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Profiles of Learning-Related Motivational Beliefs and Perceived Effectiveness of Learning Strategies Related to Academic Achievement and Psychological Well-Being

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Abstract: This study applied a person-oriented approach to differentiate middle school students' academic achievement and psychological well-being. The profiles were identified according to their learning-related motivational beliefs (indicating how motivated they are to learn effectively) and the perceived effectiveness of learning strategies (about how students evaluate deep and surface learning strategies). Participants (N = 1356, Grade 8) completed three questionnaires assessing the motivational beliefs, perceived effectiveness of learning strategies, and psychological well-being. Reading comprehension score was used as an academic achievement measure. Four profiles were identified: high, average, low, and very low learning competence. Profiles differed most in valuing effective learning. Students who belonged to profiles with higher motivational beliefs and better knowledge of learning strategies were also more academically successful and rated their psychological well-being higher compared to students who belonged to profiles with lower motivation and firmer knowledge of learning strategies. To improve students' academic success and well-being, education systems should focus on teaching effective learning strategies as well as supporting motivational beliefs.

Keywords: *Learning strategies, motivational beliefs, psychological well-being.*

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Introduction

Learning is influenced by many factors, including age, personality traits such as the ability to conform to environmental conditions, general well-being (Bücker et al., 2018; Kaya & Erdem, 2021), motivational beliefs (Eccles & Wigfield, 2020), and knowledge and usage of learning strategies (Bjork et al., 2013). Learning strategies are goal-directed procedures or activities that learners intentionally and effortfully apply during learning to regulate, execute, or evaluate a particular learning problem or task, supporting the memorization and understanding of the material (Van Meter & Campbell, 2020). Knowledge of effective learning strategies is necessary but insufficient for their implementation – learners must also be motivated to use these strategies. A successful learner is characterized by supportive motivations for learning and awareness of effective learning strategies that optimize the learning process (Hattie & Donoghue, 2018). This is especially important in middle school when students' motivation to learn has generally decreased (Eccles & Wigfield, 2020). Although previous research has shown that subject-specific motivational beliefs are related to the knowledge and use of learning strategies (Alexander & Murphy, 1998), only few studies have examined motivational beliefs to use these strategies and learn more effectively (for exceptions see Karabenick et al., 2021; Kikas et al., 2024).

Studies have shown that higher subject-specific motivational beliefs and knowledge of learning strategies are associated with better academic performance (Dent & Koenka, 2016). Besides academic achievement, equally important is a psychological well-being (Klapp et al., 2024), which is crucial to coping with different school-related challenges. Studies have shown that students tend to perform academically better when their well-being increases, and vice versa (see meta-analyses Bücker et al., 2018; Kaya & Erdem, 2021). Although psychological well-being among students is increasingly studied, little is known of its learning-related aspects (Rodríguez et al., 2022). However, it has been confirmed that self-regulated learning is related to a higher level of psychological well-being (Rodríguez et al., 2022; Tavakolizadeh et al.,

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2012). Good learning skills are particularly important in independent study to achieve academic success and maintain psychological well-being. It was visible during the Covid-19 pandemic when students were forced to manage and maintain their motivation for learning (Holzer et al., 2021).

While growing amount of studies have examined profiles of subject-specific motivational beliefs profiles and their relations with achievement (Fong, Kremer, et al., 2021; Lazarides et al., 2021), the studies on strategy-related motivation have been variable-oriented. Unlike a variable-oriented approach, which focuses primarily on analyzing relationships among variables and group-based comparisons, a person-oriented approach explores how individuals differ in their learning-related indicators (Howard & Hoffman, 2018). Thus, there is a need for person-oriented studies. To our knowledge, profiles of students with different motivational beliefs about using effective learning strategies have not been studied. This is important because groups of students may have different combinations of motivational beliefs and knowledge of learning strategies that are differentially related to achievement and well-being.

This research focuses on 8th-grade students in Estonia, where the value of students' learning competence for academic achievement and their well-being at school and in life is increasingly being emphasized (Estonian Goverment, 2024; Kikas et al., 2023). Even though Estonian students have shown good academic knowledge in international comparative surveys such as the Program for International Student Assessment PISA (The Organisation for Economic Co-operation and Development [OECD], 2023), according to several studies, middle school students still use ineffective learning strategies (Granström & Kikas, 2023; Hennok et al., 2023), and their well-being has deteriorated over time (OECD, 2019). We aimed to examine differences in students' profiles of learning-related motivational beliefs (i.e., valuing effective learning, effort cost of effective learning, and self-efficacy) and perceived effectiveness of learning strategies (i.e., knowledge of deep and surface learning strategies) in reference to their academic achievement and well-being at the end of upper primary school. At the end of upper primary school, learning-related motivation begins to decline (Eccles & Wigfield, 2020), and poor study skills may be one of the reasons. In order for students to cope with learning increasingly complex and abstract material, it is necessary to raise knowledge of learning strategies and support the motivation to use them. The findings can contribute to developing more targeted educational interventions to support students in using effective strategies while fostering their well-being.

Literature Review

Learning Strategies

Learning strategies are defined as goal-oriented activities that the learner engages in during learning (Fiorella & Mayer, 2015) and have been proven to be important for memorizing and understanding learned material (Van Meter & Campbell, 2020). Strategies are initiated, enacted, and monitored by learners who approach tasks or problems differently based on their individual biological and cognitive characteristics (Alexander et al., 2018). The strategy's effectiveness depends on the task, the situation, and the characteristics of the learner. On the one hand, the learner must know and be able to use a specific learning strategy. On the other hand, the learning task must create a need for this (Samuelstuen & Bråten, 2007).

The literature offers a wide array of strategies, from basic re-reading methods to more intricate techniques for synthesizing knowledge or creating conceptual frameworks (Donker et al., 2014). Strategies are distributed into deep-level strategies aimed at profound understanding and active transformation of information and more surface-level strategies that aim at basic comprehension that doesn't support integrating the information with prior knowledge (Hattie & Donoghue, 2018). The importance of both surface and deep learning has been emphasized. It depends on the goal of learning. As students use deep-level strategies, they seek understanding, create meaning, and construct ideas. Thus, students are focusing on what they are learning, trying to gain a deeper understanding, linking ideas together and making connections with prior experiences, asking questions about what they are learning, discussing their ideas with others, and comparing perspectives (Hattie & Donoghue, 2018). Surface-level strategies emphasize the learning of facts and ideas rather than seeing connections between them (Hattie & Donoghue, 2018). The learning material may be difficult to retrieve from long-term memory if it is simply reviewed rather than integrated (Weinstein et al., 2011). In general, deep-level strategies are considered more effective, although the learner's particular characteristics and the context of the learning process should always be considered, in which deep, surface, or a combination of strategies best support learning (Alexander et al., 2018). Research has shown that using surface-learning in addition to deep-learning strategies is beneficial to prolonged memorization and understanding (Frey et al., 2017).

The solution to each task can be accomplished through a variety of strategies. Learning strategies should be chosen according to the requirements of the task and the goals of the learning. Consequently, researchers have suggested using task-specific questionnaires containing questions regarding recently completed learning tasks (Samuelstuen & Bråten, 2007). In this study, we examined students' perceived effectiveness of learning strategies by having them consider specific scenarios in which two students complete the same learning task using different strategies (see Granström et al., 2023). Based on earlier empirical studies, one of these strategies is more effective than the other in each scenario. Previous studies indicate that many students tend to use and value surface-level strategies like re-reading and massing (Dunlosky et al., 2013; Kikas et al., 2021). Rereading involves revisiting previously studied material to reinforce understanding and

retention (Dunlosky et al., 2013). Massing refers to a learning strategy where learners study the same amount of material in a single, extended session rather than distributing the study across shorter, spaced intervals (Yeung et al., 2020).

Motivational Beliefs

Besides knowing learning strategies, students should also be motivated to use deep-level strategies (Roediger & Pyc, 2012). An individual's motivation determines the desire to know, act, understand, believe, or gain particular knowledge, skills, attitudes, or values (Filgona et al., 2020). The motivational construct operationalized in the current study is grounded within the framework of expectancy-value theory (Eccles & Wigfield, 2020) which describes students' decision to pursue academic tasks, their achievement, and their persistence. We examined three components of motivational beliefs: the value of effective learning (intrinsic value and utility value), the effort cost of effective learning, and the expectation of being able to cope with effective learning (self-efficacy).

Values refer to what students can attain through different tasks and how these qualities impact individuals' motivation for achieving those tasks (Eccles & Wigfield, 2020). A task's intrinsic value is the enjoyment one derives from performing it. This component is similar to intrinsic motivation and interest (Ryan & Deci, 2020). The students who are intrinsically motivated often become deeply engaged with the activity and can persist with it for a long time (Wigfield & Eccles, 2020). Utility value or usefulness refers to how a task fits into an individual's present or future plans (Wigfield & Eccles, 2020). It is considered that the perception of usefulness is part of autonomous motivation because it relates to the achievement of goals that are important to a person (Ryan & Deci, 2020). Students with higher value beliefs tend to use more deep-level learning strategies compared to students with lower value beliefs (Metallidou & Vlachou, 2010; Shinogaya, 2018).

Besides the positive indicators, there are also negative indicators that affect learning outcomes. Using deep-level learning strategies can have costs in terms of the time and effort required to implement them The term perceived cost refers to the negative consequences associated with the performance of a task (Jiang et al., 2018). There are several aspects to a cost, including the amount of effort required to complete a task, the loss of time and ability to engage in other valuable activities, and the psychological effects of struggle or failure (Eccles & Wigfield, 2020). Effort cost, which is the focus of this study in relation to effective learning, is described as students perception of how much effort is needed to be successful at the task (Eccles & Wigfield, 2020). The importance of cost has been recently emphasized as many interventions have demonstrated that lowering perceived cost and increasing utility value beliefs can be effective, while interest is more difficult to raise (Gaspard et al., 2015; Hulleman et al., 2017).

Students' expectations for success and failure also significantly impact their learning behavior. In this context, self-efficacy beliefs play a crucial role, reflecting a person's subjective certainty of being able to cope with difficult or new circumstances based on their competencies (Bandura, 1993; Honicke & Broadbent, 2016). Studies have found that students with higher self-efficacy tend to use deep-level learning strategies (Diseth, 2011).

Consequently, concern for how individual differences in motivational beliefs can be leveraged to support perceived effectiveness and use of deep-level learning strategies needs to be considered in relation to the setting in which learning occurs and to the responsibility of learners within that setting to regulate and support their motivations.

Academic Achievement and Psychological Well-Being related to Learning Strategies and Motivational Beliefs

Educational psychology has studied academic achievement by examining various factors such as cognitive abilities, motivation, and learning strategies. The current research studies how integrating learning-related motivational beliefs and the perceived effectiveness of learning strategies is related to academic achievement. Our study includes a reading comprehension task as a measure of academic outcome, assessing a student's ability to understand and interpret written material, a fundamental skill in learning (Melby-Lervåg & Lervåg, 2014). It is widely known that knowledge of deep-level learning strategies and using them predicts good learning outcomes (Dent & Koenka, 2016; Fong, Krou, et al., 2021; Kikas et al., 2021; Puusepp et al., 2024). Otherwise, strategies that support surface learning are negatively associated with achievement (Diseth, 2011). The meta-analysis by Dent and Koenka (2016), which synthesized findings from 59 studies and 72 independent samples, revealed a small but significant positive relationship (r = .11) between the use of cognitive learning strategies and academic achievement. The findings emphasize that metacognitive processes, such as selecting and applying appropriate strategies, are more crucial for academic success (r = .20). Additionally, correlation between students' use of cognitive strategies and academic performance grew stronger from elementary to secondary school. It was not significant in elementary school (r = .06), became significant in middle school (r = .09), and strengthened further in high school (r = .16), highlighting the increasing importance of strategic learning behaviors. Murayama et al. (2013) examined the impact of motivational variables, learning strategies, and intelligence on students' math achievement over time. Based on their findings, deep-learning strategies were positively associated with math growth while surface-learning strategies were negatively associated.

The concept of well-being includes psychological, social, emotional, cognitive, and physical factors. There are two main approaches to well-being: Hedonia and eudaimonia (Deci & Ryan, 2008). The first refers to positive emotions and is largely expressed in subjective well-being (Diener, 2000; Kahneman et al., 1999). Eudaimonia refers to positive functioning and self-actualization and is largely reflected through psychological well-being (Ryff, 1989).

Ryff's (1989) well-being model refers to how people respond to life challenges and realize their potential. This model captures six theory-guided components that are proposed to engender positive functioning: self-acceptance, environmental mastery, autonomy, positive relations with others, purpose in life, and personal growth (Keyes et al., 2002; Ryff, 2013; Ryff & Keyes, 1995). These components are derived from Aristotle's views of the highest human good involving virtue and the realization of one's potential, but also from the work of psychodynamic, existential, and humanistic psychologists (Ryff & Singer, 2008).

Studies have shown a significant relationship between well-being and academic achievement (Bücker et al., 2018; Cárdenas et al., 2022; Govorova et al., 2020; Rodríguez et al., 2020), which is supported by different theories. For instance, according to the broaden-and-build theory of positive emotions (Fredrickson, 2001), the experience of positive emotions allows for building new skills and resources, which is related to higher academic achievement. Also, self-determination theory posits that social and contextual factors influence well-being and the quality of performance (Deci & Ryan, 2012). Individuals' experiences of autonomy, relatedness to others, and competence contribute to their motivation, engagement in activities, and academic performance (Amholt et al., 2020). Although recent meta-analyses and reviews have shown inconsistent findings, some have shown that there is a link between well-being and academic achievement (Bücker et al., 2018; Kaya & Erdem, 2021). However, some studies have found that well-being does not significantly impact academic achievement (e.g., Wang et al., 2015). In their recent review, Amholt et al. (2020) concluded that the results of studies are inconsistent. The conflicting studies indicate the need to use a more defined well-being construct (Dodge et al., 2012). Also, the variety of concepts and measures makes it difficult to compare studies.

To the best of our knowledge, little research has been done in previous studies (for exceptions see Rodríguez et al., 2022; Tavakolizadeh et al., 2012) on how knowledge and usage of learning strategies could be associated with well-being. A little more has been studied on the relationships between motivational beliefs and well-being. It has been found that learning motivation enhances psychological well-being and may help to overcome mental health-related outcomes (Rehman et al., 2020).

Aims and Hypotheses

The present study aimed to examine how the integration of learning-related motivational beliefs and the perceived effectiveness of learning strategies are related to academic achievement and psychological well-being. In order to learn more about the factors that contribute to students' academic achievement and psychological well-being, it is important to examine the patterns of factors that have effect on learning rather than describe the average learner (Hickendorff et al., 2018). Thus, we assumed that there are profiles of students with different learning motivation indicators and perceived effectiveness of learning strategies. The research questions and hypotheses were as follows.

First, how do students differ in profiles of learning-related motivational beliefs and perceived effectiveness of learning strategies? Previous person-oriented studies provide insights into motivational profiles (e.g., Fong, Kremer, et al., 2021; Lazarides et al., 2021) and profiles related to both motivation and self-regulated learning (e.g., Dörrenbächer & Perels, 2016; Heirweg et al., 2019; Katsantonis & McLellan, 2023; Liu et al., 2014). Based on these studies, we hypothesized (H1) to identify profiles characterized by high, low, and average learning-related motivational beliefs (valuing effective learning, effort cost of effective learning, and self-efficacy) and perceived effectiveness of learning strategies. We also expected to find divergent patterns of motivational beliefs and perceived effectiveness of learning strategies (i.e., high motivational beliefs, low perceived effectiveness of learning strategies).

Second, how are different student profiles related to their academic achievement? We hypothesized (H2) that students who belong to the profiles with higher motivational beliefs and better knowledge of learning strategies (perceiving deep-level strategies' effectiveness as higher than surface-level strategies) also achieve higher reading comprehension scores. We expected particularly significant differences in reading comprehension scores between low, average, and high profiles (Dörrenbächer & Perels, 2016; Heirweg et al., 2019; Liu et al., 2014).

Third, how are different student profiles related to their psychological well-being indicators? We expected (H3) that students who belong to the profiles with higher learning competence also have higher psychological well-being (Rehman et al., 2020; Rodríguez et al., 2022; Tavakolizadeh et al., 2012).

Methodology

Sample and Data Collection

The participants were 1356 Estonian 8th-grade students (50.2% boys; age M = 14.29, SD = 0.50) from 87 classes in 45 mainstream schools of Estonia, both urban and rural. The sample included students with both Estonian (85.9%) and Russian (14.1%) as the language of instruction. Students' learning-related motivational beliefs, perceived effectiveness of deep- and surface-level learning strategies, psychological well-being, reading comprehension, and information on earlier grades were assessed with the web-based assessment as a part of the project "Developing tools for assessing learning to learn, social, and self-determination competencies in the third stage of basic school". In addition to this measure, external indicators that were not included in the final assessment tool, such as psychological well-being and academic achievement,

were added only for this data collection. In the autumn of 2020, HARNO (Education and Youth Board, a government agency of the Ministry of Education and Research that deals with the implementation of Estonian education and youth policy) invited all Estonian schools to participate in the study, after which specific instructions were given to teachers regarding the tests. Participation was voluntary for all schools. Students were tested at the beginning of the school year (September-November 2020), and teachers could choose the most suitable day during the predetermined period. The tests were administered during a regular school day in computer labs under the supervision of teachers. Completing the whole test took approximately 45 minutes. Students and their parents were informed of the content of the test, they could refuse to participate in the study, and students could interrupt completing the test at any time.

Measures

Motivational Beliefs. Motivational beliefs were assessed via a questionnaire based on the expectancy-value theory (Eccles & Wigfield, 2020) in relation to effective learning (see Kikas et al., 2024). Students had to think about how well each description characterizes them and mark their answers using a 5-point Likert-type scale (1 – *do not agree at all*; 5 – *completely agree*). One item assessed the self-efficacy of effective learning ("I am able to use effective learning strategies"). Valuing effective learning was assessed with two items ("I am interested to know how to learn more effectively"; "Knowledge of how to learn effectively is useful in my out-of-school life and future"). The reliability for valuing effective learning was good (α = .74). The effort cost of effective learning strategies was assessed with one item ("Using effective learning strategies is too time-consuming").

Perceived Effectiveness of Deep- and Surface-level Learning Strategies. Participants were given five learning scenarios and descriptions of two students who used different learning strategies. Strategies were selected based on earlier empirical studies indicating that one strategy supports more deep-level learning than the other in a specific learning situation (Kikas et al., 2024). Students evaluated on a 5-point Likert-type scale the effectiveness of each strategy (1 - strategy is ineffective, 5 - strategy is very effective). Confirmatory factor analysis was conducted to control the hypothesized loadings of the items on two factors. The model for approaches to the perceived effectiveness of learning strategies fit for the two-factor model (deep- and surface-level strategies) was good ($\chi 2 = 111.86$, df = 24, $p < .001$, CFI = .960, TLI = .924 RMSEA = .056). The factor loadings ranged from .313 to .536. The reliability for the perceived effectiveness of deep-level (α = .56) and surface-level (α = .55) learning strategies was low. Mean scores of the evaluations of deep- and surface-level learning strategies were used. Factor loadings and descriptions of all items are presented in Appendix A.

Reading Comprehension. Students had to read and comprehend a text about how to learn more effectively (see Puusepp et al., 2024). The reading comprehension task was presented to the students after they had answered to the motivational beliefs and learning strategies questionnaire. The purpose of the reading comprehension task was to assess a student's ability to understand and interpret written material, which is one of the fundamental skills in learning (Melby-Lervåg & Lervåg, 2014). Through reading comprehension, it is possible to measure directly what was learned. The text was intended to teach students effective learning strategies that support deep learning. The text included 391 words and 30 sentences. The text first discussed the importance of thinking activity while learning and how the information is stored in long-term memory. Next, some learning strategies were introduced, explaining why they are effective for learning and how to use them. Finally, it was stated that learning takes time and is often a deliberate way to bring about lasting memory changes. Students' reading comprehension was assessed with eight multiple-choice questions about the text. There were five choices, one of which was "I don't know". Students could read the text again while answering the questions. A reading comprehension score was calculated as the sum of selected correct answers and not selected incorrect answers. The reliability of the reading comprehension scale was high (α = .80), assessed using tetrachoric Cronbach's α due to the binary nature of the items.

Psychological Well-Being. Carol Ryff's short psychological well-being questionnaire was used to assess students' psychological well-being (Ryff, 1989). The Estonian and Russian versions were used and adapted for adolescents by the second author of the paper. Students were asked to evaluate the statements on a 6-point Likert-type scale (1 – *do not agree at all*; 6 – *completely agree*). Six aspects of psychological well-being were assessed: 1) autonomy (the ability to decide independently without waiting for the approval of others; to evaluate oneself based on one's own attitudes and values); 2) positive relationships (the ability to establish close and caring relationships with others, to be empathetic and caring); 3) environmental mastery (the ability to cope with various tasks, belief in one's abilities); 4) self-acceptance (the ability to accept oneself and one's qualities; to treat oneself positively); 5) purpose in life (having an idea of a meaningful life; having specific goals and objectives; 6) personal growth (realization of one's inner potential; continuous self-development; orientation to getting acquainted with new situations). There were three statements for each aspect.

The model for approaches to the psychological well-being fit for the six-factor model was good ($\chi 2 = 216.50$, df = 129, $p < .001$, CFI = .994, TLI = .993, RMSEA = .024). The factor loadings ranged from .336 to .759. The following subscales showed acceptable reliability: Personal growth (α = .59), and positive relations with others (α = .60). The subscales with good reliability included autonomy (α = .70), environmental mastery (α = .83), self-acceptance (α = .84), and purpose in life (α = .86). Factor loadings and descriptions of all items are presented in Appendix B.

Analyzing of Data

Data were analyzed using IBMM SPSS Statistics (Version 29) and Mplus statistical package (Version 8.3; Muthén and Muthén, 1998–2017). Descriptives of the study variables are presented in Table 1, and correlations between the variables are in Appendix C. The normality of the data was assessed through skewness and kurtosis values (see Table 1). These indicators were used to determine whether the data followed a normal distribution. A variable was approximately normally distributed if both skewness and kurtosis fell within the range of -1 to 1 (Kim, 2013). Confirmatory Factor Analysis was used to assess a number of factors in the perceived effectiveness of learning strategies and psychological well-being. Model fit was examined using five indices: chi-square ($\chi 2$), the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). CFI and TLI values above .95, RMSEA values below .06, and SRMR values below .08 indicate excellent model fit, while CFI and TLI values above .90 and RMSEA and SRMR values below .10 are indications of acceptable model fit (Hu & Bentler, 1999). Additionally, based on the guidelines provided by Tabachnick and Fidell (2013), factor loadings with an absolute value less than .32 were ignored, as only variables with loadings of .32 and above were considered for interpretation.

In order to answer the first research question, a latent profile analysis (LPA) was conducted to determine the number of profiles, considering the motivational indicators and perceived effectiveness of deep- and surface-level learning strategies. An LPA is a person-oriented method; in contrast to variable-centered approaches, it classifies individuals in a given group in accordance with some construct that cannot be directly measured (Howard & Hoffman, 2018). LPA results were evaluated by fit indicators and theoretical background. Minimum values of the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and sample-size adjusted BIC (aBIC) were considered, along with entropy, Vuong-Lo-Mendell-Rubin Likelihood Ratio test (VLMR) values (Collins & Lanza, 2010). To test whether the students with distinct profiles have different levels of academic achievement and psychological well-being, the Bolck, Croon, and Hagenaars (BCH) method (Asparouhov & Muthén, 2021) was used. This method is suitable for estimating the parameters of a latent structure model for categorical data and proposes a simple correction for a common source of bias (Bolck et al., 2004).

Results

Table 1. Descriptives of Study Variables

Variable	N	M	SD	Min-max	Skew.	Kurt.
Perceived effectiveness of deep-level LSs	1356	3.67	0.60	1-5	-0.22	-0.15
Perceived effectiveness of surface-level LSs	1356	3.86	0.55	1-5	-0.26	-0.11
Valuing effective learning	1356	3.94	0.84	1-5	-0.70	0.41
Effort cost of effective learning	1356	2.96	1.04	1-5	0.21	-0.40
Self-efficacy of effective learning	1356	3.23	0.95	1-5	-0.26	-0.04
Reading comprehension	1356	23.03	4.11	10-32	-0.40	-0.42
Autonomy	1355	11.59	2.88	3-18	-0.29	0.31
Personal growth	1355	13.30	2.78	3-18	-0.78	1.40
Environmental mastery	1355	12.00	2.93	3-18	-0.50	0.65
Positive relations with others	1355	13.17	2.82	3-18	-0.82	1.30
Self-acceptance	1355	12.51	3.44	3-18	-0.62	0.27
Purpose in life	1355	12.63	3.50	3-18	-0.50	-0.06

Note. Skew. = Skewness; Kurt. = Kurtosis

Latent Profile Analysis

Latent profile models containing 2, 3, 4, 5, and 6 classes were fit to the data. The model fit indices are available in Table 2. The VLMR test was used in choosing the best class solution. The p-value for the LMR tests for the 5-class and 6-class models were insignificant, indicating that adding extra classes to the 4-class model did not provide statistically significant improvements in the model. In this case, we rejected the 5-class and 6-class models in favor of the 4-class solution. The relative entropy for the 4-class model solution was above the cut-off point of .80 (see Table 2), as recommended by Clark and Muthén (2009), indicating a better classification. The entropy value of the 4-class solution was .86, indicating that 86% of subjects were correctly classified, which is considered high. The correct class assignment probabilities are all above .70 (i.e., .94 for profile 1, .95 for profile 2, .96 for profile 3, and .92 for profile 4). Given the high relative entropy and the adequate class assignment probabilities, it is evident that the latent profile membership classification in the present study was adequate enough. In addition, it is important to point out that even though finding the best solution for LPA is based on statistical indicators, they may not always provide a uniform and adequate result, which is why the final decision also is based on theoretical background and the interpretability of the obtained results (Howard & Hoffman, 2018). The results of this analysis suggested that a four-class solution was the best fit for the data.

Table 2. Information Criteria for the LPA

Profiles	BIC[a]	AIC	Entropy	VLMR *p*
2	15484	15451	.64	.0002
3	15365	15320	.76	.0190
4	**15304**	**15247**	**.86**	**.0809**
5	15297	15227	.80	.5508
6	15295	15214	.81	.5055

The means of the four profiles are presented in Table 3. The standardized results are presented in Figure 1. The results presented in Table 3 show that the mean difference among the four profiles was significant in terms of the perceived effectiveness of deep-level learning strategies [$F(3, 1352) = 23.74$, $p < .05$, $\eta 2 = 0.05$], perceived effectiveness of surface-level learning strategies [$F(3, 1352) = 18.62$, $p < .05$, $\eta 2 = 0.04$], valuing effective learning [$F(3, 1352) = 4590.73$, $p < .05$, $\eta 2 = 0.91$], effort cost of effective learning [$F(3, 1352) = 4.22$, $p < .05$, $\eta 2 = 0.01$], and self-efficacy of effective learning [$F(3, 1352) = 36.82$, $p < .05$, $\eta 2 = 0.08$].

Table 3. Means of the Four Profiles

Variable	Profile 1 M (SD)	Profile 2 M (SD)	Profile 3 M (SD)	Profile 4 M (SD)	Differences between profiles
PE of deep-level LSs	3.38 (0.69)	3.48 (0.55)	3.63 (0.56)	3.82 (0.61)	4 > 1 2 3; 3 > 1 2; 2 > 1
PE of surface-level LSs	3.48 (0.67)	3.72 (0.52)	3.85 (0.55)	3.96 (0.52)	4 > 1 2 3; 3 > 1 2; 2 > 1
Valuing EF	1.61 (0.39)	2.87 (0.22)	3.77 (0.25)	4.76 (0.25)	4 > 1 2 3; 3 > 1 2; 2 > 1
Effort cost of EF	3.20 (1.37)	3.14 (1.02)	2.95 (0.99)	2.87 (1.05)	4 > 2
Self-efficacy of EF	2.27 (1.07)	2.94 (0.90)	3.18 (0.87)	3.47 (0.95)	4 > 1 2 3; 3 > 1 2; 2 > 1

Note. Differences between profiles indicate significant differences at $p < .05$. PE = perceived effectiveness; LS = learning strategies; EF = effective learning.

Our first hypothesis was partially confirmed insofar as uniform profiles (i.e., low, average, and high) were identified, but mixed profiles (e.g., high motivational beliefs, low perceived effectiveness of learning strategies) did not occur. The first profile composed 3% of the sample ($N = 44$) and represents individuals who have low perceived effectiveness of both deep- and surface-level learning strategies and who do not value effective learning (*very low learning competence* profile). They evaluated the cost of effective learning high, and their self-efficacy was very low compared to other students. The second profile composed 18% of the sample ($N = 222$) and comprises individuals whose learning competence is also low (*low learning competence*). They do not value effective learning, find it too time-consuming, and their self-efficacy is low. The third profile composed 40% of the sample ($N = 553$) and referred to those with average perceived effectiveness of both deep- and surface-level learning strategies, valuing, cost, and self-efficacy (*average learning competence*). Finally, the fourth profile composed 39% of the sample ($N = 536$) and comprises individuals with high perceived effectiveness of both deep- and surface-level learning strategies, very high learning valuing, low cost of effective learning, and high self-efficacy (*high learning competence*).

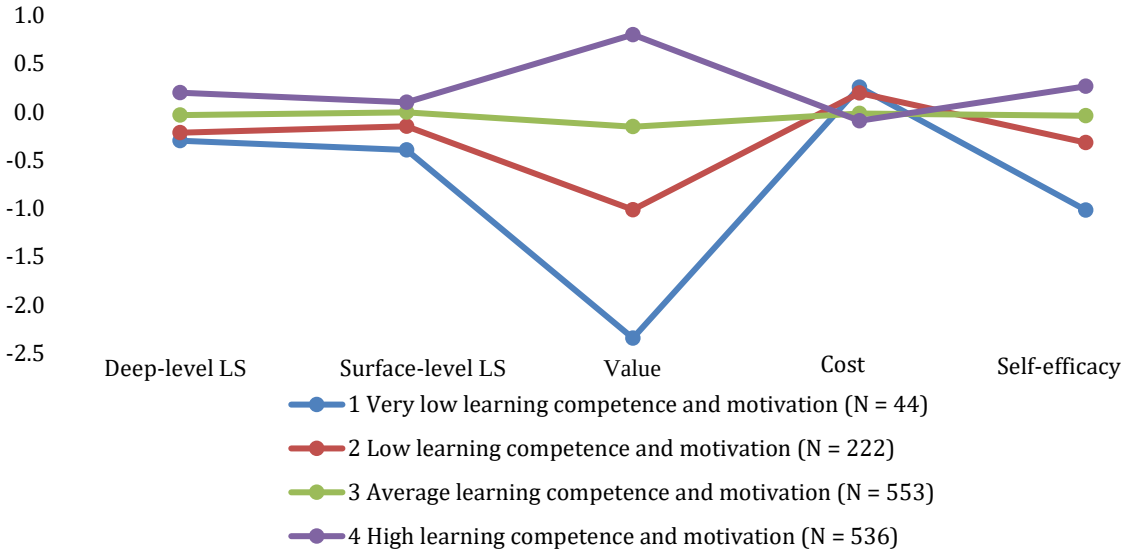

Figure 1. Results of Latent Profile Analysis

Table 4. Profile Differences Between Academic Achievement and Psychological Well-Being Indicators

		1. Very low learning competence (*N* = 44)	**2. Low learning competence (*N* = 222)**	**3. Average learning competence (*N* = 553)**	**4. High learning competence (*N* = 536)**		
	Min-max	***M (SE)***	***M (SE)***	***M (SE)***	***M (SE)***	***χ2***	**Differences between profiles (*p* < .05)**
Academic achievement							
Reading comprehension	10-32	20.60 (0.62)	21.76 (0.45)	22.94 (0.34)	23.90 (0.27)	76.67*	4 > 1 2 3; 3 > 1 2
Psychological well-being							
Autonomy	3-18	11.49 (0.53)	10.83 (0.23)	11.63 (0.15)	11.86 (0.13)	19.99*	4 > 2; 3 > 2
Personal growth	3-18	10.63 (0.65)	12.01 (0.20)	13.17 (0.13)	14.19 (0.17)	113.71*	4 > 1 2 3; 3 > 1 2; 2 > 1
Environmental mastery	3-18	9.48 (0.63)	11.12 (0.24)	12.12 (0.11)	12.43 (0.13)	43.40*	4 > 1 2; 3 > 1 2; 2 > 1
Positive relations with others	3-18	12.00 (0.45)	12.04 (0.27)	13.18 (0.14)	13.78 (0.13)	86.17*	4 > 2 3; 3 > 1 2
Self-acceptance	3-18	10.70 (0.50)	11.53 (0.25)	12.59 (0.14)	12.97 (0.16)	39.14*	4 > 1 2; 3 > 1 2
Purpose in life	3-18	9.91 (0.49)	11.52 (0.20)	12.60 (0.17)	13.33 (0.18)	86.44*	4 > 1 2 3; 3 > 1 2; 2 > 1
Psychological well-being	18-108	64.16 (2.56)	69.05 (1.10)	75.23 (0.58)	78.65 (0.59)	106.72*	4 > 1 2 3; 3 > 1 2

Note. *N* = number of students in profiles. * *p* < .05

Differences in Academic Achievement and Psychological Well-Being

The means and standard errors of all included auxiliary variables across four profiles and indications of significant differences between each profile are shown in Table 4. As expected (Hypotheses 2 and 3), students in the *High learning competence* profile scored the highest on text comprehension and psychological well-being indicators.

Discussion

Awareness of learning and thinking about one's learning is an important aspect of learning consciously and effectively (Roediger & Pyc, 2012), which, however, presupposes a motivated student who values learning (Eccles & Wigfield, 2020). The main purpose of the study was to discover profiles of learning competence as expressed in learning-related motivational beliefs and the perceived effectiveness of learning strategies. Furthermore, we examined how these profiles were related to academic achievement and psychological well-being indicators based on an 8th-grade Estonian student sample. Four distinct profiles of students were found, of which two showed very low and low learning competence, while the remaining two had average and high learning competence. Better academic achievement (reading comprehension) and psychological well-being were associated with profiles characterized by high or average learning competence, while the poorest outcomes were reflected by profiles characterized by very low or low learning competence.

Profiles of Perceived Effectiveness of Learning Strategies and Motivational Beliefs

Contrary to our expectations, no mixed profiles emerged, suggesting that students' learning competence tends to follow a more uniform pattern rather than a combination of high motivational beliefs and low perceived strategy effectiveness. This profile structure replicated the findings of previous person-oriented studies of motivational profiles (Katsantonis & McLellan, 2023; Liu et al., 2014). The two adaptive – average and high learning competence – profiles included almost the same number of students and accounted for the majority of the sample. These two adaptive profiles differ more in motivation and less in the perceived effectiveness of learning strategies. The key difference between these two profiles is valuing effective learning, with the profile of high learning competence showing the highest value of effective learning among all profiles. As students in these profiles also have the best knowledge of deep-level learning strategies, the result is concordant with previous research suggesting that students with higher value beliefs also value more effective learning strategies (Metallidou & Vlachou, 2010; Shinogaya, 2018).

The two maladaptive profiles identified have low and very low learning competence. The students in these profiles reported equally effective deep-level and surface-level strategies. Compared to more adaptive learning competence profiles, students in these profiles also evaluated lower the effectiveness of both deep- and surface-level strategies. The key differences between the two maladaptive profiles are in their value and self-efficacy, with the profile of very low learning competence showing the lowest value and self-efficacy of learning. Prior research has indicated that expectancy for success and values are significantly related and mutually sustaining (Wigfield & Eccles, 2020). Self-efficacy and value also showed similar levels in most of our profiles. However, there are relatively few students in the very low and low profiles compared to the other profiles.

Reviewing all profiles revealed minor differences in the perceived effectiveness of the learning strategies but it should be worth noting that deep- and surface-level strategies were evaluated as equally effective by almost all profiles. Many studies ask for the effectiveness of strategies to be evaluated separately and not context-specific, this study asked to evaluate the effectiveness of two different strategies in a specific learning situation, which means that it should be easier to identify which strategy is more efficient, but our results show the opposite. Research has shown that middle school students tend to use ineffective learning strategies and believe that these are more effective (Granström & Kikas, 2023; Hennok et al., 2023; Kikas et al., 2021, 2024). Although the combined use of deep and surface strategies can be effective, the learning situation and purpose must always be considered (Samuelstuen & Bråten, 2007). One possible reason why students also evaluate surface-level strategies effectively may be in motivational beliefs (Metallidou & Vlachou, 2010; Shinogaya, 2018), because using deep-level strategies may be more complicated and time-consuming at first, especially if they are not taught how to use them (Bjork et al., 2013). However, it should be emphasized that both deep- and surface-level strategies are important for learning, depending on whether the learning aim is long- or short-term. In order to get a more comprehensive picture of a student's learning profile, it is important to consider strategies and motivation together.

In conclusion, the main difference between profiles was in the value of effective learning – the higher it is valued, the higher the perceived effectiveness of learning strategies, the higher the self-efficacy, and the lower the cost of effective learning. As previous research has shown that the utility value of learning can be increased (Hulleman et al., 2017), the awareness of learning strategies could also be raised by explaining the benefits of effective ways of learning. Various studies suggest that students' motivation tends to decline further with the shift to middle school (e.g., Eccles & Wigfield, 2020; Pajares, 2008), underscoring the need to avoid or reverse this downward trend earlier.

Profile Differences in Academic Achievement

We used the results of the reading comprehension test as an indicator of academic achievement, as reading is a fundamental skill that applies to most learning domains. We found that reading comprehension differs in all profiles, but students with high and average learning competence differ the most from the other profiles. It is expected that when students are aware of deep-level learning strategies and motivated enough to use them, they apply them more readily, which leads, in turn, to better performance. Our findings are in line with several studies indicating that awareness and use of deep-level learning strategies, that is, effective processing of information, is related to better academic outcomes on specific learning tasks as well as higher GPA (Dent & Koenka, 2016; Fong, Krou, et al., 2021; Kikas et al., 2021; Puusepp et al., 2024). Taken together, the students who have managed to obtain high performances at the end of the middle school years tend to have higher perceived effectiveness and value of deep-level learning strategies. They also show greater confidence in themselves and their abilities to learn effectively. They do not consider the use of more effective learning strategies too time- consuming, therefore achieving better management of the learning process. Consequently, it is necessary to investigate how profiles of students combine learning strategies and motivational beliefs in order to determine how this impacts their learning outcomes (Heirweg et al., 2019). Our study also examined these patterns related to effective learning. Students who are able to self-regulate their learning are active, motivated learners who act purposefully (i.e., use effective learning strategies) to achieve their academic goals (Donker et al., 2014).

Profile Differences in Psychological Well-Being

Psychological well-being variables differed among all the profiles. Results indicate that students in the high learning competence profile, characterized by a good knowledge of deep-level learning strategies and a high motivation to learn better and more efficiently, displayed the highest indicators of psychological well-being. There may be various reasons that explain our results. On the one hand, when teaching students to learn effectively and supporting them in understanding the value of learning, the perceived cost of achieving academic success does not necessarily have to be high. However, the psychological well-being of students is maintained. This is also in line with prior research (Rehman et al., 2020) showing that learning-related motivation enhances students' psychological well-being. We may also speculate that using effective learning strategies can be beneficial in the long run. Students who know different strategies and are able to use them according to the purpose of learning to find a suitable strategy to cope with and control difficult learning tasks and situations.

On the other hand, higher psychological well-being may also lead to firmer motivational beliefs, which means students are more open to learning different strategies that promote academic success. It is consistent with the broaden-and-build theory of positive emotions (Fredrickson, 2001). The experience of positive emotions allows for building new skills and resources, which in turn can lead to better academic achievement.

Many studies emphasize the importance of motivation for academic success (Marsh et al., 2005). Our results suggest that students with better learning competence profiles tend to achieve higher academic results and report higher psychological well-being. This indicates that the learning environment and how this environment supports students' psychological well-being also plays an important role at school. Psychological well-being, as in mental health, has an important role to play in students' academic achievement and should be monitored more frequently in future learning-related research.

Conclusion

Educating students about effective learning strategies and motivating them to use these strategies should go hand-in-hand since emphasizing the benefits will increase their motivation to learn effectively. At the same time, our results showed that students do not differentiate between deep- and surface-level learning strategies, which indicates the need to clarify further which learning strategies are more effective in some learning situations than others. Those students who are motivated and achieve their academic goals through effective learning strategies, may feel a sense of accomplishment and satisfaction with their learning. By understanding the value and need of different learning strategies, students are better able to take charge of their own learning and develop a sense of mastery over their studies. These positive emotions that come from self-regulated and successful learning can contribute to an overall sense of well-being. All in all, our results indicate that in order for students to be successful in school and at the same time feel psychologically well and satisfied, it is important to address learning-related and motivational beliefs alongside strategy instruction so that students become self-regulated learners.

Recommendations

The teaching of learning strategies should be explicitly taught in the same way as the teaching of subject knowledge. However, research has shown that while teachers may incorporate learning strategies into their lessons, they do not always explicitly teach these strategies to students (Olop et al., 2024). This lack of direct instruction can limit students' knowledge of effective learning, making it harder for them to apply these strategies independently. Yet, teaching learning strategies alone is not enough; supporting students' motivation to use them is equally important. Since these strategies can be cognitively demanding, time-consuming, and may not yield immediate results, students must recognize their value and be motivated to persist. Our study found that students differed most in how much they valued effective learning. Previous

research highlights the effectiveness of increasing utility value within specific subjects (Gaspard et al., 2015; Hulleman et al., 2017), making it essential also to emphasize the utility value of learning strategies—helping students understand when, how, and why they are beneficial (see Dunlosky et al., 2013 for a comparison of learning strategies' effectiveness and usage recommendations based on student characteristics). Furthermore, our findings indicate that students perceived the cost of using effective learning strategies relatively similarly, regardless of how much they valued effective learning and learning strategies. This suggests that in addition to emphasizing utility value, reducing the perceived cost of engaging in effective learning strategies should also be a focus. By addressing both the benefits and the effort associated with these strategies, educators can better support students in adopting and maintaining effective learning habits.

Limitations

It is also important to consider some limitations associated with the present research while interpreting the results. First, we chose the sample for this current study from Estonian students. Therefore, the finding may not apply to other cultures and educational systems. However, the strength is a large sample of middle school students across Estonia from different regions. Second, we used self-report measures, and such measures can be impacted by social desirability and self-report biases. Also, when assessing motivational beliefs in relation to effective learning, students were not presented with an exact definition of what effective learning is. Thus, there may have been some differences in students' interpretations of effective learning. In the future, it is reasonable to specify what effective learning is in the questionnaire instructions and to give examples of effective learning strategies. Third, some of the motivational beliefs (perceived cost and self-efficacy) were assessed with one statement. In addition to task-related effort, measuring the loss of valued alternatives and emotional cost would provide further information. Also, to ensure the validity of the questionnaire, more statements should be included in the future. Fourth, reliability indicators and factor loadings of scenario-based questionnaires for learning strategies and of some psychological well-being indicators were quite low. These low reliability indicators and factor loadings related to learning strategies may have been influenced by the fact that students' general awareness of learning strategies is rather poor (Hennok et al., 2023), and the results of the scenario-based questionnaire showed that it is difficult to distinguish between deep- and surface-level learning strategies. We emphasize that in future, more learning scenarios should be used, and the scenario-based questionnaire should be combined with other assessment methods that measure knowledge of learning strategies, so that the results of different methods can be compared. The factor loadings for the psychological well-being subscale of personal growth were particularly low, with a Cronbach's alpha of .59, which is lower than the reliability indicators for the other subscales. One possible reason for this is that the subscale consisted of only three items, and Cronbach's alpha is strongly influenced by the number of items in a scale. When a scale has fewer than five items, an alpha value of .50 can be interpreted similarly to .70 (Field, 2009). Additionally, the statements in this subscale may have been challenging for adolescents to answer, as this questionnaire has predominantly been used with adult populations in previous studies. To improve reliability in future research, increasing the number of items in this subscale should be considered.

Finally, it was a cross-sectional study, so we cannot infer relations of causality among the variables of this study. Students´ level of academic success and psychological well-being may also impact their learning competencies. Additional studies with a longitudinal research design, considering different age groups, would lead to further information on how motivational beliefs, perceived effectiveness of learning strategies, and psychological well-being change during the school years.

Ethics Statements

The study was ordered by the Estonian Ministry of Education and Research and thus, approval from the ethical board was not needed. However, this study included constructs directly related to school curricula and contents, and was in accordance with the APA principles underlying research with human participants. Informed consent was obtained from students and their parents. Children of parents who disagreed with the study did not participate.

Conflict of Interest

The authors report there are no competing interests to declare.

Authorship Contribution Statement

Härma: Conceptualization, analysis, writing. Pulver: Writing, reviewing, editing. Kikas: Writing, reviewing, editing, supervision, final approval.

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Appendix A

Table A1. Factor loadings of perceived effectiveness of deep- and surface level learning strategies (LS)

Scenario	Choice of answers	Factor loadings of deep-level LS	Factor loadings of surface-level LS
1. Students are preparing for a test on one textbook chapter. They use different learning strategies.	*Student A* reads the textbook twice.		.360
	Student B tests their knowledge. They close the textbook and answer the questions without looking at the text.	.350	
2. Students have to understand the equation in a math test and be able to solve related tasks. Students solve the same number of tasks in preparation for the test but use different learning strategies.	*Student A* solves the example tasks several times.		.421
	Student B solves the example tasks given by teachers once and in addition to new tasks.	.389	
3. Students have to read up themselves on a new topic before class. They have to read one chapter of the textbook as homework. Their knowledge of the subject is not very good. Both students learn a new topic in the same amount of time but use different strategies.	*Student A* reads the text and then tries to make sense of what is being read. They think about what they already know about the topic and try to relate the new information to prior knowledge.	.484	
	Student B reads the text thoroughly and then highlights the important words in the text.		.504
4. Students have to prepare for the major test in one subject. They decide to make a summary.	*Student A* systematizes what is learned according to associations and topics. They try to find common features and categorize the topics in summary.	.450	
	Student B starts compiling the summary from the beginning. They rank different topics in the order in which he learned them.		.536
5. Students have to understand and be able to solve different types of tasks in one topic. Students study for the same amount of time and solve the same number of tasks of each type but use different strategies.	*Student A* solves first Type 1, then Type 2, and then Type 3 tasks.		.313
	Student B solves different types of tasks alternately.	.356	

Appendix B

Table B1. Factor loadings of psychological well-being questionnaire

Construct	First-order factor loadings	Second-order factor loadings
Autonomy		0.824
Usually, my decisions are not affected by what others think.	.593	
I am sure of my opinion, even if it contradicts the majority opinion.	.621	
I am not afraid to express my opinion, even if it is contrary to the opinion of others.	.625	
Self-acceptance		1.373
I have a lot of attributes that I like about myself.	.586	
I am happy with how I have lived.	.602	
In general, I am proud of myself and my life.	.657	
Purpose in life		1.043
I like to make plans for the future and implement them.	.701	
I am one of those people who have certain goals in life.	.758	
I have a purpose and a goal to be pursued in life.	.759	
Personal growth		1.790
I am a person who likes to do something new all the time.	.368	
I feel that as a person, I have developed a lot over time.	.444	
I think it is useful to gain new experiences that allow you to see yourself and the world differently.	.336	
Environmental mastery		1.481
I can divide my time well so that I can get everything done.	.461	
I am doing quite well with my many responsibilities.	.492	
I manage my daily work well.	.488	
Positive relations with others		1.342
I am described as an accommodative person who always finds time for others.	.449	
I know I can trust my friends, and they know they can trust me.	.477	
I enjoy heart-to-heart conversations with my friends or family.	.446	

Appendix C

Table C1. Correlations between all study variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. PE of deep-level LSs	1										
2. PE of surface-level LSs	.06**	1									
3. Valuing effective learning	.23**	.21**	1								
4. Effort cost of effective learning	-.02	.07**	-.10**	1							
5. Self-efficacy of effective learning	.13**	.09**	.30**	-.17**	1						
6. Reading comprehension	.27**	-.08**	.22**	-.19**	.09**	1					
7. Autonomy	.05	.10**	.13**	-.09**	.18**	.05	1				
8. Personal growth	.18**	.12**	.34**	-.13**	.25**	.20**	.41**	1			
9. Environmental mastery	.09**	.08**	.22**	-.21**	.36**	.15**	.38**	.48**	1		
10. Positive relations with others	.13**	.12**	.22**	-.12**	.19**	.18**	.34**	.52**	.46**	1	
11. Self-acceptance	.03	.12**	.18**	-.15**	.24**	.09**	.46**	.51**	.57**	.45**	1
12. Purpose in life	.09**	.15**	.23**	-.11**	.25**	.10**	.29**	.55**	.49**	.43**	.49**

Note. PE = perceived effectiveness; LS = learning strategies. *$p < .05$; ** $p < .01$.