Received: 28 June 2023 | Revised: 19 January 2024 | Accepted: 21 February 2024

DOI: 10.1111/hequ.12510

RESEARCH ARTICLE

Higher Education Quarterly WILEY

Adaptation and validation of the academic motivation scale for higher education across four Eastern European countries

Ilona Kočvarová[1] | Jan Kalenda[1] | Jitka Vaculíková[1] | Zuzana Neupauer[2] | Ruženka Šimonji Černak[3] | Anna Włoch[4]

[1]Faculty of Humanities, Research Centre of the FHS, Tomas Bata University in Zlín, Zlín, Czech Republic

[2]Faculty of Education, Matej Bel University, Banská Bystrica, Slovak Republic

[3]Faculty of Education in Sombor, University of Novi Sad, Novi Sad, Republic of Serbia

[4]University of the National Education Commission, Cracow, Poland

Correspondence
Ilona Kočvarová, Faculty of Humanities, Research Centre of the FHS, Tomas Bata University in Zlín, nám. T. G. Masaryka 5555, 760 01 Zlín, Czech Republic.
Email: kocvarova@utb.cz

Funding information
European Commission; DANUBE project, Grant/Award Number: 2020-1-SK01-KA204-078313

Abstract

The article focuses on adaptation and validation of the Academic Motivation Scale questionnaire (AMS-28) in higher education in four Eastern European countries: Czechia, Slovakia, Serbia, and Poland. The research was conducted with a total of 1711 respondents. We examined the construct validity of AMS-28 including measurement invariance and reliability according to national, gender and age groups. Our analysis confirmed its original seven-factor structure as well as its reliability. The tool is measurement invariant across all compared groups (gender, age, countries) except Poland, whose results are specific. The results identify new places on the world map where AMS-28 is functional. The tool appears functional in time, space and various language mutations. Despite satisfactory results, there is still room for future examination of the AMS-28 among different countries. In practice, the tool has a wide range of application possibilities.

1 | INTRODUCTION

In this study, we focus on the academic motivation of adult learners (aged 18 to 64 years) within higher education. Its importance is recognised worldwide because it contributes to employability (ILO, 2021; Wheeler, 2019), enhances the well-being of adults (Field, 2012) and improves their career prospects and earnings (Albert et al., 2010; Grotlüschen et al., 2019; Psacharopoulos, 2006). To capture effective educational policy and support, it is worth

understanding what motivates adults to be involved in it. In this study, we use the terms "higher education" and "adult education". Although these are different terms, they share common aspects. We distinguish them according to their use in the cited studies.

Generally, motivation is a part of the metacognitive strategies employed in learning, and it is considered a primary driving force of learning (Renniger & Hidi, 2019; Ryan & Deci, 2019, 2020), because high levels of motivation lead to better readiness of students, higher retention during studies and a deeper sense of learning itself (e.g., Côté & Levine, 2000; Jansen et al., 2016; Vallerand et al., 1992). Motivation in higher education can differ among specific groups according to the cultural background (on an international level, e.g., Boeren, Holford, et al., 2012; Boeren, Nicaise, et al., 2012); gender (different responsibilities, support and opportunities in family or work, e.g., Albert et al., 2010; Boeren, 2011; Vaculíková et al., 2020); or age (different tendency towards job-oriented learning in higher age according to Rubenson, 2018); as well as other factors not included in this study.

Although the body of literature investigating participation in higher education has significantly grown during the last decade (for an overview, see, e.g., Desjardins, 2020), research targeting adults' motivation for education has been less frequent in recent years, primarily in the case of Eastern European countries (e.g., Boeren, 2016, 2019; Merriam & Baumgartner, 2020).

Drawing on these arguments, our article focuses on adapting and validating a research instrument (specified below) for identifying motivation for adult formal education on higher level that can be systematically used by researchers and professionals in four Eastern European countries: Czechia, Slovakia, Serbia and Poland.

2 | ADULT LEARNERS' MOTIVATION: STATE OF THE ART

The issue of adult learners' motivation was addressed as early as in the 1960s by Cyril Houle (1961) and his followers (Boshier, 1971, 1977; Courtney, 1992). Since then, in a broad context of lifelong learning, many theories have conceptualised the function of motivation, for instance, Vroom's (1964) valence-instrumentality-expectancy theory (Courtney, 1992) and attitudes-oriented models of behaviour (Baert et al., 2006; Kyndt et al., 2013). Both approaches have produced several typologies of learners according to their motivation profile, for example, the typology of goal-oriented and activity-oriented learners (Boshier, 1971) or the typology of vocationally and externally motivated learners on the one hand and learners motivated by social factors and intrinsic interest in the subject of the study on the other (Boeren, Holford, et al., 2012; Boeren, Nicaise, et al., 2012). As an outcome of these investigations, the research consensus was that the motivation for adult learning is mainly based on two universal behaviour drivers: intrinsic and extrinsic motives.

However, only a few researchers (Blunt & Yang, 2002; Boshier, 1971; Isaac et al., 2001; Mulenga & Liang, 2008) have addressed the issue of developing and validating research instruments directly focused on adult learners. This could be a product of the prevailing qualitative approach to research focused on adult learners (Rubenson & Elfert, 2019) or of lower methodological standards that were previously applied to statistically oriented investigations of motivation for adult learning activities (Boeren, 2018, 2019).

Moreover, with the exception of Boeren, Holford, et al.'s (2012), Boeren, Nicaise, et al.'s (2012) comparative research, which also included some Eastern European countries (Czechia, Poland, Estonia and Bulgaria), researchers have not been interested in exploring differences among adult learners from an international comparative perspective. Therefore, we have limited knowledge about this issue across Eastern European countries. In this study, we do not only bring overall insight into this topic across Eastern Europe, but we also reflect on potential measurement invariance in the perception of motivation in different countries.

Finally, although previous studies distinguished between intrinsic and extrinsic drivers, they did not explore enough the internal factor structure of these motives (Deci & Ryan, 2017; Gagné et al., 2014; Ryan & Deci, 2000, 2019, 2020; Vallerand et al., 1992, 1993, 1994). Previous studies have also focused on the academic motivation of adults in terms of basic socio-demographic factors such as age and gender. We consider them in this study as well.

Research has pointed out that especially those over 30 years of age belong among the so-called non-traditional learners who must handle different social roles (e.g., family-related and job-related) that differentiate them from younger, traditional higher education students (Schuetze & Slowey, 2002). Scholars also found differences between men and women, with men showing higher levels of extrinsic motivation (Rothes et al., 2014). Women's motivation has been shown to be influenced by their higher involvement in the family and less linked to their employment (Albert et al., 2010; Boeren, 2011; Vaculíková et al., 2020).

3 | AIMS OF THE STUDY

This paper presents the results of our adaptation and validation procedure for the Academic Motivation Scale (AMS-28) questionnaire (Vallerand et al., 1993, 1994) in four Eastern European countries: Czechia, Serbia, Slovakia, and Poland. We choose this scale for several reasons. At first, it draws from Self-Determination Theory (SDT), a widely accepted theory of motivation that distinguishes between various subtypes of motivation and understands motivation as a continuum (Ryan & Deci, 2019, 2020). Second, it has been extensively used to explore motivational aspects of learning in higher education (Gagné et al., 2014; Howard et al., 2017). Third, many scholars from the adult education field (Boeren, 2016; Kalenda & Kočvarová, 2022; Kyndt et al., 2013; Merriam & Baumgartner, 2020) argue for its utilisation for researching adults' motivation for both organised and informal learning. In practice, AMS-28 is a suitable tool for the purposes of collective as well as individual student counselling and diagnostics during the process of their study. It can help to identify their motivations to start studying, to continue on a higher level, to drop out of studies before graduation, or to come back to school from work.

Based on these assumptions, our aim is to adapt and validate AMS-28, and at the same time, its theoretical base SDT, in the field of higher education in a new cultural context. Three sub-aims of the study are to evaluate (1) the construct validity of the AMS-28, (2) its measurement invariance across selected countries, as well as gender and age groups and (3) the reliability of its factors among compared groups of respondents. The rationale for our aims lies in the fact that the AMS-28 was previously used mainly in English-speaking (Cokley, 2015; Vallerand et al., 1993, 1994) and Spanish-speaking countries (Núñez et al., 2010, 2005; Stover et al., 2012).

3.1 | Structure of the study

This article is further organised as follows. We start with a description of the SDT approach that represents the basis for the AMS-28, including breaking down its factors and discussing previous validation attempts. After that, we turn our attention to methodological aspects, describing a cultural adaptation of all four national scales. Next, we present the validation covering our application of a confirmatory factor analysis (CFA) including measurement invariance (MI), followed by an evaluation of the tool's reliability. We conclude with the discussion of our findings and their limits.

4 | SELF-DETERMINATION THEORY (SDT) AS A BASE FOR AMS-28

SDT represents a general motivation theory of human behaviour that was primarily formulated by Ryan and Deci (2000, 2019). Their theoretical framework assumes that motivation has a crucial position in human behaviour. According to SDT, motivation is a driver of social action (Deci & Ryan, 2017). Different types of behaviours, including learning, are motivated along the so-called self-determination continuum that works with various degrees of individual autonomy (Deci & Ryan, 2017; Ryan & Deci, 2000). Based on this, we can conceptualise learning as intrinsically motivated on the one pole, with extrinsically motivated and amotivated on the other side of the continuum.

While intrinsic motivation represents activities performed mainly for the pleasure and satisfaction derived from participation itself, accompanied by a high level of autonomy and internalisation, extrinsic motivation is much more dependent on situational conditions and external control. Furthermore, Ryan and Deci (2000) argue that extrinsic motivation is a heterogeneous category, dominantly associated with the instrumental orientation of people and saturated by external reward, social recognition, or avoidance of punishment. Because the degree of autonomy varies a lot, the SDT (Deci & Ryan, 2017; Ryan & Deci, 2000) approach distinguishes several subtypes of extrinsic motivation: (1) extrinsic motivation with external regulation where external rewards (e.g., money) have a dominant position, (2) extrinsic motivation with introjected regulation where people, contrary to the previous type, pursue their activity more for being recognised by peers, seeking social recognition, (3) extrinsic motivation with identification, a subtype which includes a conscious assessment of the value of the activity and (4) extrinsic motivation with integration that is typical of the highest level of self-determination and is therefore the closest to intrinsic motivation. In this case, the value of the activity is integrated into its own self-concept. Usually, students who show a greater level of self-determination achieve a higher quality of learning and better outcomes (Ratelle et al., 2007).

The last subtype of motivation is amotivation, the relative absence of motivation, which is prevalent in situations where individuals perceive no causality between their actions and outcomes. In such moments, they experience feelings of incompetence and lack of control (Vallerand et al., 1992). Amotivated learners are involved in education without any sense of purpose. Many times, they were obliged to do it.

Based on SDT, Vallerand et al. (1993, 1994) developed a research instrument to investigate the motivation to study at both secondary and higher levels of formal education. However, compared to Ryan and Deci's classification, Vallerand et al. (1993, 1994) and his colleagues extended the initial conceptualisation of the self-determination continuum to be more suited to the organised educational environment. Particularly, they extended the subtypes of intrinsic motivation by adding three specific variants regarding the object of learning: experiences, knowledge, and self-realisation.

For this purpose, they formulated a seven-factor solution that contains three subtypes of intrinsic motivation: (F1) intrinsic motivation towards knowledge or knowing, (F2) intrinsic motivation towards accomplishment and (F3) intrinsic motivation towards experiencing stimulation. This accompanies three subtypes of extrinsic motivation: (F4) extrinsic motivation identified, (F5) extrinsic motivation with introjected regulation, (F6) extrinsic motivation with external regulation, and finally (F7) amotivation.

Subsequently, this research instrument was repeatedly applied and validated across Anglophone (Cokley, 2015; Fairchild et al., 2005) and Hispanophone countries (Núñez et al., 2010, 2005; Stover et al., 2012), as well as Greece (Barkoukis et al., 2008). All these studies verified the factorial structure of motivation in samples of adolescent high-school or university students in daily study programmes. The broadest agreement prevails on the original seven-factor concept of the instrument (Akoto, 2014; Barkoukis et al., 2008; Chong & Ahmed, 2012; Núñez et al., 2005), which is also the starting point for this study. A study by Fairchild et al. (2005) systematises more detailed information on current approaches to validating AMS-28. A study by Fulmer and Frijters (2009) summarises different approaches in the measurement of student motivation.

5 | METHODS

First, we carried out an adaptation of the AMS-28. This was primarily based on an analysis of theoretical sources concerning adult learners´ motivation, with SDT appearing to be the optimal theory applicable across the countries involved in our study. Regarding this theory, the AMS-28 tool was chosen, as it structurally corresponds to its conceptualisation of motivation. The requirements for adapting research instruments by Hambleton et al. (2005) as well as guidelines of International Test Commission (2017) were implemented. Four language permutations of this tool were created. First, each item was translated in several different versions. Second, backward and forward

translations were applied to identify the version that best matched the original wording of each item. Third, each item was expertly evaluated from the perspective of its cultural acceptability and linguistic intelligibility in each country. At this stage, the authors of the study were in the position of native speakers of the national languages of the four investigated countries (Czech, Slovak, Serbian and Polish). At the same time, the expert assessment of professional translators was used to avoid equivocal translations. Fourth, each language permutation was tested and discussed with several different (according to gender, age, and educational level) members of the target population, after which final adjustments were made.

To continue the adaptation process, four language permutations of the AMS-28 were assembled, preserving the original meaning of its items and factors. The tool consists of 28 items, which are evenly divided into 7 factors (4 items for each factor). The items are sorted alternately so that the individual factors intersect with each other. Only within the analysis is it necessary to link the items to the relevant factors. Respondents indicate on a seven-point scale the extent to which each of the items presently corresponds to one of the reasons why they study in the higher education system (from 1 = does not correspond at all, to 7 = corresponds exactly). An overview of the items in the original English and the four language permutations is presented in Table S1.

The questionnaire was distributed to a convenient sample of the target population (see section *Research sample*) to obtain the data for validation. After data collection was completed, typical psychometric procedures were applied to evaluate construct validity (DeVellis, 2017; Furr, 2018; Roos & Bauldry, 2022). As this is an adapted version of the instrument, which has already been validated in various cultural and institutional contexts and has a strong theoretical background, our analysis was performed on a confirmatory level. This means we did not apply exploratory factor analysis, but only the confirmatory one (to compare with a different approach, see Willner et al., 2023). Using CFA, we first focused on the construct validity of individual factors followed by three hypothetical models of their relations, including all respondents together. After that, the model was evaluated in separate groups (according to country, gender, and age). Finally, MI and the reliability of the tool among predefined groups were also evaluated.

5.1 | Research sample

Students of higher education in the surveyed countries aged 18 to 64 constituted the target population for this study. For this purpose, higher education was defined as ISCED levels 5: short-cycle tertiary education, 6: Bachelor's or equivalent level, 7: Master's or equivalent level, and 8: Doctoral or equivalent level (UNESCO Institute for Statistics, 2012). Data collection was conducted separately in all four countries in the first quarter of 2022. Data were collected through a special web-based platform. The link to the platform, with instructions on how to complete the questionnaire, was disseminated by national research teams using the computer-assisted web interviewing (CAWI) method. The invitation to participate in the research was distributed across countries and targeted schools respecting their geographical breakdown. In the questionnaire, the geographical distribution of the obtained set of respondents was not recorded. The realisation of data collection was disrupted by a wave of the Covid-19 pandemic, and the research team had to compromise on the original plan for a representative dataset. A convenient sample was obtained. Respondents voluntarily participated in data collection respecting that all questionnaire items were set as mandatory, so there are no missing values in the data. The socio-demographic distribution of the sample can be found in Table 1.

Table 1 shows that most of our research sample consists of women under the age of 30 who have already completed their education at the ISCED 6 level (Bachelor). Indicative national distributions of target population according to gender, age and educational level are listed in Table S2. The disproportion of the research sample compared to the population is visible in all countries in terms of gender (79% female), in Serbia and Poland in terms of age (32% older age group). In all countries, a higher representation of bachelor's degree graduates was obtained compared to population data.

TABLE 1 Socio-demographic characteristics of the research sample.

	Country									
	Czechia		Slovakia		Serbia		Poland		Total	
Category/subcategory	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Gender										
Male	129	25.1	98	19.2	105	25.6	23	8.3	355	20.7
Female	385	74.9	413	80.8	305	74.4	253	91.7	1356	79.3
Age										
18–29 years	479	93.2	471	92.2	276	67.3	188	68.1	1414	82.6
30–64 years	35	6.8	40	7.8	134	32.7	88	31.9	297	17.4
Education										
ISCED 3–5	204	39.7	0	0.0[a]	152	37.1	123	44.6	479	28.0
ISCED 6	236	45.9	350	68.5	134	32.7	87	31.5	807	47.2
ISCED 7	73	14.2	120	23.5	95	23.2	62	22.5	350	20.5
ISCED 8	1	0.2	41	8.0	29	7.1	4	1.4	75	4.4
Together	514	30.0	511	29.9	410	24.0	276	16.1	1711	100.0

Note: Countries are listed in descending order of research sample size. Education = the highest level of completed education. ISCED = the International Standard Classification of Education.

[a]In Slovakia, levels ISCED 3–5 and ISCED 6 are merged.

5.2 | Data analyses

All analytical procedures were applied along with judgement criteria according to the SDT framework, as well as the practical usefulness of the instrument. After checking the data, basic descriptive statistics concerning the individual items of the instrument were performed (minimum, maximum, mean, standard deviation, skewness and kurtosis). Based on the recommendations of Olsson et al. (2000), we decided to apply CFA using maximum likelihood (ML) estimation, because "it demonstrates higher accuracy in terms of empirical and theoretical fit compared to the other estimators" (GLS, WLS) and it is less sensitive to variations in sample size and kurtosis. Its application requirements (linearity, multivariate normality, absence of outliers) were checked. More specifically, linearity was assessed by inspection of the inter-correlations matrix for evidence of relationship among the items within each factor and Mardia's coefficients were used to evaluate multivariate normality with a check of the standardised residual values for the presence of outliers.

First, we applied CFA on each factor separately. We obtained detailed insight into the internal factor structure of the instrument. It also helped us to identify covariances between items' error terms and keep them strictly inside each factor. We consider this approach more logical and practical than covariances across factors because, in practice, there may be a need to work only with a part of the tool or only with one factor. Therefore, we consider it useful to present the CFA results for individual factors. After that, the overall fit was tested for three models. Model 1 assumes the existence of seven interrelated factors, each of which is saturated with four items. This model is the closest to the original AMS-28 theoretical concept and it is also most supported by validation studies to date. The other two models reflect SDT in a modified form, but still retain its original logic. Model 2 assumes the existence of three factors, namely Intrinsic motivation (combination of factors F1–F3), Extrinsic motivation (combination of factors F4–F6) and Amotivation (F7). Model 3 combines Model 1 and Model 2 and assumes the existence of three factors, the first two of which are further divided into three sub-factors. A simplified visualisation of all models is in Figure S1. The model with the best model fit was used in further stages of the analysis.

Second, we realised CFA on different groups based on country, gender and age. Third, we realised MI testing for predefined groups mentioned above. To evaluate reliability, traditional Cronbach's α, as well as McDonald's ω, and Gutmann's $\lambda 6$ including 95% confidence intervals were applied to the tool's individual factors, and at the same time, they were applied separately for compared groups of respondents. This approach was based on current criticism of Cronbach's α and discussion on reliability measurements presented by Trizano-Hermosilla and Alvarado (2016) and Malkewitz et al. (2023).

The descriptive analysis was conducted in IBM SPSS 27.0. We used IBM SPSS AMOS 27.0 for the CFA, including MI. JASP 0.16.2.0 was used for the calculation of reliability, because it enables the calculation of not only Cronbach's α, but also McDonald's ω and Gutmann's $\lambda 6$.

6 | RESULTS

Descriptive statistics for all items of the tool can be found in Table S3. The means of all 28 items ranged from 1.85 to 5.70 (on a scale of 1 to 7). The values of the standard deviations (SD) of all items ranged from 1.41 to 1.95. The skewness and kurtosis of most items did not exceed the value of ±2 (Trochim & Donnelly, 2006), suggesting acceptable data dispersion. Two items showed an increased level of kurtosis (I19 = 2.636; I26 = 2.438), both from factor F7 Amotivation. This result was caused by a very low level of agreement with these items ($x_{I19} = 1.847$, $x_{I26} = 1.865$). Both items and the factor were further re-examined for other quality indicators, as presented below.

6.1 | Results of CFA and MI

Regarding the aims of our study, construct validity was evaluated using CFA. The application of this technique made it possible to assess not only the construct validity of the instrument, but also to contribute to the validation of the SDT, on the basis of which the instrument was created. Before application, assumptions for CFA using ML estimation were checked. Linearity was assessed using Pearson's correlations between items within each hypothesised factor (see Table S4). The lowest correlation was recorded within the F2 factor between items I6 and I27 ($r = .284$). With the use of visualisation through a scatter plot and interpolation with different curves, the linear relationship proved to be suitable here as well ($R^2 = .35$ as in the case of the quadratic and cubic curves). The requirement for multivariate normality was evaluated using Mardia's coefficients in IBM SPSS AMOS. Although this requirement was violated, its compliance appears debatable, and it should not have a major impact on the quality of the analysis based on ML when applied to larger datasets numbering hundreds of units (Finch et al., 1997; Kline, 2011). Mahalanobis distance was computed for the detection of outliers. A detailed examination of the results indicated the existence of outliers ($n = 99$; 5.7%). We decided to keep them in the data because they represent the natural variability of the investigated entity. Based on a discussion presented by Xia and Yang (2019), the comparative fit index (CFI), Tucker–Lewis index (TLI), and root mean square error of approximation (RMSEA) were applied to assess the model's goodness of fit. The cut-offs for the CFI and TLI indices were set at a value higher than 0.90, and the RMSEA cut-off point was set to an upper limit of 0.08, suggesting a reasonable and applicable model-data fit. Results of CFA and MI are further presented in three steps, which logically follow from each other.

Step 1 involved verifying the construct validity of individual factors and their modification, leading to the achievement of acceptable statistical as well as practical quality parameters. The modifications were judged and made to keep with the theory and maintain the original content validity of the tool. We have only intervened in covariances between items' error terms inside individual factors with a similar focus. These modifications were made in four factors, as shown in Table 2.

Looking at the CFA results for individual factors in Table S5, we see that all the factors meet all required criteria of the statistical quality parameters; most of them are close to perfect. However, this is partly due to the fact that the models of individual factors are simple and small. All factors of the model work independently so they can be applied and interpreted separately, which is important for the practical usage of the tool. It also means that they form a functional basis for a more complex model.

Step 1 also included the evaluation of the overall model fit for three hypothetical models defined above. Pearson correlations among all the tool's factors were inspected using Cohen's (1988) conventions for interpreting

TABLE 2 Covariances between items' error terms.

Factor	Items	Labels
F2	I6 + I27	I6: For the pleasure I experience while surpassing myself in my studies I27: Because college (CEGEP) allows me to experience a personal satisfaction in my quest for excellence in my studies
F4	I3 + I10	I3: Because I think that a college (CEGEP) education will help me better prepare for the career I have chosen I10: Because eventually it will enable me to enter the job market in a field that I like
F5	I14 + I21	I14: Because of the fact that when I succeed in college (CEGEP) I feel important I21: To show myself that I am an intelligent person
F7	I5 + I12	I5: Honestly, I don't know; I really feel that I am wasting my time in school I12: I once had good reasons for going to college (CEGEP); however, now I wonder whether I should continue

TABLE 3 Pearson correlations among factors of the AMS-28.

Factor	F2	F3	F4	F5	F6	F7
F1	.742**	.798**	.517**	.264**	.154**	−.444**
F2		.729**	.519**	.504**	.277**	−.350**
F3			.434**	.303**	.160**	−.296**
F4				.325**	.569**	−.406**
F5					.511**	−.002
F6						−.048*

**Correlation is significant at the .01 level (2-tailed). *Correlation is significant at the .05 level (2-tailed).

TABLE 4 Results of CFA for three hypothetical models of AMS-28.

Model	No	x^2	*df*	CFI	TLI	RMSEA
Model 1 (7 factors)	28	2248.068	325	0.933	0.923	0.059
Model 2 (3 factors)	28	5854.436	343	0.809	0.790	0.097
Model 3 (2 second-order factors and 7 factors)	28	3319.164	337	0.897	0.884	0.072

Abbreviations: CFI, comparative fit index; *df*, degrees of freedom; No, number of items; RMSEA, root mean square error of approximation; TLI, Tucker–Lewis index; x^2, value of the chi-square test.

their sizes ($r = .1$ small; $r = .3$ medium; $r = .5$ large). As shown in Table 3, the largest correlations are among F1, F2 and F3 (all factors regarding intrinsic motivation). Correlations among F4, F5 and F6 regarding extrinsic motivation are moderate to large. F1 to F6 correlate negatively with F7 (Amotivation); most of these correlations are moderate.

Correlation analysis indicated that considerations of the existence of three theoretical models (Model 1–Model 3) analytically make sense. Therefore, we proceeded to verify them using CFA. The results are presented in Table 4 with visualisation included in Figure S1.

The model fit indicators clearly show that Model 1 meets the above requirements and best fits the data base (CFI = 0.933; TLI = 0.923; RMSEA = 0,059), so it can be applied as a basis for further analytical steps. A detailed visualisation of Model 1 is in Figure S2.

Step 2 included testing the default model in separate predefined groups of respondents. We distinguished four countries (Czechia, Slovakia, Serbia, Poland), two gender groups (women, men), and two age groups (ages 18–29 representing a significant majority of younger participants in higher education, ages 30–64 years representing a relatively small group of so called non-traditional older participants). The results can be found in Table 5.

As shown in Table 5, the default model works well according to predefined statistical quality parameters in almost all subgroups of respondents. The default model in the Male subgroup is on the verge of acceptability due to the relatively small value of TLI (0.898), but its other parameters are acceptable. The default model in the Poland subgroup is weak in two parameters (CFI = 0.881, TLI = 0.861) and the values are relatively well below the acceptance limit. For this reason, the subgroup Poland was not included in the analysis of MI among countries in the next step, because here, the unsatisfactory results would show up again and would have a devaluing effect on the next stages of the analysis. At this point of the analysis, it was irrelevant to compare the model for Poland with other countries in terms of MI. Given the satisfactory results of other groups and in an effort to preserve the original content validity of the tool, it seemed logical to exclude Poland from further analyses. A separate in-depth analysis for Poland will be needed as part of a separate study.

Step 3 included evaluation of MI on three levels (Putnick & Bornstein, 2016; Xu & Tracey, 2017): configural (a qualitatively invariant measurement pattern of factors; loadings and intercepts freely estimated), metric (a quantitatively invariant measurement model of factors; loadings equal and intercepts freely estimated) and scalar (the invariant mean levels of item intercepts; loadings as well as intercepts equal across groups). The higher the level

TABLE 5 Results of CFA for the default model in separate groups.

Groups and subgroups	*n*	No	x^2	*df*	CFI	TLI	RMSEA
Country							
Czechia	514	28	968.491	325	0.933	0.922	0.062
Slovakia	511	28	876.127	325	0.936	0.926	0.058
Serbia	410	28	951.119	325	0.921	0.908	0.069
Poland	276	28	828.653	325	0.881	0.861	0.075
Gender							
Female	1356	28	1887.105	325	0.932	0.921	0.060
Male	355	28	848.555	325	0.912	0.898	0.067
Age							
18–29 years	1414	28	1977.875	325	0.930	0.919	0.060
30–64 years	297	28	2248.068	325	0.933	0.923	0.059

Note: Subgroups are sorted in descending order of statistical model quality parameters.

Abbreviations: CFI, comparative fit index; *df*, degrees of freedom; *n*, sample size of each group; No, number of items; RMSEA, root mean square error of approximation; TLI, Tucker–Lewis index; x^2, value of the chi-square test.

of MI, the stricter the degree of conformity of the tested model across groups, and the higher the degree of their comparability. The results are shown in Table 6.

In line with Cheung and Rensvold (2002), the differences among the values of CFI were used to interpret the results (with values lower than 0.01 considered a sign of invariance). According to this rule, the instrument is measurement invariant among three countries up to the metric level, among two groups of gender up to the scalar level and among two groups of age up to the scalar level. Although the obtained results can be considered satisfactory, we also addressed the question of how to increase the level of MI across countries from metric to scalar level. Comparison of parameter estimates of individual items among countries, as well as inspection of modification indices and any partial changes to the model (intended to keep its original content validity) did not bring the required conclusion. We have also conducted this analysis for all possible pairs of the three countries included in MI analysis (Czechia and Slovakia, Czechia and Serbia, Slovakia and Serbia). All these combinations can be assumed to be measurement invariant on the metric level. The strongest result, which almost reached the scalar level of MI, was between Czechia and Slovakia. For complete results, see Table 7.

6.2 | Results of reliability

We have evaluated reliability of each factor separately in each of the compared groups (four countries, two genders, two age groups). The results for all groups can be found in Table S6. Overall, all factors of the instrument in all monitored groups show a satisfactory level of reliability (all coefficients above .7). In all groups, this limit is also met at the lower bound of the confidence interval, except for factors F4 and F7 in Poland, where the values are slightly below the acceptable level.

7 | DISCUSSION AND CONCLUSION

The results of our study identify new places on the world map where AMS-28 is functional and thus expand the space for its application with the possibility of international comparison of results. The tool appears functional in

TABLE 6 Measurement invariance of the AMS-28 for predefined groups.

Grouping variable	Level of invariance	No	x^2	*df*	CFI	ΔCFI	TLI	RMSEA
Country	Configural	28	2795.81	975	0.93		0.919	0.036
	Metric	28	2880.759	1017	0.929	−0.001	0.921	0.036
	Scalar	28	3711.521	1073	0.899	−0.03	0.893	0.041
Gender	Configural	28	2736.248	650	0.928		0.916	0.043
	Metric	28	2778.363	671	0.927	−0.001	0.918	0.043
	Scalar	28	2847.732	699	0.926	−0.001	0.92	0.042
Age	Configural	28	2745.089	650	0.928		0.916	0.043
	Metric	28	2802.448	671	0.926	−0.002	0.917	0.043
	Scalar	28	2999.702	699	0.921	−0.005	0.914	0.044

Abbreviations: CFI, comparative fit index; *df*, degrees of freedom; No, number of items; RMSEA, root mean square error of approximation; TLI, Tucker–Lewis index; x^2, value of the chi-square test; ΔCFI, the difference of CFI between the current and previous level of measurement invariance.

TABLE 7 Measurement invariance of AMS-28 across pairs of countries.

Pair of countries	Level of invariance	No	x^2	*df*	CFI	ΔCFI	TLI	RMSEA
Slovakia + Czechia	Configural	28	1844.617	650	0.935		0.924	0.042
	Metric	28	1875.457	671	0.934	−0.001	0.926	0.042
	Scalar	28	2120.596	699	0.922	−0.012	0.916	0.045
Slovakia + Serbia	Configural	28	1827.312	650	0.929		0.917	0.044
	Metric	28	1869.954	671	0.928	−0.001	0.918	0.044
	Scalar	28	2400.811	699	0.897	−0.031	0.889	0.051
Czechia + Serbia	Configural	28	1919.658	650	0.928		0.916	0.046
	Metric	28	1975.309	671	0.926	−0.002	0.916	0.046
	Scalar	28	2526.882	699	0.896	−0.030	0.887	0.053

Note: Pairs of countries are sorted in descending order of model quality parameters.

Abbreviations: CFI, comparative fit index; *df*, degrees of freedom; No, number of items; RMSEA, root mean square error of approximation; TLI, Tucker–Lewis index; x^2, value of the chi-square test; ΔCFI, the difference of CFI between the current and previous level of measurement invariance.

time (it has been used for 30 years), in space (Anglophone and Hispanophone countries, as well as Greece) and in its various language mutations. In the studies cited here so far, the evidence supporting the seven-factor concept of this instrument with the use of CFA prevails. However, the studies also contain various limits that must be taken into account (limited representativeness and size of the tested samples, not fully filled model fit parameters, etc.). Considering how long and how widely the tool appears to be functional, we are convinced that it is a high-quality, multi-validated and consistent construct.

Concerning the primary aim of this unique cross-cultural study, we state that under the conditions of the implementation of our study on a convenient sample, the AMS-28 meets the commonly observed requirements for construct validity and reliability for learners outside Anglophone (Cokley, 2015; Fairchild et al., 2005) and Hispanophone countries (Núñez et al., 2010, 2005; Stover et al., 2012). Therefore, it can potentially be applied in other Eastern European countries (e.g., Hungary, Latvia, or Romania). Our results strongly correspond to the theoretical basis of SDT (Deci & Ryan, 2017; Ryan & Deci, 2000; Vallerand et al., 1993, 1994). SDT, the AMS-28 research instrument, and our current empirical evidence from selected Eastern European countries are consistent.

From the point of view of the international research team participating in this study, there was no modification of the instrument that would affect its original structure and content validity as well as reliability, including four language permutations of the instrument. Our results did not lead to any modification of the focus, number, or structure of the items, nor the focus, number, or structure of the factors of AMS-28. We have found that the tool is robust in its application as a whole, as well as in the case of all individual factors. This finding strongly but not unconditionally supports the frequently discussed assumption of SDT that the structure of motivation is culturally invariant (Ryan & Deci, 2019). We have identified the largest correlations between factors representing intrinsic motivations (F1–F3), while the correlations among factors representing extrinsic motivation (F4–F6) were moderate to large. This result corresponds with the assumption of a more heterogenous structure of extrinsic motivation (Ryan & Deci, 2000). Hand in hand with the theory, there are also negative correlations of F7 (Amotivation) with all other factors (Vallerand et al., 1992). At least in the Eastern European context, the motives of adult learners mostly correspond to the central arguments of SDT.

However, it should be recalled that our study includes Poland, for which the default model is not entirely appropriate. This could be caused by two interconnected reasons: (1) given that adults in Poland generally hold more conservative values (Inglehart et al., 2004), their perception of academic motivation may distinctly differ. They might view their involvement in higher education more as a duty or traditional obligation, which could affect their recognition of various intrinsic motivations as being less relevant; (2) this difference in perception might be further accentuated by the specific composition of the Polish sample, which predominantly consists of women, who are generally more conservative (Inglehart et al., 2004), setting it apart from the samples in the other three countries.

To increase the comparability of international results obtained with the use of the AMS-28, one possibility is proceeding to a modification of the tool in the sense of reducing items or factors, or merging factors, because a simpler model could possibly suit a wider range of groups. However, this modification should not lead to a deviation from the original theory, which according to our results appears to be functional among most countries. Another way might be based on the application of so-called anchoring vignettes (for more, see Vonkova et al., 2018).

Our analysis of the tool's measurement invariance led to a predominantly satisfactory result. The tool is measurement invariant according to both gender and age up to the scalar level. At this level, it practically allows multi-group comparisons of latent constructs (e.g., *t*-tests or ANOVA). Applied to three countries (Poland was excluded from this analysis due to the insufficient quality of the default model), the tool is measurement invariant up to the metric level that allows researchers to substantiate multi-group comparisons of factor variances and covariances. Only the combination of two countries, Czechia and Slovakia, almost reached the scalar level. This result is not surprising because these two countries are very close from the perspective of history (they were part of one state from 1918 to 1993, with an interruption during World War II), geography (they are neighbouring countries), and language (their languages are very similar).

7.1 | Limitations and directions for future research

Although the original intention was to create four national quota samples representative in terms of gender and level of education attended, due to technical complications and low response rate (probably because of the escalating wave of the coronavirus pandemic), it was essential to provide a convenient sample. It is usually recommended to apply CFA to representative samples from the population as a confirmatory technique. However, it is often applied to convenient or intentional (and thus differently deviated) samples (Decius et al., 2022; Gjesfjeld et al., 2008; Grassi-Oliveira et al., 2014; Lietz et al., 2011; Yan & Lyndon, 2021). The collection of data during the pandemic period could also have caused a certain shift in the results due to the specific situation of the persons examined (as discussed by Fridkin et al., 2023). However, our results do not suggest this.

The relatively small size of our sample played its role in our analytical approach, since we decided to work with groups of gender and age only within the sample as a whole ($n = 1711$), not within each country separately. The smallest sample was gathered in Poland ($n = 276$), but it meets the basic sample size recommendations when implementing CFA—a sample size over 200 with fewer than 40 items in the model and no missing data, as discussed by Kyriazos (2018).

Our analytical approach is strongly based on CFA, which is consistent with other current studies in this area (Akoto, 2014; Barkoukis et al., 2008; Bennett & Ananthram, 2022; Chong & Ahmed, 2012; Dremova et al., 2023; Esposito et al., 2022). However, it should be emphasised that this technique is applicable to assess the construct validity of instruments (not validity in the general sense). This study is not aimed at evaluating other types of validity. Other studies validating AMS-28 also refer to other types of validity; for example, Barkoukis et al. (2008) contain factorial, concurrent and predictive validity, and Fairchild et al. (2005) convergent and discriminant validity of AMS-28. In this context, it is also important to note, that there is no universal valid scale. Validity, as well as reliability, cannot be proven once and for all; it must be repeatedly evaluated. Each scale's validity is contingent on its intended uses and interpretations.

Future research should focus on the adaptation and validation of the AMS-28 in a wider socio-cultural context (other language mutations, other specific target groups, other educational settings). Based on our results, the connection between SDT and AMS-28 appears to be theoretically strong and practically functional. However, further attention should be paid to broader aspects of validity as well as MI across different cultural groups in order to be able to minimise measurement errors in their comparisons. In higher education, this is relevant, for example, in study programmes conferred by two or more accredited institutions from different countries.

Results of AMS-28, in practice, can help to provide suitable individual study plans, or to early identify those, who (despite satisfactory results) are considering dropping out. Aggregated results can help to identify clusters of students showing similar types of motivation and their possible evolution over time. We consider it appropriate to apply AMS-28 simultaneously with other tools created and validated for the purposes of student counselling as well as quality evaluation in higher education, for example, Student engagement scale (Tadesse et al., 2018), which can lead to a positive synergistic effect.

AUTHOR CONTRIBUTIONS

Ilona Kočvarová: Writing – original draft; methodology; validation; visualization; writing – review and editing; software; formal analysis; project administration; data curation; supervision; resources; investigation; conceptualization. **Jan Kalenda:** Funding acquisition; conceptualization; investigation; writing – original draft; writing – review and editing; project administration; supervision; formal analysis. **Jitka Vaculíková:** Conceptualization; investigation; writing – original draft; writing – review and editing; validation. **Zuzana Neupauer:** Conceptualization; investigation; funding acquisition; project administration; supervision. **Ruženka Šimonji Černak:** Conceptualization; funding acquisition; project administration; supervision; investigation. **Anna Włoch:** Conceptualization; investigation; funding acquisition; project administration; supervision.

ACKNOWLEDGEMENTS

Open access publishing facilitated by Univerzita Tomase Bati ve Zline, as part of the Wiley - CzechELib agreement.

FUNDING INFORMATION

This article was researched and written with the kind financial support of the DANUBE project "Development of new andragogical diagnostic approaches and interventions of the adult docility phenomenon", project number 2020-1-SK01-KA204-078313.

CONFLICT OF INTEREST STATEMENT

The authors declare no actual or potential conflicts of interest with respect to the research, authorship, or publication of this article.

DATA AVAILABILITY STATEMENT

The dataset analysed in this study is available online: https://owncloud.cesnet.cz/index.php/s/jSUgn7XjCWbW28z.

ETHICS STATEMENT

Data collection and data analysis follow ethical principles of research, respecting the ICC/ESOMAR International Code (ESOMAR, 2016). The principle of anonymity keeps participants anonymous and the researchers emphasised voluntary participation and informed consent throughout the study. Participants were informed about the aims of the research and that the given information would be treated confidentially. Furthermore, grant-project reviewers evaluated the grant proposals with respect to their ethical implications and assured the safety and rights of participants.

ORCID

Ilona Kočvarová https://orcid.org/0000-0002-7070-7998

REFERENCES

Akoto, E. (2014). Cross-cultural factorial validity of the academic motivation scale. *Cross Cultural Management: An International Journal*, *21*(1), 104–125. https://doi.org/10.1108/CCM-11-2011-0100

Albert, V. C., García-Serrano, C., & Hernanz, V. (2010). On-the-job training in Europe: Determinants and wage returns. *International Labour Review*, *149*(3), 315–341. https://doi.org/10.1111/j.1564-913X.2010.00089.x

Baert, H., De Rick, K., & Van Valckenborgh, K. (2006). Towards the conceptualisation of learning climate. In R. Vieira de Castro, A. V. Sancho, & V. Guimaraes (Eds.), *Adult education: New routes new landscapes* (pp. 87–111). University de Minho.

Barkoukis, V., Tsorbatzoudis, H., Grouios, G., & Sideridis, G. (2008). The assessment of intrinsic and extrinsic motivation and amotivation: Validity and reliability of the Greek version of the academic motivation scale. *Assessment in Education: Principles, Policy and Practice*, *15*(1), 39–55. https://doi.org/10.1080/09695940701876128

Bennett, D., & Ananthram, S. (2022). Development, validation and deployment of the EmployABILITY scale. *Studies in Higher Education*, *47*(7), 1311–1325. https://doi.org/10.1080/03075079.2021.1888079

Blunt, A., & Yang, B. (2002). Factor structure of the adult attitudes toward adult and continuing education scale and its capacity to predict participation behaviour: Evidence for adoption of a revised scale. *Adult Education Quarterly*, *52*(4), 299–314. https://doi.org/10.1177/074171302400448627

Boeren, E. (2011). Gender differences in formal, non-formal and informal adult learning. *Studies in Continuing Education*, *33*(3), 333–346. https://doi.org/10.1080/0158037X.2011.610301

Boeren, E. (2016). *Lifelong learning participation in a changing policy context. An interdisciplinary theory*. Palgrave Macmillan.

Boeren, E. (2018). The methodological underdog: A review of quantitative research in the key adult education journals. *Adult Education Quarterly*, *68*(1), 63–79. https://doi.org/10.1177/0741713617739347

Boeren, E. (2019). Quantitative research in research on the education and learning of adults. In A. Fejes & E. Nylander (Eds.), *Mapping out the research field of adult education and learning* (pp. 139–155). Springer.

Boeren, E., Holford, J., Nicaise, I., & Baert, H. (2012). Why do adults learn? Developing motivational typology across twelve European countries. *Globalisation, Societies and Education*, *10*(2), 247–269. https://doi.org/10.1080/14767724.2012.678764

Boeren, E., Nicaise, I., Roosmaa, E. L., & Saar, E. (2012). Formal adult education in the spotlight: Profiles, motivation, and experiences of participants in 12 countries. In S. Riddel, J. Markowitsch, & E. Weeden (Eds.), *Lifelong learning in Europe: Equality and efficiency in balance* (pp. 63–86). Polity Press.

Boshier, R. (1971). Motivational orientations of adult education participants: A factor analytic exploration of Houle's typology. *Adult Education*, *21*(2), 3–26. https://doi.org/10.1177/074171367102100201

Boshier, R. (1977). Motivational orientations re-visited: Life-space motives and the education participation scale. *Adult Education Quarterly*, *27*(2), 89–115. https://doi.org/10.1177/074171367702700202

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling*, *9*(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5

Chong, Y. S., & Ahmed, P. K. (2012). Understanding student motivation in higher education participation: A psychometric validation of the academic motivation scale in the Malaysian context. In C. Dan (Ed.), *International proceedings of economics development and research* (pp. 118–122). International Association of Computer Science and Information Technology.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge. https://doi.org/10.4324/9780203771587

Cokley, K. (2015). A confirmatory factor analysis of the academic motivation scale with black college students. *Measurement and Evaluation in Counseling and Development*, *48*, 124–139. https://doi.org/10.1177/0748175614563316

Côté, J. E., & Levine, C. G. (2000). Attitude versus aptitude: Is intelligence or motivation more important for positive higher-educational outcomes? *Journal of Adolescence Research*, *15*(1), 58–80. https://doi.org/10.1177/0743558400151004

Courtney, S. (1992). *Why do adults learn? Towards a theory of participation in adult education*. Routledge.

Deci, E. L., & Ryan, R. M. (2017). *Self-determination theory. Basic psychological needs in motivation, development and wellness*. The Guilford Press.

Decius, J., Dannowsky, J., & Schaper, N. (2022). The casual within the formal: A model and measure of informal learning in higher education. *Active Learning in Higher Education*, 1–22. https://doi.org/10.1177/14697874221087427

Desjardins, P. (2020). *PIAAC thematic report on adult learning*. OECD Education Working Paper No. 223. OECD.

DeVellis, R. F. (2017). *Scale development: Theory and applications* (4th ed.). Sage.

Dremova, O., Maloshonok, M., Terentev, E., & Federiakin, D. (2023). Criticism and justification of undergraduate academic dishonesty: Development and validation of the domestic, market and industrial orders of worth scales. *European Journal of Higher Education*, *13*(1), 44–61. https://doi.org/10.1080/21568235.2021.1987287

Esposito, G., Marôco, J., Passeggia, R., Pepicelli, G., & Freda, M. F. (2022). The Italian validation of the university student engagement inventory. *European Journal of Higher Education*, *12*(1), 35–55. https://doi.org/10.1080/21568235.2021.1875018

Fairchild, A. J., Horst, S. J., Finney, S. J., & Barron, K. E. (2005). Evaluating existing and new validity evidence for the academic motivation scale. *Contemporary Educational Psychology*, *30*(3), 331–358. https://doi.org/10.1016/j.cedpsych.2004.11.001

Field, J. (2012). Is lifelong learning making a difference? Research-based evidence on the impact of adult learning. In D. Aspin, J. Chapman, K. Evans, & R. Bagnall (Eds.), *Second international handbook of lifelong learning* (pp. 887–897). Springer.

Finch, J. F., West, S. H., & MacKinnon, D. P. (1997). Effects of sample size and nonnormality on the estimation of mediated effects in latent variable models. *Structural Equation Modeling: A Multidisciplinary Journal*, *4*(2), 87–107. https://doi.org/10.1080/10705519709540063

Fridkin, L., Fonts, N. B., Quy, K., & Zwiener-Collins, N. (2023). Understanding effects of COVID-19 on undergraduate academic stress, motivation and coping over time. *Higher Education Quarterly*, *77*, 1–15. https://doi.org/10.1111/hequ.12425

Fulmer, S., & Frijters, J. (2009). A review of self-report and alternative approaches in the measurement of student motivation. *Educational Psychology Review*, *21*, 219–246. https://doi.org/10.1007/s10648-009-9107-x

Furr, R. M. (2018). *Psychometrics: An introduction* (3rd ed.). Sage.

Gagné, M., Forest, J., Vansteenkiste, M., Crevier-Braud, L., Van den Broeck, A., Aspeli, A., Bellerose, J., Benabou, C., Güntert, S. T., Halvari, H., Indiyastuti, D. L., Johnson, P. A., Molstad, M. H., Naudin, M., Ndao, A., Olafsen, A. H., Roussel, P., Wang, Z., & Westbye, C. (2014). The multidimensional work motivation scale: Validation evidence in seven languages and nine countries. *European Journal of Work and Organizational Psychology*, *24*(2), 178–196. https://doi.org/10.1080/1359432X.2013.877892

Gjesfjeld, C. D., Greeno, C. G., & Kim, K. H. (2008). A confirmatory factor analysis of an abbreviated social support instrument: The MOS-SSS. *Research on Social Work Practice*, *18*(3), 231–237. https://doi.org/10.1177/1049731507309830

Grassi-Oliveira, R., Cogo-Moreira, H., Salum, G. A., Brietzke, E., Viola, T. W., Manfro, G. G., Kristensen, C. H., & Arteche, A. X. (2014). Childhood trauma questionnaire (CTQ) in Brazilian samples of different age groups: Findings from confirmatory factor analysis. *PLoS One*, *9*(1), e87118. https://doi.org/10.1371/journal.pone.0087118

Grotlüschen, A., Buddeberg, K., Redmer, A., Ansen, H., & Dannath, J. (2019). Vulnerable subgroups and numeracy practices: How poverty, debt, and unemployment relate to everyday numeracy practices. *Adult Education Quarterly*, *69*(4), 251–270. https://doi.org/10.1177/0741713619841132

Hambleton, R. K., Merenda, P. F., & Spielberger, C. D. (Eds.). (2005). *Adapting educational and psychological tests for cross-cultural assessment*. Psychology Press.

Houle, C. O. (1961). *The inquiring mind*. The University of Wisconsin Press.

Howard, J. L., Gagné, M., & Bureua, J. S. (2017). Testing a continuum structure of self-determined motivation. A meta-analysis. *Psychological Bulletin*, *143*(2), 1343–1377. https://doi.org/10.1037/bul0000125

ILO. (2021). *Digitalisation of TVET and skills development: Leveraging technology to support lifelong learning. Policy Brief*. International Labour Organisation.

Inglehart, R., Basáñes, M., Diez-Medrano, J., Halman, L., & Luikx, D. (Eds.). (2004). *Human beliefs and values: A cross-cultural sourcebook based on the 1999–2002 values surveys*. Singlo veitiuno editores.

International Test Commission. (2017). The ITC guidelines for translating and adapting tests (2nd ed.). https://www.intestcom.org

Isaac, E., Guy, T., & Valentine, T. (2001). Understanding African American learners' motivations to learn in church-based adult education. *Adult Education Quarterly*, *52*(1), 23–38. https://doi.org/10.1177/07417130122087377

Jansen, M., Lüdtke, O., & Schroeders, U. (2016). Evidence for positive relationship between interest and achievement: Examining between-person and within-person variations in five domains. *Contemporary Educational Psychology*, *46*, 116–127. https://doi.org/10.1016/j.cedpsych.2016.05.004

Kalenda, J., & Kočvarová, I. (2022). Why do not they participate? Reasons for non-participation in adult learning and education from the viewpoint of self-determination theory. *Journal of European Research of Learning and Education of Adults*, *13*(2), 193–208. https://doi.org/10.3384/rela.2000-7426.3535

Kline, R. B. (2011). *Principles and practice of structural equation modeling*. Guilford Press.

Krstić, J., Ergić, T., Gardović, M., Aćimović, K. M., & Žarić, T. (2022). *Visoko obrazovanje 2021/2022*. Republički zavod za statistiku.

Kyndt, E., Raes, E., Dochy, F., & Janssens, E. (2013). Approaches to learning at work: Investigating work motivation, workload and choice independence. *Journal of Career Development*, *40*(4), 271–291. https://doi.org/10.1177/0894845312450776

Kyriazos, T. (2018). Applied psychometrics: Sample size and sample power considerations in factor analysis (EFA, CFA) and SEM in general. *Psychology*, *9*(8), 2207–2230. https://doi.org/10.4236/psych.2018.98126

Lietz, C. A., Gerdes, K. E., Sun, F., Geiger, J. M., Wagaman, M. A., & Segal, E. A. (2011). The empathy assessment index (EAI): A confirmatory factor analysis of a multidimensional model of empathy. *Journal of the Society for Social Work and Research*, *2*(2), 104–124. https://doi.org/10.5243/jsswr.2011.6

Malkewitz, C. P., Schwall, P., Meesters, C., & Hardt, J. (2023). Estimating reliability: A comparison of Cronbach's α, McDonald's ω_t and the greatest lower bound. *Social Sciences & Humanities Open*, *7*(1), 100368. https://doi.org/10.1016/j.ssaho.2022.100368

Merriam, S. B., & Baumgartner, L. M. (2020). *Learning in adulthood. A comprehensive guide*. John Wiley & Sons.

Ministerstvo školstva, vedy, výskumu a športu Slovenskej republiky (MŠVVaŠ SR). (2023). *Výročné správy o stave vysokého školstva*. https://www.minedu.sk/vyrocne-spravy-o-stave-vysokeho-skolstva/

Ministerstvo školství, mládeže a tělovýchovy (MŠMT). (2022). *Data o studentech, poprvé zapsaných a absolventech vysokých škol*. https://www.msmt.cz/vzdelavani/skolstvi-v-cr/statistika-skolstvi/data-o-studentech-poprve-zapsanych-a-absolventech-vysokych?lang=1

Mulenga, D., & Liang, J. S. (2008). Motivations for older adults' participation in distance education: A study at the National Open University of Taiwan. *International Journal of Lifelong Education*, *27*(3), 289–314. https://doi.org/10.1080/02601370802047791

Núñez, J. L., Martín-Albo, J., & Navarro, J. G. (2005). Validación de la versión española de la Ëchelle de Motivation en Éducation. *Psicothema*, *17*(2), 334–349. https://www.redalyc.org/pdf/727/72717225.pdf

Núñez, J. L., Martín-Albo, J., Navarro, J. G., & Suárez, Z. (2010). Adaptación y validación de la versión española de la Escala de Motivación Educativa en estudiantes de educación secundaria postobligatoria. *Estudios de Psicología*, *31*(1), 89–100. https://doi.org/10.1174/021093910790744590

Olsson, U., Foss, T., Troye, S., & Howell, R. (2000). The performance of ML, GLS, and WLS estimation in structural equation modeling under conditions of misspecification and nonnormality. *Structural Equation Modeling: A Multidisciplinary Journal*, *7*(4), 557–595. https://doi.org/10.1207/S15328007SEM0704_3

Psacharopoulos, G. P. (2006). The value of investment in education: Theory, evidence and policy. *Journal of Education Finance*, *32*(2), 113–126. https://doi.org/10.1007/978-94-6209-794-0_8

Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review: Perspectives in Behavior and Cognition*, *41*, 71–90. https://doi.org/10.1016/j.dr.2016.06.004

Ratelle, C. F., Guay, F., Vallerand, R. J., Larose, S., & Senécal, C. (2007). Autonomous, controlled, and amotivated types of academic motivation: A person-oriented analysis. *Journal of Educational Psychology*, *99*(4), 734–746. https://doi.org/10.1037/0022-0663.99.4.734

Renniger, K., & Hidi, S. E. (2019). *The Cambridge handbook of motivation and learning*. Cambridge University Press.

Roos, M. J., & Bauldry, S. (2022). *Confirmatory factor analysis*. Sage.

Rothes, A., Lemos, M. S., & Gonçalves, T. (2014). Motives and beliefs of learners enrolled in adult education. *Procedia-Social and Behavioral Sciences*, *112*, 939–948. https://doi.org/10.1016/j.sbspro.2014.01.1252

Rubenson, K. (2018). Conceptualising participation in adult learning and education. Equity issues. In M. Milana (Ed.), *The Palgrave international handbook on adult and lifelong education and learning* (1st ed., pp. 337–357). Palgrave Macmillan. https://doi.org/10.1057/978-1-137-55783-4_18

Rubenson, K., & Elfert, M. (2019). Examining the "weak field" of adult education. In A. Fejes & E. Nylander (Eds.), *Mapping out the research field of adult education and learning* (pp. 15–31). Springer.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1), 54–67. https://doi.org/10.1006/ceps.1999.1020

Ryan, R. M., & Deci, E. L. (2019). Brick by brick: The origins, development, and the future of self-determination theory. In A. J. Elliot (Ed.), *Advances in motivation science* (pp. 111–156). MA Elsevier Inc.

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, *61*, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Schuetze, H. G., & Slowey, M. (2002). Participation and exclusion: A comparative analysis of non-traditional students and lifelong learners in higher education. *Higher Education*, *44*(3/4), 309–327.

Stover, J. B., de la Iglesia, G., Rial Boubeta, A., & Fernandez Liporace, M. (2012). Academic motivation scale: Adaptation and psychometric analyses for high school and college students. *Psychology Research and Behavior Management*, *5*, 71–83. https://doi.org/10.2147/PRBM.S33188

Tadesse, T., Manathunga, C., & Gillies, R. M. (2018). The development and validation of the student engagement scale in an Ethiopian university context. *Higher Education Research & Development*, *37*(1), 188–205.

Trizano-Hermosilla, I., & Alvarado, J. M. (2016). Best alternatives to Cronbach's alpha reliability in realistic conditions: Congeneric and asymmetrical measurements. *Frontiers in Psychology*, *26*(7). https://doi.org/10.3389/fpsyg.2016.00769

Trochim, W. M., & Donnelly, J. P. (2006). *The research methods knowledge base* (3rd ed.). Atomic Dog.

UNESCO Institute for Statistics. (2012). *International Standard Classification of Education ISCED 2011*. https://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en.pdf

Urząd Statystyczny w Gdańsku. (2021). *Szkolnictwo wyższe w roku akademickim 2022/2023 (wyniki wstępne)*. https://stat.gov.pl/files/gfx/portalinformacyjny/pl/defaultaktualnosci/5488/8/9/1/szkolnictwo_wyzsze_w_roku_akademickim_2022-2023_-_wyniki_wstepne.pdf

Vaculíková, J., Kalenda, J., & Kočvarová, I. (2020). Hidden gender differences in formal and non-formal adult education. *Studies in Continuing Education*, *43*(1), 1–15. https://doi.org/10.1080/0158037X.2020.1732334

Vallerand, R. J., Gagné, F., Senécal, C., & Pelletier, L. G. (1994). A comparison of the school intrinsic and perceived competence of gifted and regular students. *Gifted Child Quarterly*, *38*(4), 172–175. https://doi.org/10.1177/001698629403800403

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Briere, N. M., Senécal, C., & Vallierès, E. F. (1992). The academic motivation scale: A measure of intrinsic, extrinsic, and amotivation in education. *Educational Psychology Measurement*, *52*(4), 1003–1017. https://doi.org/10.1177/0013164492052004025

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Briere, N. M., Senécal, C., & Valliers, E. F. (1993). On the assessment of intrinsic, extrinsic, and amotivation in education: Evidence on the concurrent and construct validity of the academic motivation scale. *Educational and Psychological Measurement*, *53*(1), 159–172. https://doi.org/10.1177/0013164493053001018

Vonkova, H., Zamarro, G., & Hitt, C. (2018). Cross-country heterogeneity in students' reporting behavior: The use of the anchoring vignette method. *Journal of Educational Measurement*, *55*(1), 3–31. https://doi.org/10.1111/jedm.12161

Vroom, V. H. (1964). *Work and motivation*. Wiley.

Wheeler, S. (2019). *Digital learning in organizations. Help your workforce capitalize on technology*. Kogan Page.

Willner, T., Lipshits-Braziler, Y., & Gati, I. (2023). Construction and initial validation of the higher education orientations questionnaire. *Journal of Career Assessment*, *31*(1), 85–108. https://doi.org/10.1177/10690727221090621

Xia, Y., & Yang, Y. (2019). RMSEA, CFI, and TLI in structural equation modeling with ordered categorical data: The story they tell depends on the estimation methods. *Behavior Research Methods*, *51*, 409–428. https://doi.org/10.3758/s13428-018-1055-2

Xu, H., & Tracey, T. (2017). Use of multi-group confirmatory factor analysis in examining measurement invariance in counselling psychology research. *The European Journal of Counselling Psychology*, *6*(1), 75–82. https://doi.org/10.5964/ejcop.v6i1.120

Yan, Y. H., & Lyndon, L. (2021). Targeting student learning needs: The development and preliminary validation of the learning needs questionnaire for a diverse university student population. *Higher Education Research & Development*, *40*(7), 1452–1465. https://doi.org/10.1080/07294360.2020.1818062

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Kočvarová, I., Kalenda, J., Vaculíková, J., Neupauer, Z., Černak, R. Š., & Włoch, A. (2024). Adaptation and validation of the academic motivation scale for higher education across four Eastern European countries. *Higher Education Quarterly*, *00*, e12510. https://doi.org/10.1111/hequ.12510