Cross-cultural comparative examination of the Academic Motivation Scale using exploratory structural equation modeling

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ABSTRACT

The goal of the present research was to the cross-cultural examination of the factor structure of the Academic Motivation Scale (AMS) and its extensive invariance testing with exploratory structural equation modeling (ESEM). Three comprehensive samples were collected: a Hungarian high school ($N = 1139$), a Hungarian university ($N = 1163$) samples, and a French university ($N = 1009$) sample. Compared to confirmatory factor analysis, ESEM demonstrated better model fit and less inflated inter-factor correlations in all three samples. Among Hungarian high school students, intrinsic dimensions were less differentiated. Gender invariance was confirmed on the level of latent means. As for age- and language invariance, only configural invariance was supported. The AMS showed mostly adequate reliability and good temporal stability. Based on the present and prior studies, ESEM appears to be the most adequate analytic strategy for the deeper understanding of academic motivations measured by the AMS.

1. Introduction

According to the self-determination theory (SDT) of Deci and Ryan (1985, 2000), human behavior is driven by motivations that one wants to satisfy. Based on the levels of self-determination, three main forms of human motivation can be separated. First, *intrinsic motivation* (IM) suggests that one engages in a behavior or activity for internal reasons (enjoyment, pleasure). Three forms of IM can be distinguished (Vallerand et al., 1992): intrinsic motivation to know (IMTK) refers to gaining new knowledge about a certain topic. Intrinsic motivation toward accomplishment (IMTA) is related to the aim of overcoming goals or surpassing oneself. The third type of intrinsic motivation is connected to experiencing stimulation (IMES) where one is rewarded by the experienced subjective sensations of the activity (i.e., joy or arousal).

Second, *extrinsic motivation* (EM) manifests when an individual engages in an activity for reasons that are external. Deci and Ryan (2000) distinguished four forms of extrinsic motivation. Extrinsic motivation of external regulation (EMER) is generated by avoiding punishment or obtaining reward following the behavior. Extrinsic motivation of introjected regulation (EMIJ) characterizes those stances when the

activity is internalized to a certain degree and one performs an activity due to internal pressures (e.g., anxiety). Extrinsic motivation of identified regulation (EMID) occurs when one identifies with the reasons behind the activity which becomes important for the individual. Extrinsic motivation of integrated regulation (EMIN) as the most self-determined form of EM supposes that the motivational drives are the most inner, but they still have external sources that are separate from the activity.

The third element is *amotivation* (AM). It manifests when one does not find the connection between his/her behavior and the experienced consequences. Therefore, the state of amotivation lacks any forms of intrinsic or extrinsic motivations and also lacks the intention for any kind of action related to a certain area.

1.1. The factorial structure of the AMS

One of the most frequently used instruments to measure different motivations of students is the AMS. The original version was created by Vallerand, Blais, Brière, and Pelletier (1989) and was adapted to English (Vallerand et al., 1992, 1993). It includes seven dimensions[2]: three forms of intrinsic motivation, three forms of extrinsic motivation and an

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[2] The AMS does not measure the integrated regulation aspect of extrinsic motivation as it has been shown to manifest in later phases of psychological development (Ratelle et al., 2007).

amotivation subscale. Regarding the psychometric properties of the AMS, previous results are mostly consistent. The originally hypothesized seven-factor structure was confirmed in the original (Vallerand et al., 1989) and the adaptation studies (Vallerand et al., 1992, 1993) as well. Moreover, this seven-factor solution has been supported in most of the adaptations (for more details, see Supplementary material 1 in Appendix A).

Although the results of previous validation studies appear to be mostly consistent, several concerns can be raised. First, regarding the factor structure, not all studies demonstrated adequate goodness-of-fit. Furthermore, in some cases, acceptable model fit was achieved by using ad hoc correlated uniquenesses which—as stated by Marsh, Morin, Parker, and Kaur (2014)—could lead to dubious results. Finally, correlations were noticeably high between adjacent motivational factors (i.e., three forms of intrinsic motivation) that could undercut the discriminant validity of the scale and question the tripartite model of intrinsic motivation (Carbonneau, Vallerand, & Lafrenière, 2012).

1.2. A new approach for scale assessment: exploratory structural equation modeling

The factorial structure of the AMS was mainly assessed with confirmatory factor analysis (CFA) where items are restricted to load on their respective factors without allowing cross-loadings (Marsh et al., 2009). This method could result in (1) low goodness-of-fit indices and (2) inflated factor correlations, limiting the discriminant validity of the instrument (e.g., Marsh et al., 2014). ESEM has been suggested as a new flexible method, combining EFA and CFA methods as it integrates the less restrictive aspects of EFA (e.g., cross-loadings are possible) and the statistical advantages of CFA (e.g., invariance testing). ESEM showed better model fit and reduced inter-factor correlations than CFA, resulting in a more exact estimate of correlation values (Morin, Marsh, & Nagengast, 2013). Therefore, ESEM is reasonable as cross-loadings between the adjacent factors can be expected.

1.3. Measurement invariance for group differences

An important psychometric aspect of instruments such the AMS is whether it can be used to compare individuals from different subgroups (e.g., males vs. females, younger vs. older individuals) or over time. If the results can be replicated across-multiple subgroup, then the comparisons are meaningful and could be generalized. This can be done by performing measurement invariance testing (Meredith, 1993; Vandenberg & Lance, 2000).

Several levels of invariance can be differentiated: configural invariance tests whether the respondents of two subgroups apply the same conceptual framework (the same factor structure) without constraining any parameters. Weak (metric) invariance tests the factor loadings and supposes that the same construct is measured across the subgroups. Strong (scalar) invariance tests the item intercepts and supposes that individuals have comparable scores on the items representing a construct (e.g., different types of motivations) regardless of subgroup membership. Strict (residual) invariance tests item uniquenesses and suggests that the measurement errors are similar in the different subgroups. Additionally, latent variances-covariances and latent means can also be investigated. Multiple invariance tests were carried out on AMS by comparing groups based on gender, types of high school, academic years, or the abilities of students (e.g., Alivernini & Lucidi, 2008; Caleon et al., 2015; Guay, Morin, Litalien, Valois, & Vallerand, 2015; Smith, Davy, & Rosenberg, 2010). The present study intends to test the replicability of these results and include further subgroups in the analyses as well by comparing Eastern European and Western European contexts.

Several differences warrant the testing of invariance in different nations. First, France can be considered as a post-materialist country with an emphasis being put on individual values such as self-growth or self-

fulfillment. On the other hand, Hungary can be considered as a materialist country where materialist values are still more prevalent with emphasis on financial and material gain (Inglehart, 1977). These cultural differences could also reflect in the motivations of students with post-materialist values being related to intrinsic motivation, while materialist values to extrinsic motivation.

1.4. The present study

The first goal of the present study was the cross-cultural examination of the factor structure and construct validity of the Academic Motivation Scale on Hungarian and French samples with different age groups. The second goal was to extensively test the invariance across different subgroups in order to investigate the comparability and the generalizability of the scale.

2. Materials and methods

2.1. Participants

Three samples were used in the current research. Sample 1 consisted of 1139 Hungarian high school students (629 females) who were aged between 14 and 20 years ($M_{Sample1} = 16.75$, $SD_{Sample1} = 1.22$). Sample 2 consisted of 1163 Hungarian college and university students (676 females), aged between 18 and 59 years ($M_{Sample2} = 22.26$, $SD_{Sample2} = 3.85$). Sample 3 consisted of 1009 French college and university students (586 females), aged between 18 and 45 years ($M_{Sample3} = 19.83$, $SD_{Sample3} = 1.99$). For assessing temporal stability, a separate sample of 100 Hungarian university students ($M_{age} = 20.96$, $SD_{age} = 1.89$) filled out the questionnaire over a four-week period (similarly to Vallerand et al., 1992).

2.2. Measures

For high school students, the high school version of the AMS was used (Vallerand et al., 1989), whereas the college version was used for the university students (Vallerand et al., 1992, 1993). Students were asked the question of "Why do you go to school/college?", respectively. Three of the factors referred to intrinsic: *IMTK* (four items, e.g., "For the pleasure that I experience in broadening my knowledge about subjects which appeal to me."), *IMTA* (four items, e.g. "For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments."), *IMES* (four items, e.g. "For the pleasure that I experience when I read interesting authors."); another three to extrinsic motivation: *EMID* (four items, e.g. "Because I believe that a few additional years of education will improve my competence as a worker."), *EMIJ* (four items, e.g. "To show myself that I am an intelligent person."), *EMER* (four items, e.g. "In order to have a better salary later on."), and one measured *AM* (four items, e.g. "Honestly, I don't know; I really feel that I am wasting my time in school."). They responded on a seven-point Likert scale (1 = doesn't correspond at all; 7 = corresponds exactly). Both versions of the AMS were translated to Hungarian and back translated by following the protocol of Beaton, Bombardier, Guillemin, and Ferraz (2000).

2.3. Procedure

The study was conducted in accordance with the Declaration of Helsinki and with the approval of the Institutional Review Board of the Eötvös Loránd University. Students were informed about the content of the questionnaire and volunteered for participation. In the case of Sample 1, the schools and parents were informed about the topic of the research through an opt-out passive consent. Furthermore, students were assured of their anonymity and that teachers would not be informed about their responses. The questionnaires were filled out during