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The Interplay Between Students' Learning-Related Beliefs, Reading Comprehension Strategies and Academic Success

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Abstract

The present study explored the combined effects of students' learning-related beliefs as well as use of reading comprehension strategies on academic success—academic outcomes and exhaustion. In total, 1165 eighth grade students' beliefs, use of reading comprehension strategies and reading comprehension were assessed at the beginning of the school year. Half a year later 296 students from the sample reported their academic exhaustion and grades from the previous semester. Students' learning-related beliefs and use of deep reading comprehension strategies were associated with their academic outcomes and exhaustion. More specifically, believing in quick and effortless learning was associated with the use of a smaller variety of deep reading comprehension strategies and lower academic outcomes. Additionally, students' motivational beliefs about effective learning were mainly indirectly through strategy use linked to their academic outcomes, while having direct effects on academic exhaustion. These results refer to the importance of addressing learning-related beliefs in addition to strategy instruction.

Keywords: academic exhaustion, academic outcomes, cost, expectancy-value, quick and effortless learning beliefs, reading comprehension strategies,

1. Introduction

Being a successful learner entails holding adaptive beliefs and flexibly employing effective learning—including reading comprehension—strategies for mastering new knowledge and skills as well as sustaining an optimal level of well-being (Boekaerts, 2011; Pintrich, 2000; Zimmerman, 2000). Even though these aspects of successful learning are assumed to be interconnected and are presented as such in theoretical models (Panadero, 2017), they are often studied separately (e.g., Berger & Karabenick, 2011; Schommer-Aikins & Easter, 2008; for more complex models, see Liem et al., 2008). Whilst the more construct-specific approaches enable zooming in on specific associations, it can possibly lead to overemphasizing certain effects while ignoring others. Therefore, in the present study, we adopted a variable-oriented approach to explore the interplay of the effects of students' beliefs about learning, their motivation to learn effectively as well as their use of reading comprehension strategies on their academic outcomes and exhaustion. Moreover, we accounted for students' prior academic achievement to explore the unique effects over and above this strong influence (Harackiewicz et al., 2002).

The present study focuses on 8th grade students as lower secondary school years have been characterized by an increased misfit between adolescents' developmental needs and the school environment, often resulting in declining study motivation (Wang & Eccles, 2012). The study was conducted in Estonia, where lower secondary school years mark the end of compulsory education, highlighting the relevance of 8th grade students' school-related motivation and coping when it comes to their future educational trajectories. Despite being one of the top-performing countries in education, there has been a concern about Estonian students' comparably lower levels of well-being (OECD, 2016; Schleicher, 2019), exemplifying a more universal debate on whether high academic results must come at the cost of student well-being. In the present study, therefore, we explored the effects of theoretically relevant learning-related aspects on students' academic outcomes and ill-being.

1.1 Academic Success

Researchers often operationalize academic success as narrowly as academic achievement measured by grades,

which is not a sufficiently generalizable and valid measure of student success (York et al., 2015). In the current study, besides students' grades, performance on a reading comprehension task was also included as an outcome measure, as reading comprehension can be considered a fundamental building block to all learning (Melby-Lervåg & Lervåg, 2014). In addition, we inspected students' negative affective outcomes that most often stem from difficulties in coping due to the imbalance between school-related demands and students' available resources (Salmela-Aro, Savolainen, et al., 2009; Salmela-Aro & Upadyaya, 2014b). More specifically, students' academic exhaustion (a dimension of academic burnout) was included as an indicator of academic success. Exhaustion is a negative predictor of mental health outcomes (Salmela-Aro & Upadyaya, 2014b) as well as students' academic trajectories and subsequent employment options (Salmela-Aro & Upadyaya, 2014a).

1.2 Learning-Related Beliefs

Effective learning, which leads to permanent changes in knowledge structures is a process that takes time, effort, and awareness of the learning process (Soderstrom & Bjork, 2015). Yet, students are often unaware of this (Bjork et al., 2013). Beliefs that students hold about the nature of learning—quick and effortless learning (QEL) beliefs—range from more naïve, believing that learning should happen quickly and effortlessly, to more sophisticated, believing that learning happens gradually and takes effort. Such beliefs, sometimes referred to as effort beliefs (Blackwell et al., 2007) or studied as a dimension of epistemically related beliefs (Schommer-Aikins & Easter, 2008), are shown to associate with students' learning strategies and academic performance (Cano, 2005; Schommer-Aikins, 2004). Research regarding the associations of adolescents' QEL beliefs with academic burnout, though, appears to be lacking. A few studies have examined these relationships among university students, demonstrating naïve beliefs about the process of learning to predict the feeling of depersonalization (Kokkinos & Stavropoulos, 2016).

Motivation is essential for engaging in effortful tasks as it helps to initiate activities and persist at them (Eccles & Wigfield, 2020). According to the expectancy-value-cost framework, students' motivational beliefs—expectancy of outcomes (competency beliefs), perceived value, and cost of learning activities—guide their subjective interpretations of learning situations and tasks; these subjective interpretations, in turn, affect the learning process (Eccles & Wigfield, 2020; Jiang et al., 2018). According to Karabenick and colleagues (2021), in addition to expectancies and values regarding specific subjects (outcome motivation), students also hold expectancies and values related to the learning process (strategy motivation). Our study aims to examine strategy motivation—self-efficacy, intrinsic and utility value of effective learning, and perceived cost of mastering effective learning strategies (Eccles & Wigfield, 2002; Plante et al., 2013). Self-efficacy includes students' competency beliefs and expectancies of success, as empirically these constructs have been shown to be indistinguishable (Eccles & Wigfield, 2002). Intrinsic value describes students' subjective enjoyment of or interest in an activity, whereas utility value refers to the extent to which a task or domain relates to the goals of the student. Perceived cost includes negative aspects of engaging in a task, such as lost time and opportunities (Eccles & Wigfield, 2002; Plante et al., 2013).

Students' subject-specific self-efficacy has been positively, and perceived cost negatively associated with academic performance (Flake et al., 2015; Gaspard et al., 2017; Guo et al., 2015; Jiang et al., 2018). Associations between academic achievement and the value component of subject-specific motivational beliefs, though, have not always emerged (positive associations: Gaspard et al., 2017; Jiang et al., 2018; null finding: Flake et al., 2015). To our knowledge, there is only one study that has examined the links between strategy motivation and academic performance. In this study, Schukajlow et al. (2021) showed that adolescents with higher self-efficacy and lower cost, but not value, regarding a specific learning strategy (drawing strategy) showed better use of that strategy during a problem-solving task, which also led to their better performance on the task. As to associations between students' motivational beliefs and academic burnout, students' higher subject-specific self-efficacy has been shown to associate with lower subsequent academic burnout (Salmela-Aro & Upadyaya, 2014b). Additionally, valuing school more has been demonstrated to relate to lower academic burnout (Tuominen-Soini & Salmela-Aro, 2014) and subject-specific perceived cost to be positively related to all dimensions of academic burnout among upper-secondary school students (Tuominen et al., 2020).

Until recently, students' beliefs about the nature of learning and motivational beliefs have been studied in isolation, although researchers focusing on the interplay between beliefs about the nature of *knowledge* (beliefs about how knowledge is justified and developed) and subject-specific motivational beliefs have demonstrated their combined effects on academic achievement (Guo et al., 2022). Furthermore, so far, strategy motivation has been rarely recognized and assessed (but see Karabenick et al., 2021; Kikas et al., 2023; Schukajlow et al., 2021). In the present study we address the combined effects of beliefs about the nature of *learning* (how learning happens) and

motivational beliefs about learning strategies.

1.3 Reading Comprehension Strategies

Reading comprehension strategies (RCS) are part of learning strategies and are defined as deliberate, goal-directed attempts to control and modify the reader's efforts to decode text, understand words, and construct meanings (Afflerbach et al., 2020). In lower secondary school, students are exposed to increasingly more complex texts, and thus being aware and capable of applying RCS becomes increasingly important for comprehension (Cain & Oakhill, 2007). Strategies can be categorized as surface strategies that primarily focus on repetition and memorization (e.g., re-reading materials), and deep strategies that aim at transforming or applying information, resulting in meaningful learning (Dinsmore & Alexander, 2012).

Strategic readers are aware of their reading process and able to choose appropriate strategies. Students who struggle with reading tend to use surface strategies (Rogiers et al., 2019). Moreover, students of all ages have been shown to prefer using strategies that evoke surface processing (Bjork et al., 2013). This may be explained by the fact that using deep learning strategies is more effortful and time-consuming compared to strategies that promote surface level processing. Thus, applying deep strategies assumes adaptive motivation and it is necessary to address motivation together with learning strategies (Roediger & Pyc, 2012). Learning strategies for deep processing have been repeatedly shown to be related to better academic outcomes (for meta-analyses on overall learning strategies and academic achievement, see: Dent & Koenka, 2016; Fong et al., 2021; for a meta-analysis on RCS and reading comprehension, see: Sun et al., 2021). As comprehension of text-based learning material is crucial in most school-subjects, regulating one's reading practices for deep processing of the content, e.g., monitoring comprehension and redirecting effort and resources as needed, is a robust predictor of learning success (Taraban et al., 2000).

As to associations between lower secondary school students' reading or learning strategies and academic burnout, research is scarce. However, Asikainen et al. (2020) have demonstrated that university students applying a surface approach to studying are more likely to experience academic burnout when compared to students using a deep approach. To our knowledge, relations of learning-related beliefs and learning strategies with burnout have not been explored among lower secondary school students.

1.4 Associations Between Beliefs and Strategies

QEL beliefs have been shown to relate to the use of learning strategies. For instance, Cano (2005) found that secondary school students' QEL beliefs negatively predicted their academic achievement both directly and indirectly through the use of surface strategies. Additionally, Schommer-Aikins and Easter (2008) found that while taking into account different dimensions of epistemically related beliefs, college students' QEL beliefs negatively predicted a number of self-regulatory learning strategies and academic achievement. Nevertheless, not all studies have found such associations, when taking other epistemically related beliefs into account (university students: Ravindran et al., 2005). Moreover, Metallidou (2013) found 8th and 9th graders' QEL beliefs to predict their use of deep learning strategies positively, not negatively. It is important to note that most of these studies (except for Metallidou, 2013) have assessed strategy use with general self-report instruments (e.g., Motivated Strategies for Learning Questionnaire MSLQ; Pintrich & De Groot, 1990) without providing a specific learning context or task for the respondents.

Some studies have also explored associations between reading practices, reading comprehension, and epistemic beliefs about knowledge (Bråten et al., 2015). Research concerning beliefs about learning in the contexts of reading comprehension practices is scarce. To our knowledge, only Kardash and Howell (2000) have shown undergraduates' beliefs in effortful and gradual learning to be positively associated with deep RCS.

Studies on the associations between subject-specific motivational beliefs and the quality of learning strategies have consistently shown positive associations between self-efficacy and the quality of employed learning strategies (Berger & Karabenick, 2011; Liem et al., 2008). As to value, while some studies have shown it to be positively associated only with the use of deep strategies (among adolescents: Lau & Chan, 2003; Metallidou & Vlachou, 2010), others have demonstrated value to have a positive association with surface strategies (Berger & Karabenick, 2011) or both (Liem et al., 2008). Higher perceived cost has been associated with increased use of surface strategies (Berger & Karabenick, 2011) and decreased use of more effortful strategies (Shinogaya, 2018). As to associations with RCS, researchers have demonstrated secondary school students' reading-related self-efficacy to be positively associated with their ability to use deep RCS (Lau & Chan, 2003), reported use of RCS and reading comprehension (Anmarkrud & Bråten, 2009; Bråten et al., 2013). However, even though positive associations with value have been shown (Anmarkrud & Bråten, 2009), they have not always emerged (Bråten et al., 2013), and

relations with cost have not been explored so far. Furthermore, there are a few studies that have examined strategy motivation. In one such study, Karabenick et al. (2021) examined high school students' appraisals of the utility and cost of using cognitive, metacognitive and resource management strategies and their reported use in math classes. They found that students with higher utility value tended to use effective strategies more frequently while relations with cost were more diverse. In another study, Kikas et al. (2023) showed that fourth and sixth graders with higher interest in and utility value, but not self-efficacy, of effective learning used more deep learning strategies during an individual learning task. Additionally, Schukajlow et al. (2021) showed that adolescents with higher self-efficacy and lower cost, but not value, regarding a specific strategy (drawing strategy) make better use of that strategy (have higher quality drawings) during a problem-solving task.

1.5 The Present Study

The main aim of the current study was to examine the joint effects of 8th grade students' learning-related beliefs as well as use of RCS on their academic success in terms of academic outcomes and exhaustion. Moreover, students' prior academic achievement was accounted for. Additionally, we investigated the effects of learning-related beliefs on the use of RCS. As we were interested in the overall joint effects of the mentioned learning-related aspects, we adopted a variable-oriented approach. The theoretical model is presented in Figure 1.

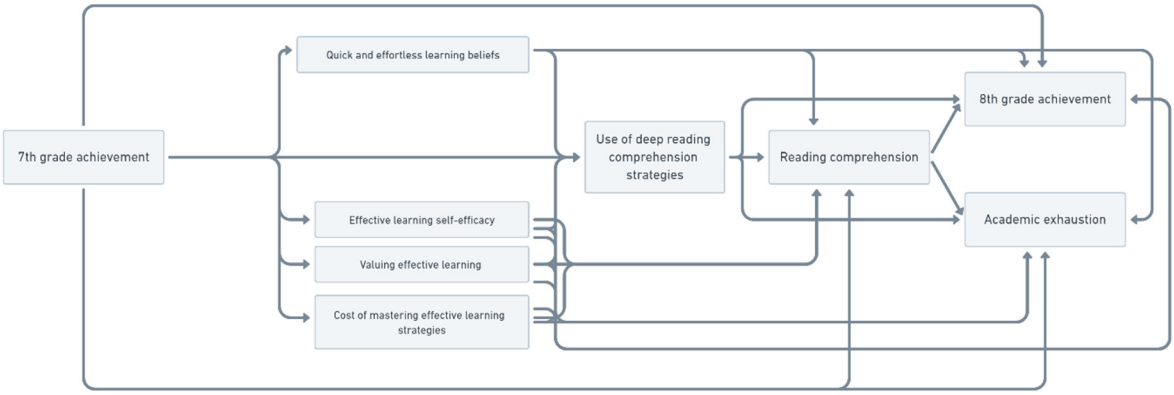

Figure 1. Theoretical Model

First, we explored the effects of learning-related beliefs on 1) performance on a reading comprehension task, 2) academic achievement (grades), and 3) academic exhaustion. We were interested in direct as well as indirect effects via the reported use of RCS. The following hypotheses were posed:

(H1a) Believing in QEL has both direct and indirect negative effects (via the use of RCS) on academic outcomes (Cano, 2005; Schommer-Aikins & Easter, 2008).

(H1b) QEL beliefs have an indirect positive effect on academic exhaustion via the use of deep RCS, based on the expected effect of QEL beliefs on RCS (Cano, 2005; Kardash & Howell, 2000; Schommer-Aikins & Easter, 2008) and the anticipated negative effect of using deep RCS on academic exhaustion (Asikainen et al., 2020).

(H1c) Higher motivation to learn effectively (higher self-efficacy and value, lower cost) has direct and indirect positive effects (via the use of RCS) on academic outcomes (Berger & Karabenick, 2011; Jiang et al., 2018; Liem et al., 2008; Schukajlow et al., 2021; Shinogaya, 2018)

(H1d) Higher motivation to learn effectively (higher self-efficacy and value, lower cost) is associated with lower academic exhaustion (Salmela-Aro & Upadyaya, 2014b; Tuominen et al., 2020; Tuominen-Soini & Salmela-Aro, 2014).

Second, we examined the effects of the use of RCS on 1) performance on a reading comprehension task, 2) academic achievement (grades), and 3) academic exhaustion. We hypothesized the use of deep RCS to have a:

(H2a) positive effect on academic outcomes (Dent & Koenka, 2016; Sun et al., 2021; Taraban et al., 2000);

(H2b) negative effect on academic exhaustion (Asikainen et al., 2020).

Third, we explored the effects of learning-related beliefs on the use of RCS. We expected:

(H3a) QEL beliefs to have a negative effect on the use of deep RCS (Cano, 2005; Kardash & Howell, 2000; Schommer-Aikins & Easter, 2008);

(H3b) Higher motivation to learn effectively (higher self-efficacy and value, lower cost) to have a positive effect on the use of deep RCS (Anmarkrud & Bråten, 2009; Berger & Karabenick, 2011; Karabenick et al., 2021; Kikas et al., 2023; Lau & Chan, 2003; Schukajlow et al., 2021; Shinogaya, 2018).

2. Method

2.1 Participants and Procedure

Participants were 1165 eighth-grade students (588 boys; age $M = 14.29$, $SD = 0.50$) from 39 schools (74 classes) all over Estonia, both from towns and the countryside. Students' beliefs, RCS, reading comprehension, and information on earlier grades were collected with a web-based assessment instrument as part of the project "Developing tools for assessing learning to learn, social, and self-determination competencies in the end of middle school" (see Kikas et al., 2021). In the autumn of 2020, Education and Youth Board of Estonia (HARNO) invited schools to participate in the study, after which specific instructions were given to teachers. Teachers informed the students and parents about the tests as well as the participants' right to cancel their participation. Tests were administered at the beginning of the school year (September–November 2020), teachers could choose the most suitable day during a predetermined period. Students took the tests in computer labs during a regular school day and were supervised by their teachers. Completing the test took about 45 minutes.

For information on academic exhaustion and half-year grades data from a separate project, coordinated by HARNO in February–March 2021, was used. From this data collection 296 students (126 boys) had been participants in the data collection in autumn 2020, enabling us to explore the longitudinal associations with academic exhaustion and grades. For this second data collection students were able to complete the questionnaire at home by themselves.

2.2 Measures

2.2.1 QEL Beliefs

Students evaluated four statements on a 5-point scale (1 – *do not agree at all* […] 5 – *completely agree*) regarding how much they believe that learning should happen quickly and effortlessly (e.g., "Working hard on a difficult problem for an extended period of time only pays off for really smart students"; cf. Schommer-Aikins et al., 2000). An average score was used (internal reliabilities of the measures are presented in Table 1).

2.2.2 Motivational Beliefs

Motivational beliefs items were formulated based on Expectancy-Value-Cost theory (Eccles & Wigfield, 2020) in relation to effective learning (Kikas et al., 2023). Students evaluated the statements on a 5-point scale (1 – *do not agree at all* […] 5 – *completely agree*). Three scores were used. *Effective learning self-efficacy* was assessed with one item ("I am able to use effective learning strategies"). *Valuing effective learning* was assessed with two items ("I am interested in finding out how to learn more effectively"; "Knowledge about effective learning is useful for my life outside of school and future"). An average score was used. *Cost of mastering effective learning strategies* was assessed with one item ("Mastering effective learning strategies is too time-consuming").

2.2.3 Reported Use of Deep RCS

After reading a text (see section 2.2.4.), students were presented with a list of 10 RCS and had to mark the ones they had used when reading the text. Six of the presented options were deep RCS (e.g., "From time to time I stopped reading and thought about what I was reading") and four were surface strategies (e.g., "I read the text quickly several times"). The list of strategies was composed based on literature (Kolić-Vehovec & Bajšanski, 2006; Mokhtari et al., 2018) and a pilot study including open-end answers. The score of using deep RCS was calculated as the sum of deep strategies that a student marked (range: 0–6).

2.2.4 Reading Comprehension

Reading comprehension was assessed with a test that students completed after having read a text of 391 words and 30 sentences about how to learn effectively. Students' reading comprehension was assessed with eight multiple choice questions about the text. For each question the students had to mark the correct answers from the four given options or, alternatively, they could mark the box "I don't know". A reading comprehension score was calculated as the sum of correct answers selected and incorrect answers not selected (range: 0 – 32). The option "I don't know" resulted in 0 points.

2.2.5 Academic Achievement

Students' 7th grade achievement was calculated as an aggregated score of students' retrospective reports of their previous academic year grades in mathematics, Estonian language and science. Students' 8th grade achievement was calculated as an aggregated score of students' retrospective reports of their previous academic semester grades in mathematics, Estonian language, physics and chemistry. Grades of these subjects were used as in the Estonian school system from the beginning of the 8th grade chemistry and physics replace the previous general science classes. In Estonia, students are graded on a scale from 1 to 5, with higher grades indicating better academic achievement.

2.2.6 Academic Exhaustion

Academic exhaustion was assessed with a questionnaire based on School Burnout Inventory (for the original version, see Salmela-Aro, Kiuru, et al., 2009; for the Estonian version, see Vinter et al., 2019). Students had to evaluate four statements on a 5-point scale (1 – *do not agree at all* […] 5 – *completely agree*) regarding how much they agreed with the statements (e.g., "I feel overwhelmed by my schoolwork"). An average score was used.

2.3 Analysis Strategy

The data were analysed using IBM SPSS Statistics (Version 25) and Mplus statistical package (Version 8.3; Muthén & Muthén, 1998-2017). Regarding missing data, the results of the Little (1988) MCAR test, $\chi 2(50) = 88.380$, $p = 0.001$, indicated that data were not missing completely at random (MCAR), therefore the robust maximum likelihood estimation (MLR) approach for missingness was used. Research questions were answered using path analysis with the specification TYPE = COMPLEX using "classroom" as the cluster. The following model fit statistics were used: 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). Non-significant $\chi 2$, CFI, and TLI values above 0.90, and RMSEA and SRMR values below 0.10 indicate an acceptable model fit (Hu & Bentler, 1999; Muthén & Muthén, 1998–2017).

3. Results

Descriptives of the study variables are presented in Table 1. Table 2 indicates that the bivariate correlations between QEL beliefs and the components of strategy motivation are small to moderate, while the correlations between the learning-related beliefs and use of RCS and aspects of academic success are mainly small (Ellis, 2010). Additionally, the correlations between academic outcomes are moderate to large (Ellis, 2010). The results of path analysis are presented in Figure 2. The model fit the data well, $\chi^2(1) = 2.12$ ($p = .146$); CFI = 0.999, TLI = 0.961, RMSEA = 0.031, 90% C.I.(0.000, 0.091), SRMR = 0.008.

Table 1. Descriptives of Study Variables

Variable	n	*M*	*SD*	*Min*	*Max*	Cronbach's α
QEL beliefs	1165	2.51	0.79	1	5	.62
Effective learning self-efficacy	1165	3.21	0.94	1	5	–
Valuing effective learning	1165	3.95	0.83	1	5	.74
Cost of mastering effective learning strategies	1165	2.90	1.01	1	5	–
Use of deep RCS	1165	2.06	1.75	0	6	–
Reading comprehension	1165	23.18	4.14	10	32	–
7th grade achievement	1163	4.15	0.61	2	5	–
8th grade achievement	296	4.32	0.59	2.6	5	–
Academic exhaustion	279	2.77	0.90	1	5	.75

Table 2. Pearson correlations Between Study Variables

	Variable	1.	2.	3.	4.	5.	6.	7.	8.
1.	QEL beliefs								
2.	Effective learning self-efficacy	–.09**							
3.	Valuing effective learning	–.19***	.30***						
4.	Cost of mastering effective learning strategies	.34***	–.16***	–.09**					
5.	Use of deep RCS	–.15***	.18***	.25***	–.14***				
6.	Reading comprehension	–.33***	.09**	.21***	–.19***	.28***			
7.	7th grade achievement	–.28***	.18***	.19***	–.17***	.17***	.42***		
8.	8th grade achievement	–.27***	.15*	.23***	–.10	.29***	.46***	.80***	
9.	Academic exhaustion	.11	–.24***	–.14*	.25***	–.13*	–.01	–.14*	–.11

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

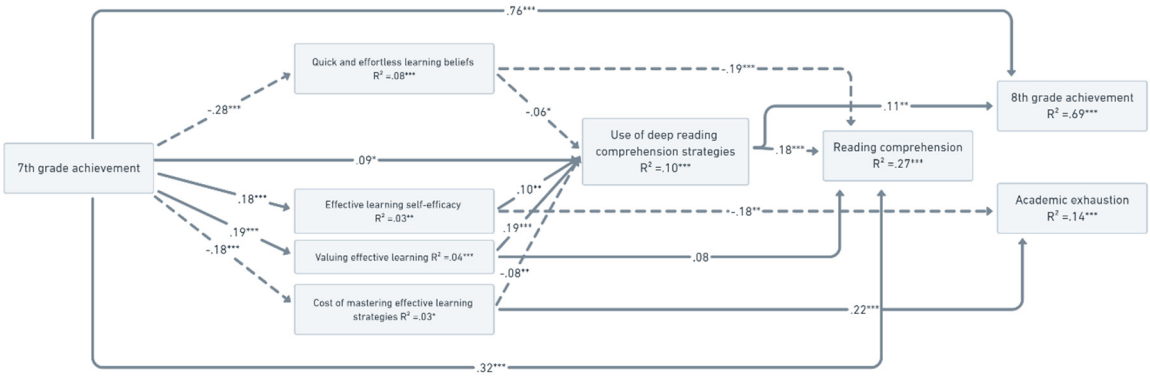

Figure 2. Standardized Results of Path Analysis

Note. Dashed lines represent negative relationships. Only significant direct paths are shown. * $p < .05$; ** $p < .01$; *** $p < .001$. Data for academic exhaustion and 8th grade achievement (n = 296) were collected half a year after the main data collection (n = 1165).

Table 3. Indirect Effects of Beliefs on Academic Success

Independent variable	Dependent variable	Mediator	β	S.E.
Effective learning self-efficacy	Reading comprehension	Use of deep RCS	.017**	0.006
	8th grade achievement		.010*	0.005
Valuing effective learning	Reading comprehension		.033***	0.009
	8th grade achievement		.020**	0.007
Cost of mastering effective learning strategies	Reading comprehension		–.014**	0.005
	8th grade achievement		–.008*	0.004

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

First, we addressed the direct and indirect effects of learning-related beliefs on academic outcomes and academic exhaustion. QEL beliefs had a negative direct effect ($\beta = –.189$, *S.E.* = 0.036, $p < .001$) on reading comprehension (H1a), but no effects on academic exhaustion (H1b).

Effective learning self-efficacy did not have any direct effects on academic outcomes but showed positive indirect effects on both reading comprehension and 8th grade achievement via the use of deep RCS (H1c; Table 3). Valuing effective learning had a direct effect on reading comprehension (β = .079, *S.E.* = 0.031, p < .05), and positive indirect effects on both reading comprehension and 8th grade achievement via the use of deep RCS (H1c; Table 3). Cost of mastering effective learning strategies did not have direct effects on academic outcomes but showed negative indirect effects on reading comprehension and 8th grade achievement via the use of deep RCS (H1c; Table 3). Additionally, effective learning self-efficacy had a negative direct effect (β = –.176, *S.E.* = 0.064, p < .01) and cost of mastering effective learning strategies a positive direct effect (β = .215, *S.E.* = 0.061, p < .001) on academic exhaustion (H1d). Valuing effective learning had no effect on academic exhaustion (H1d).

Second, regarding the effects of RCS, we found the use of deep RCS to positively predict reading comprehension (β = .178, *S.E.* = 0.032, p < .001) and 8th grade achievement (β = .107, *S.E.* = 0.031, p = .001; H2a), with no effect on academic exhaustion (H2b). Third, we found the use of deep RCS to be negatively predicted by QEL beliefs (β = –.057, *S.E.* = 0.028, p < .05; H3a) and cost of mastering effective learning strategies (β = –.078, *S.E.* = 0.029, p < .01; H3b), as well as positively by valuing effective learning (β = .186, *S.E.* = 0.029, p < .001; H3b) and self-efficacy of effective learning (β = .096, *S.E.* = 0.033, p < .01; H3b).

4. Discussion

With the current study we demonstrated that lower secondary school students' learning-related beliefs as well as their use of deep RCS are related to students' academic outcomes and exhaustion over and above the effects of prior academic achievement.

4.1 Academic Success

4.1.1 Associations of QEL and Motivational Beliefs with Academic Outcomes

In line with previous research demonstrating the influence of QEL beliefs on academic performance (e.g., Cano, 2005; Ravindran et al., 2005; Schommer-Aikins & Easter, 2008), we found that if students believed that learning should happen quickly and effortlessly, they also tended to comprehend text more poorly (H1a). Contrary to our expectations, this effect was not mediated by the reported use of deep RCS. It is possible that students used strategies that were not listed in the assessment used in the present study.

Unlike the majority of previous studies that have focused on students' motivational attitudes regarding specific subject domains, we addressed students' motivation to learn effectively. Despite these differences in assessment instruments, the results of previous studies demonstrating associations between motivational beliefs and academic achievement are in line with our findings (Anmarkrud & Bråten, 2009; Berger & Karabenick, 2011; Liem et al., 2008). In our study, motivational beliefs were mainly indirectly—via the use of RCS—related to students' academic outcomes. More specifically, we found that the higher the effective learning self-efficacy and valuing of effective learning, the higher the number of deep RCS used and through this the better the reading comprehension as well as academic achievement (H1c). Additionally, higher valuing of effective learning was associated with better reading comprehension directly. It may be expected that when students are confident about using effective learning strategies, they have high expectancies of success regarding the application of deep strategies, which leads them to apply these strategies more readily, leading, in turn, to better performance. It is also plausible that students who value effective learning, use effective strategies more readily, leading to better academic outcomes. Higher cost of mastering effective learning strategies predicted lower reading comprehension and achievement through decreased use of deep RCS (H1c). As the use of deep strategies feels effortful, it is likely that the students considering it to be too time-consuming and effortful to master effective learning strategies, are less inclined to use them as they perceive it too costly, ultimately leading to lower academic outcomes. These results are in line with research demonstrating that perceived cost explains additional variance in outcomes, beyond self-efficacy and value (Jiang et al., 2018). These results are also in line with the findings of Schukajlow et al. (2021) showing higher motivation regarding a specific strategy to be linked to better performance on a problem-solving task via the use of the respective strategy during the task. Thus, the effects of motivational beliefs regarding effective learning on academic outcomes seem to be at least partly mediated by the use of deep strategies, indicating that adaptive motivational dispositions without the use of deep strategies might not be sufficient for learning success. The association with the component of cost implies that in addition to promoting students' self-efficacy regarding and the value of effective learning, it is important to explicitly address students' specific concerns regarding the cost—time and effort—that effective learning entails.

4.1.2 Associations of QEL and Motivational Beliefs with Academic Exhaustion

In contrast to our expectations (H1b), QEL beliefs were not related to students' academic exhaustion. Unlike

motivational beliefs, QEL beliefs are traditionally assessed as a general understanding about the nature of learning and not as a personal self-referential construct. In future studies, the effect of self-referential QEL beliefs (self-theory) could be explored as a better predictor of emotional coping (e.g., De Castella & Byrne, 2015). Additionally, we only assessed academic exhaustion. It is possible that associations with other dimensions of academic burnout, for example, with cynicism, would have emerged (Kokkinos & Stavropoulos, 2016).

As to the motivational beliefs addressed, we found self-efficacy and perceived cost of mastering effective learning strategies, but not valuing effective learning, to be associated with academic exhaustion (H1d). It can be expected that students, who consider themselves not being able to use effective learning strategies and students who regard effective learning as too time-consuming, experience higher academic exhaustion stemming from the imbalance between students' available resources and their perceived school-related demands. These results are in line with and extend on previous research on academic burnout with academic exhaustion being one of its dimensions (Salmela-Aro & Upadyaya, 2014b; Tuominen et al., 2020; Tuominen-Soini & Salmela-Aro, 2014). Our findings indicate that for addressing adolescents' academic exhaustion, it is advisable to go beyond students' general school- or subject-related motivation and to consider students' motivational beliefs about effective learning, specifically. Nonetheless, by assessing academic exhaustion we only addressed students' negative academic affect. This could explain the lack of expected associations with value, which has, indeed, been shown to be a predictor of positive, not negative school-related affect (Jiang et al., 2018).

4.1.3 Associations Between the Use of Deep RQS and Academic Success

Our findings are in line with studies indicating that the use of deep processing strategies is related to better outcomes both in the context of RCS and reading comprehension, specifically (Sun et al., 2021), as well as of general learning strategies and academic achievement (Dent & Koenka, 2016; Fong et al., 2021). Better reading comprehension and 8th grade academic achievement were linked to the use of a wider variety of deep RCS (H2a). Since we assessed the use of RCS, specifically, rather than general learning strategies, the associations with performance on the specific reading comprehension task were expected. On the other hand, the effect of the use of deep RCS on general academic achievement, even when accounting for prior achievement, indicates the importance of students' proficiency in using deep RCS in a variety of subject domains (Melby-Lervåg & Lervåg, 2014).

In contrast to our expectations, the use of deep strategies was not related to academic exhaustion (H2b). This result contradicts the findings of Asikainen et al. (2020) who demonstrated that Finnish university students applying a surface approach to studying were more likely to experience academic exhaustion when compared to students using a deep approach. There are several possible reasons for these conflicting results. While we focused on adolescents in lower secondary school, Asikainen et al. (2020) studied university students. These academic contexts differ in several aspects. Whereas tasks and assessment at lower secondary school level tend to focus more on remembering facts and demonstrating learning on a short time-scale—meaning that the use of surface strategies might be sufficient—, learning tasks and assessment at the university level are more complex, requiring the use of deep learning strategies in order to be successful. In addition, university students enjoy higher levels of study motivation when compared to secondary school students (Martin, 2009), who have been shown to experience a consistent decline in study motivation (Wang & Eccles, 2012). As long as using surface strategies (e.g., quickly re-reading materials before class) enables the student to succeed in terms of academic performance, it is plausible that the processing quality of the strategies used does not affect students' emotional well-being. All in all, these contradictory findings call for more exploration and empirical confirmation in future studies.

4.2 Associations of QEL and Motivational Beliefs with the Use of Deep RCS

In line with earlier research on students' self-regulatory and deep learning strategies (Kardash & Howell, 2000; Schommer-Aikins & Easter, 2008), we found that if students believed that learning should happen quickly and effortlessly, they also tended use a smaller variety of deep RCS (H3a). It is plausible that students, who believe that learning should happen quickly and effortlessly, use fewer deep strategies as this requires effort (Bjork et al., 2013). These findings indicate that explicit classroom discussions regarding the nature of learning are called for. This would enable students to understand the reasons *why* using deep strategies is effective for comprehension even though using them might intuitively feel ineffective.

Additionally, all motivational beliefs were related to the use of deep RCS in theoretically consistent ways. In line with studies that have examined associations between learning-related motivation and use of strategies (Berger & Karabenick, 2011; Liem et al., 2008), we found higher effective learning self-efficacy to associate with the use of a greater variety of deep RCS (H3b). This finding is also in line with the study by Schukajlow et al. (2021) that showed adolescents' higher self-efficacy regarding a specific strategy to be linked to their better use of that strategy

during a problem-solving task. Interestingly, though, in another study examining strategy motivation, only value, but not self-efficacy, of deep learning strategies was linked to the actual use of such a strategy during a learning task (Kikas et al., 2023). Nonetheless, the lack of this association in their study might have been due to the easy use of the specific strategy they examined—looking at task-related drawings in addition to reading a text. As to perceived cost of mastering effective learning strategies, we found it to be negatively associated with the use of deep RCS (H3b). This finding goes beyond the current research on subject-domain-specific cost (e.g., Berger & Karabenick, 2011), while confirming and broadening previous findings regarding the relevance of the perceived cost of using self-regulatory strategies (Shinogaya, 2018) and the perceived cost of using specific problem-solving strategies (Schukajlow et al., 2021) in terms of the actual use of such strategies. Nonetheless, this association between perceived cost and reported use of RCS was small. It is possible that behind this small overall effect are more diverse relations. Namely, Karabenick et al. (2021) found the association between perceived cost of using effective strategies and the reported use of such strategies to differ significantly between students. Concerning valuing effective learning, we found it to be positively related to the use of deep RCS (H3b). This is in line with the findings of several studies (Lau & Chan, 2003; Liem et al., 2008; Manganelli et al., 2019), while differing from the studies of Berger and Karabenick (2011) and Anmarkrud and Bråten (2009), where such an association did not emerge. The fact that these studies have mainly assessed students' valuing of specific subject domains or tasks might explain the somewhat inconsistent findings concerning the relations between value and the use of deep learning strategies. Finding a subject domain or task valuable does not translate directly into the use of deep learning strategies, whereas focusing on motivational beliefs regarding effective learning specifically might bear more relations with the use of deep strategies. Nonetheless, also the few studies examining strategy motivation have found somewhat differing results: while Kikas et al. (2023) and Karabenick et al. (2021) found valuing effective strategies to be related to strategy use, Schukajlow et al. (2021) found only higher self-efficacy and lower cost, but not value, regarding a specific strategy to be linked to better use of that strategy during a task. These somewhat differing findings might have resulted from differences in the designs of these studies (the learning task used, the included covariates, participants' age). Nonetheless, the results of the present study alongside with those of the described studies point to the importance of further investigating and addressing students' strategy motivation.

4.3 Limitations and Practical Implications

As to limitations, the constructs were assessed using self-report measures. Even students' GPAs were based on their self-reported grades. Nonetheless, students' self-reported grades have been shown to be strongly positively associated with their actual grades among students of similar age (Sticca et al., 2017). Nevertheless, future studies should replicate these findings using other than self-report measures. Additionally, most constructs in this study were assessed cross-sectionally, which limits drawing inferences concerning the directionality of these relationships. Therefore, future studies should use longitudinal designs. Another limitation is that data on 8th grade GPA and academic exhaustion were obtained from a remarkably smaller number of participants compared to the whole sample and, thus, results regarding these outcomes should be replicated.

Furthermore, motivational beliefs were each assessed by only a single or two items and, therefore, future studies should include more items to assess and inspect motivation to learn effectively. While external validity of single-item measures of subject-specific motivational constructs has been shown among students of similar age (Gogol et al., 2014), motivational beliefs about effective learning should be further studied using measures with more items. Additionally, construct validity of motivational beliefs regarding effective learning should be further explored by studying their interplay with general school- or subject-related motivational beliefs in predicting learning behaviour and academic success. In addition, by addressing only academic exhaustion as an affective outcome, our results are limited to the ill-being dimension of student coping. In future studies, both academic ill-being and well-being indicators could be included. Moreover, the study was conducted in the Estonian cultural and educational environment and included a specific age group, which should be considered when generalizing the results.

Despite these limitations, our results indicate that students would likely benefit more from the instruction of effective learning strategies if their beliefs about the nature of learning and motivational beliefs about effective learning are explicitly addressed alongside each other. More specifically, students will more likely apply deep strategies if they have a sophisticated understanding about the role of time and effort in learning. Moreover, in addition to helping students see the value of using deep learning strategies, acknowledging students' concerns about the cost of mastering these strategies might be important for understanding why students do not use deep strategies. Furthermore, students need help to see the difficulties that accompany deep strategies as desirable (Bjork & Bjork, 2011).

Our findings also refer to the practical value of addressing not only students' general school- or subject-related motivation, but specifically also their motivational beliefs about effective learning, as beliefs about effective learning seem to bear direct links to students' use of deep learning strategies, higher academic achievement, and also lower levels of academic exhaustion.

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