for adequate model fit proposed by Hu and Bentler (1999). However, the present study's results mirror previous psychometric studies from the originators of the scale as well as other researchers (Vallerand et al. 1992; Cokley 2000; Cokley et al. 2001) in North American samples.

The Cronbach alpha coefficients were high for almost all the sub-scales of the Greek version of the AMS and similar to those reported by Vallerand et al. (1992, 1993) and Cokley et al. (2001). The intrinsic motivation to experience stimulation sub-scale was an exception with a relatively small coefficient. Findings with this sub-scale must be treated with caution. As far as the temporal stability of the scale is concerned the test-retest coefficients were high enough for all the sub-scales to support the reliability of the scale. Similar values were reported by Vallerand et al. (1992).

The results revealed the existence of gender differences regarding intrinsic motivation to know and amotivation. More specifically, females were higher in intrinsic motivation to know, and lower in amotivation, compared to males. These findings were in accord with those reported earlier using Greek (Tsorbatzoudis et al. 2001) and Canadian samples (Vallerand et al. 1992), suggesting that females may be more self-determined than males. Tsorbatzoudis et al. (2001) reported that males had higher values in introjection, amotivation and intrinsic motivation toward accomplishment. Vallerand et al. (1992), on the other hand, showed that females had higher values in all types of intrinsic motivation, introjection, and identification. Therefore, despite Cokley et al.'s (2001) findings there is evidence that in both Greek and Canadian samples females have a more self-determined profile than males.

Given preliminary evidence from Study 1 regarding the factorial validity of the scale, Study 2 sought both to replicate and extend the findings of Study 1. The concept of measurement

invariance is prominent in Structural Equation Modelling (SEM) in which the concern of capitalising on chance or fitting sample idiosyncrasies can result in misleading models. Thus, it is suggested that models are cross-validated with multiple samples and across populations. Study 2 attempts to test measurement invariance with an independent sample from the same population of high school students. A secondary purpose of Study 2 is to expand on the construct validity of the AMS model by attempting to account for the variability of motivation related constructs such as effort (the behavioural manifestation of motivation), enjoyment (an emotional characteristic of intrinsic motivation), pressure, and goal orientations.

Study 2

A substantial amount of the educational psychology literature has focused on the importance of motivation and the associated emotions. Dweck's (1986) goal orientation model suggests that the way individuals approach a task determines both the outcome and the regulatory system involved. Thus, goal orientations represent internal cognitive representations (structures) that result in successful or unsuccessful self-regulation. Dweck (1986) and Nicholls (1989) described two such orientations[1], a task (or mastery) and an ego (or performance). A task orientation is grounded on intrinsic motivation and represents one's pleasurable engagement with an activity whereas an ego orientation describes individuals who focus on outperforming others and gain favourable judgements. Numerous studies suggest that goal orientations are extremely important in accounting for the behavioural manifestations of motivation and associated emotions (e.g., Elliot et al. 1999), and may account for various personality constructs (see Elliot and Church 1997; Elliot and McGregor 1999, 2001; Harackiewicz et al. 2002). Given that goal orientations are grounded on the early motivational orientations of IM and EM, a valid motivational scale (i.e., AMS) should account for substantial amounts of the variability in goal orientations. Furthermore, those predictions should be in the desired directions. Thus, it was predicted that a task orientation would be strongly linked to IM (and its respective constructs) whereas an ego orientation should be predicted by EM and the focus on external reward structures. It was also predicted that amotivation would be linked negatively, albeit weakly, with both goal orientations. Furthermore, it was predicted that IM would demonstrate stronger correlations with cognitive and affective motivational-relevant constructs such as enjoyment, effort and perceived competence, whilst EM and amotivation would correlate more strongly with anxiety-related constructs such as pressure. Given the added complexity of domain-specific measures, the study was conducted in the physical education setting. This setting was chosen as the context to test the concurrent validity of AMS because children's covert behaviour can be readily evaluated in the PE setting (i.e., children cannot day-dream, pretend they are engaged, fool around, etc.).

Method

Participants and procedures

The sample of the second study consisted of 303 high school pupils ranging in age from 13 to 17 years (mean age 14.35 years, standard deviation .74). Participants completed the questionnaires during regular school hours under the supervision of the researchers. As in Study 1, permission was granted from the Ministry of Education and informal consent was obtained by the principal and the students themselves. Both oral and written instructions were given to the students, while they were assured about the confidentiality of their responses and they were encouraged to ask any questions regarding the understanding of the items of the scales. The completion of the scale lasted approximately 15 minutes.

Questionnaires

In order to examine the concurrent validity of the scale, the AMS was administered with the TEOSQ (Duda and Nicholls 1992) and the IMI (McAuley et al. 1989). The motivational constructs assessed by these questionnaires are similar to those used by Vallerand et al. (1993). Both questionnaires have been translated in Greek and have been validated earlier (cf. Papaioannou and McDonald 1993; Digelidis and Papaioannou 1999). The TEOSQ was designed for the estimation of the two basic goal orientations, *task* (e.g., 'I feel most successful in physical education when I learn something that is fun to do') and *ego* (e.g., 'I feel most successful in physical education when the other can't do as well as me'). Responses were given on a 5-point Likert scale ranging from totally disagree (1) to totally agree (5). The IMI includes the estimation of four sub-scales: interest-enjoyment (e.g., I enjoy PE lessons very much), perceived competence (e.g., I think I am pretty good in PE lessons), effort (e.g., I put a lot of effort into PE lessons) and tension-pressure (e.g., I feel tense while participating in PE lessons). Responses are given on a 4-point Likert scale from totally disagree (1) to totally agree (4).

Statistical analyses

Table 3 presents between-construct correlations and internal consistency estimates (in parentheses). Each goal orientation (one at a time) comprised the dependent variables in a linear regression model in which the SDT stages (e.g., IM, EM) were the predictors. All analyses were conducted via SPSS for Windows 11.5.

Results

Factorial validity and reliability of the scale

The 7-factor correlated model that reached acceptable fit levels in Study 1 was also tested for fit in Study 2. The χ^2 was once again significant ($\chi^2_{(324)} = 679.987$, $p < .001$), but again reflected the positive bias of excessive power. Thus, model adequacy was mostly evaluated by the use of fit indices. As in Study 1, the model that produced acceptable fit was the 7-factor correlated model. The CFI reached adequate, but borderline levels (i.e., .901) and the average standardised residuals were at satisfactory levels, (.070). Additionally, all factor loadings were statistically significant at .01 and all, but one, exceeded .60 in standardised values (range: .504 to .807). Finally, the standardised root mean squared residual was at acceptable levels (.068) with correspondingly narrow 90% confidence intervals (range: .060 and .075).

Internal consistency was estimated via Cronbach alphas (see Table 4). The alphas for the AMS sub-scales were, for the most part, acceptable and similar to those reported in Study 1, as well as the relevant international literature (Vallerand et al. 1992, 1993). Cronbach's alpha for the sub-scale of intrinsic motivation to experience stimulation was at medium levels, as in Study 1. The other sub-scales showed high internal consistency. The alphas of the TEOSQ and IMI sub-scales were also high and similar to those reported in the literature (Papaioannou and Macdonald 1993) (Table 4).

Concurrent validity of the SDT scale

The correlational analysis revealed significant correlations between the AMS sub-scales and among the sub-scales of the TEOSQ and IMI. These correlations were, with a few exceptions, in the anticipated direction (Table 4). More specifically, the IM sub-scales demonstrated moderate to high correlations with each other (*r* range: .35 to .66), moderate to low correlations with the EM sub-scales (*r* range: .28 to .46) and low negative correlations with amotivation (*r* range: –.12

Table 4. Cronbach alphas and correlation coefficients among the AMS', TEOSQ's and IMI's subscales in Study 2.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Task orientation	(.82)	.21**	.35**	.25**	.33**	.22**	.13*	.31**	ns	.28**	.25**	.25**	ns
2. Ego orientation		(.73)	.21**	.23**	.11*	.19**	.33**	.11*	ns	.19**	.16*	.30**	.11*
3. IM to know			(.86)	.42**	.66**	.32**	.32**	.46**	−.22**	.27**	.30**	.18**	ns
4. IM to accomplish				(.79)	.35**	.44**	.60**	.42**	ns	.24**	.17**	.20**	ns
5. IM to exp. stimulation					(.63)	ns	.28**	.30**	−.12*	.22**	.24**	.19**	ns
6. Ext. regulation						(.78)	.49**	.68**	ns	.16**	.13**	.18**	ns
7. Introjection							(.72)	.44**	ns	.28**	.22**	.14*	ns
8. Identification								(.82)	−.20**	.25**	.23**	.14*	ns
9. Amotivation									(.80)	ns	Ns	Ns	.34**
10. Enjoyment										(.72)	.42**	.42**	.11*
11. Effort											(.80)	.38**	.15**
12. P. competence												(.78)	.16**
13. Pressure													(.68)

Note: * $p < .05$, ** $p < .01$. Numbers in parentheses represent Cronbach alpha values.
70 < 324.28.

to –.22). Similarly, the EM sub-scales showed moderate to high correlations with each other (*r* range: .44 to .68), and low and negative correlations with amotivation. Only the relationship between the IM to accomplish and the EM sub-scales was not in the expected direction (*r* range: .42 to .60).

Regarding concurrent validity, the AMS was correlated with the TEOSQ and the IMI. The analysis indicated that the IM sub-scales and identification were more strongly correlated with *task* (*r* range: .25 to .35) rather than *ego* orientation (*r* range: .11 to .23), as expected. The opposite pattern emerged for external regulation and introjection (*r* range: .19 to .33 for *ego* and.13 to .22 for *task* orientation). Amotivation did not correlate significantly with any goal orientation, deviating slightly from predictions (negative relationships were expected). Regarding the motivation-relevant constructs measured with IMI, significant correlations emerged between the IM sub-scales and enjoyment (*r* range: .22 to .27), effort (*r* range: .17 to .30) and perceived competence (*r* range: .18 to .20). The respective correlations for the EM sub-scales ranged from .16 to .28 for enjoyment, from .13 to .23 for effort, and from .14 to .18 for perceived competence. Lastly, amotivation was significantly correlated only with the tension-pressure sub-scale ($r = .34$, $p < .01$).

Results from the linear regression analyses indicated that the simultaneous evaluation of all SDT predictors for the explanation of task orientation produced a significant $R^2 = .30$. Thus, the motivational, trait-like orientations accounted for significant amounts of the variability of orientations towards goal setting ($F_{(7, 424)} = 25{,}61$, $p < .001$). More specifically, task goals were predicted significantly by IM to know (beta = .267), IM to accomplish (beta = .121), but not IM stimulation (beta = .046). From the extrinsic motivation variables, only identification accounted for significant amounts of the variability in task goals (beta = .335). Both external regulation and introjection were unrelated with task orientation (beta = –.048; beta = –.117 respectively). Also, as predicted, amotivation was unrelated to task goals (beta = –.009).

Regarding ego orientation, all SDT predictors accounted for a significant 17% of the variability of this orientation [$F(7,426) = 12{,}49$, $p < .001$]. Several IM and EM constructs were significant predictors of ego goals. Among them were the IM to know (beta = .171), the IM for stimulation (beta = –.147), and EM introjection (beta = .226). Amotivation was a significant predictor of ego goals (beta = .127). The fact that IM explained significant variability of extrinsic goals (such as those to perform), may be due to their shared variability (correlation of task and ego goals was .30), a finding agreeing with previous studies' estimates (Elliot et al. 1999).

Discussion

Study 2 re-examined the reliability and factorial validity of the scale structure produced in Study 1. The results from the CFAs replicated those of Study 1. Borderline but adequate fit emerged, supporting the multivariate nature of the SDT components. The 7-factor structure with inclusion of three intrinsic motivation constructs was verified as in Study 1. Additionally the internal consistency coefficients were similar to those reported in Study 1. Cronbach alphas were high for almost all sub-scales. Intrinsic motivation to experience stimulation showed once again low-to-medium internal consistency. These findings provided substantial support regarding the factorial validity and reliability of the Greek version of the AMS scale.

Furthermore, Study 2 examined the construct and concurrent validity of the scale. Construct validity was assessed through correlations among the AMS sub-scales. The findings confirmed the simplex model pattern proposed by the theory, i.e. dimensions of motivation that are closer to the motivation continuum have higher correlations comparing to the more distant ones (Deci and Ryan 1985). The intrinsic motivation sub-scales were highly related to each other. On the other hand, the respective relations between intrinsic and extrinsic motivation sub-scales were lower.

The less self-determined sub-scales revealed lower correlations with intrinsic motivation, as expected. Finally, intrinsic motivation was negatively related to amotivation. Similar patterns of relationships were found for the extrinsic motivation sub-scales. These sub-scales (EM) were highly correlated with each other, also displaying lower relations with the more distant constructs (e.g., intrinsic motivation sub-scales). The finding that the self-determined sub-scales should be more closely related with each other compared to the less determined sub-scales provides strong support regarding the construct validity of the scale (Vallerand et al. 1993; Cokley 2000).

The correlations between the AMS sub-scales and other motivational constructs provided support regarding its construct validity. Intrinsic motivation sub-scales were stronger related to enjoyment, effort, perceived competence, and task orientation than the extrinsic motivation sub-scales. Amotivation and pressure were not significantly related to intrinsic motivation. In contrast to intrinsic motivation sub-scales, the extrinsic motivation sub-scales revealed stronger relationship with ego orientation.

Finally, the regression analyses provided evidence concerning the concurrent validity of the AMS. The IM sub-scales were significant predictors of task orientation, while the EM sub-scales predicted ego goals. These findings were in the expected direction, indicating that intrinsic motivation measured via the AMS can significantly predict other constructs that are thought to describe facets of intrinsic motivation such as task orientation. Similarly, *introjection* and *amotivation* were predictors of ego orientation, a construct reflecting normative comparisons, hence, involvement in an activity as a means to an end.

General discussion

The Academic Motivation Scale has been developed to respond to the 'why' question behind motivated behaviour in contrast to previous measures that focus on the antecedents and consequences of behaviour (Vallerand 1997). The psychometric properties of the scale have been examined in Canadian (Vallerand et al. 1992, 1993), US (Cokley 2000; Cokley et al. 2001) and Spanish samples (Nunez et al. 2004). These studies have provided evidence on the reliability and factorial, construct and concurrent validity of the scale. In Greece, Tsorbatzoudis and associates attempted to translate and adapt the scale. Both exploratory (Tsorbatzoudis et al. 1999) and confirmatory factor analyses (Tsorbatzoudis et al. 2001) provided partial support to the reliability and factorial validity of the Greek version. However, the scale produced was not identical to the original one since four items were excluded. Moreover, there was no evidence on the construct, and concurrent validity of the scale. These issues were addressed in the present studies.

The confirmatory factor analyses suggested the existence of seven correlated facets of self-determined behaviour. The fit indices were similar to those found in studies examining the factorial validity of the scale using Canadian (Vallerand et al. 1992), Spanish (Nunez et al. 2004) and US (Cokley 2000; Cokley et al. 2001) samples. It should be noted that the distinction of the three types of intrinsic motivation on the Greek version of AMS has been of great importance, and potential concern. These types of intrinsic motivation are at the same level on the self-determination continuum proposed by Deci and Ryan (1985) and Vallerand (1989), and, thus, it is difficult to differentiate between them since they correspond to similar constructs (Cokley 2000). Therefore, Vallerand et al. (1992) emphasised the necessity for the distinction of these motivational subtypes. In line with Vallerand et al.'s (1992) and Cokley et al.'s (2001) findings, those of the present study indicate that the Greek version of AMS can successfully differentiate the types of intrinsic motivation.

The reliability of the scale was examined using both internal consistency and test-retest estimates. Estimates were high and acceptable, similar to those reported previously (Vallerand et al. 1992, 1993; Cokley et al. 2001). The IM to experience stimulation was the only sub-scale that showed medium alphas in both studies. This sub-scale was developed to assess the sensations

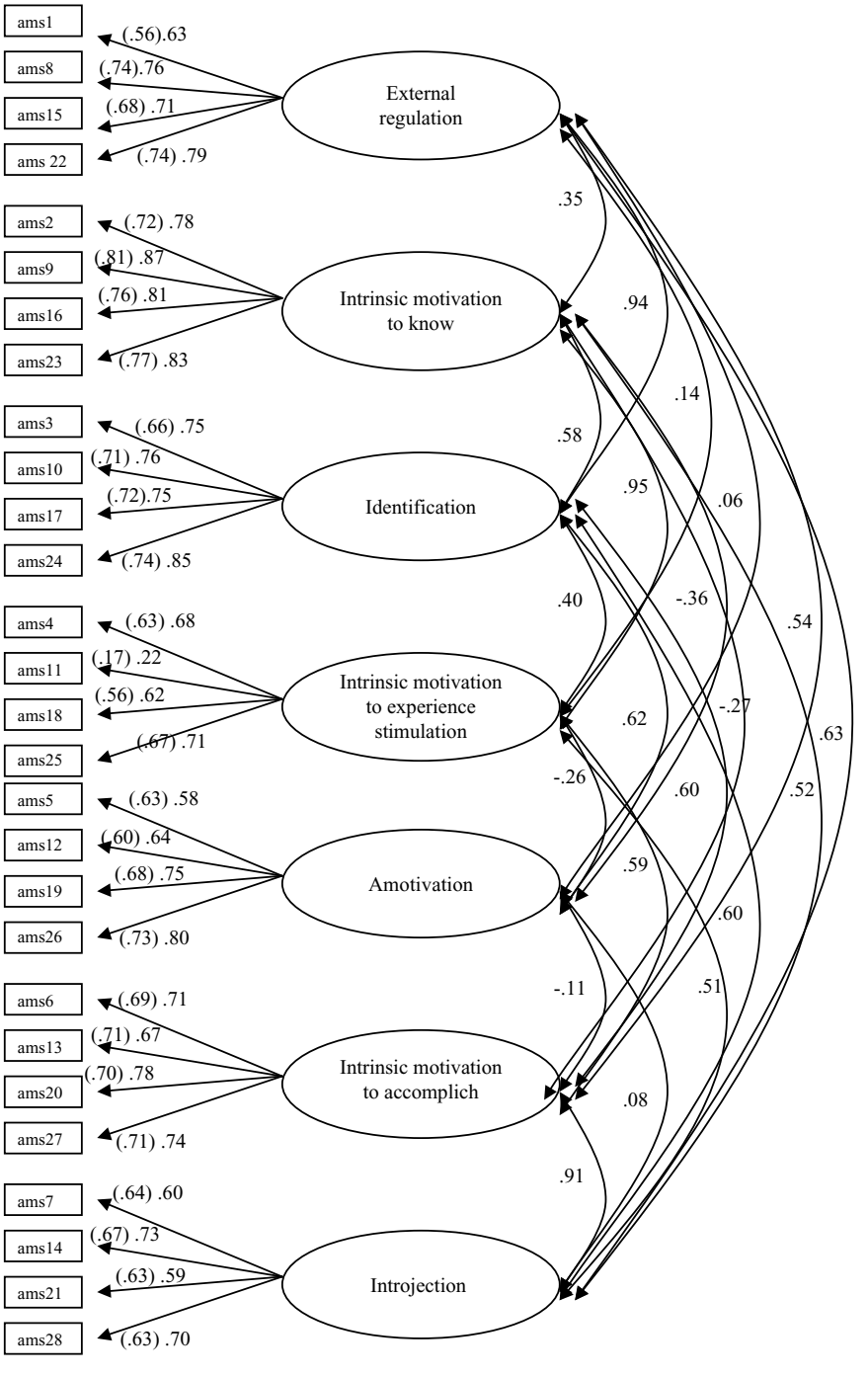

Figure 1. Confirmatory factor analysis of AMS items. Numbers in brackets represent the standardised estimates from Study 1, while numbers without brackets those of Study 2.

experienced by being involved in an activity (Vallerand et al. 1992). However, these sensations are not necessarily operative in the general school context. Different activities may trigger different sensations for different individuals. Thus, what is exciting for one person may not be exciting for another. The Greek school context may not be the one that would trigger sensation-like feelings for all students. Attempting to assess sensation in the absence of a related activity (sensation-eliciting) may be problematic and may be the cause of producing increased measurement error (as manifested by low alphas). Thus, this sub-scale should still be the subject of further scrutiny.

Differences on the motivational profile between males and females were tested since different patterns were reported earlier between Canadian (Vallerand et al. 1992) and US (Cokley et al. 2001) samples. Similar to the Canadian students, Greek female high school students demonstrated a more self-determined profile. It would be obscure to claim that Greek society and education is closer to the Canadian than the US ones and that thus these differences exist. The explanation may lie with other environmental (e.g. location of sample) and personal (e.g. personality, socio-economic status) factors that may have affected motivation. However, the consistency of these findings with those reported by Tsorbatzoudis et al. (2001) suggests that female high school students in Greece are more self-determined than males.

In order to confirm the construct validity of the scale a specific pattern of correlations should emerge. This pattern, termed the simplex pattern, is based on the location of the constructs on the self-determination continuum. Findings from Study 2 are similar to those reported by Vallerand et al. (1993) providing supporting evidence on the hypothesised simplex pattern. According to this pattern, between construct correlations should be stronger for adjacent latent variables compared to more distant ones. This pattern of correlations was evident in the present studies, with the exception of the IM to accomplish scale, which correlated higher with the EM sub-scales, compared to the respective IM sub-scales. These findings resemble those of Cokley (2000) who argued that the differences among the intrinsic and extrinsic motivation constructs might not be as definite as self-determination theory attests. In the Vallerand et al. (1993) study, the IM to experience stimulation showed high correlations with extrinsic motivation variables compared to the intrinsic ones.

Beyond its factorial structure, the AMS was significantly correlated with goal orientations and those predictions were in accord with expectations. For example, a task orientation was significantly predicted by intrinsic motivation but not extrinsic, with the exception of identification, which is a more self-determined form of extrinsic motivation. Being intrinsically motivated to know predicted significantly one's pursuit of goals that have intrinsic causes. Also, a focus on introjection, reflecting social or personal pressures to do well was strongly related with performance goals, that is, seeking to outperform other students. Thus, the AMS had significant associations with relevant psychological constructs such as goal orientations, linking trait-like forms of motivation to goal pursuit.

In conclusion, findings from the present studies confirm the seven-factor structure proposed by Vallerand et al. (1992). Furthermore, the confirmatory factor analyses supported the differentiation of the intrinsic types of motivation. Additionally, the internal consistency and test-retest coefficients were high for almost all the sub-scales supporting the reliability of the scale. Lastly, there is enough evidence supporting the construct and concurrent validity of the scale. These findings provide sufficient evidence on the validity and reliability of the Greek version of AMS and its use in Greek education in order to estimate the different types of motivation.

The ability of AMS to estimate the seven dimensions of motivation in Greek culture is of great importance, as it supports the generalisation of self-determination theory in other cultures than Anglo-Saxon. As with the findings from Spain, the self-determination theory could be used as a sound theoretical framework to study motivation in different cultures. Furthermore, the validation of the seven factor structure supports the multidimensionality of academic motivation. Hence,

future interventions should view motivation as multidimensional concept and include facets that enhance the positive (intrinsic motivation to know, to accomplish and to experience stimulation and identification) and undermine the negative dimensions (introjection, external regulation and amotivation). Finally, these interventions should promote the internalisation process proposed by the self-determination theory.

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Note

1. The terms task/mastery and ego/performance were used interchangeably and represent the same conceptual dimensions.

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