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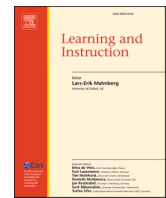
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# Commonalities and differences in strategies for regulating motivation and emotion in academic settings: A within-person approach

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## ABSTRACT

**Background:** Motivation and emotion form important pillars of students' educational experiences and, while representing distinguishable constructs, are closely intertwined. Consequently, it can be assumed that their regulation may be governed by similar mechanisms as well. From a theoretical perspective, MR and ER strategy taxonomies do contain overlap, particularly among strategies involving reappraisals of personal competencies, but also unique (i.e., non-overlapping) strategies. Empirically, however, motivational regulation (MR) and emotion regulation (ER) have had little intersection in prior research and stem from rather disconnected research traditions.

**Aims:** Building on previous work on the functional interplay between students' motivation and emotion, we examined similarities and differences in MR and ER strategies and tested the assumption that MR strategies are also used to regulate emotions, and ER strategies to regulate motivation, in study situations.

**Sample:** Participants were 1,466 university students.

**Method:** Using a within-person design, students reported on their use of various strategies for managing regulatory problems involving either low motivation or negative emotions (anxiety, boredom).

**Results:** Using CFA and latent difference modeling, we found that strategy use was strongly correlated and differed little in terms of mean levels across motivational and emotional regulation problems. These correlations were even stronger, and mean differences smaller, than those found for regulatory problem distinctions within motivational and emotional problems.

**Conclusions:** The findings indicate that many designated MR and ER strategies as distinguished in current taxonomies may be relevant for managing both motivational and emotional problems and underscore the need for joint theoretical perspectives on MR and ER.

## 1. Introduction

Motivation and emotion are key determinants of students' well-being, learning, and achievement. They represent distinguishable constructs and play unique roles in students' academic lives, but are also highly intertwined: They co-occur when students set goals, evaluate their progress, encounter difficulties, or analyze the results of their learning, and share common antecedents (Meyer & Turner, 2006; Pekrun, 2023). It thus seems plausible that the regulation of motivation and emotion is governed by similar mechanisms as well. Nevertheless,

inquiry into motivational regulation (MR) and emotion regulation (ER) in academic settings has operated in relative isolation, forming largely independent literatures. In a study examining university students' ER, Webster and Hadwin (2015, p. 20) concluded that several of the strategies identified "closely align with the motivation regulation strategies described by Wolters (2003)," and that "it may be worthwhile to further explore the distinction between regulating emotions and regulating motivation during [...] studying." Relatedly, Ben-Eliyahu (2019) notes that strategies for regulating different components of self-regulated learning (SRL) overlap, implying they can serve multiple purposes, but

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<sup>2</sup> research interests: emotion and emotional development in education; emotional self-regulation.

systematic comparisons of MR and ER strategies are lacking.

This study examined common ground and differences in regulating motivation and emotion in academic settings. Building on a theoretical comparison of extant taxonomies of motivation regulation (MR) and emotion regulation (ER) strategies which form a major focus in the respective research fields, we derived and tested the assumption that MR strategies are also used to regulate emotions, and ER strategies to regulate motivation, using a within-person approach in which students rated the use of different MR and ER strategies for various motivational and emotional study problems.

### 1.1. Achievement-related motivation and emotion

According to Schunk et al. (2014), motivation comprises the processes by which goal-directed behaviors are initiated and sustained. When these processes are tied to achievement-related tasks (e.g., studying) and outcomes (success or failure), scholars typically speak of achievement motivation. Similarly, achievement emotions are related to achievement activities and outcomes, whereby emotions are understood as multidimensional phenomena involving affective, cognitive, motivational, physiological, and expressive subcomponents (Pekrun, 2018). From this perspective, motivation forms an inherent part of emotional experience: Emotions can trigger different motivational-behavioral tendencies in individuals, including approach (e.g., increase task-related effort) versus avoidance behaviors (e.g., skipping class). On the one hand, anticipated emotions drive motivational processes including goal setting (Umarji et al., 2021), and ‘feelings of desire’ form the core of motivation (Pekrun, 2023)—on the other hand, emotions also result from motivational processes such as attributions involving inferences about the causes of success or failure, and study-related motivation and emotion are reciprocally linked (Sutter-Brandenberger et al., 2018).

At the same time, conceptual boundaries between motivation and emotion are often blurry (Bong et al., 2023). Intrinsic motivation and enjoyment of learning constitute a prime example. Intrinsic motivation is typically defined and measured as motivation to engage in tasks because they are experienced as enjoyable (Isen & Reeve, 2005); essentially, specific qualities of motivation are characterized by specific emotional experiences. Similarly, prominent emotion measures such as the Achievement Emotions Questionnaire (AEQ; Pekrun et al., 2023) contain items tapping into motivational components of emotions (e.g., being motivated skip class because of one’s experience of boredom therein).

Expectancy-value theory (EVT; Wigfield & Eccles, 2000) and control-value theory (CVT; Pekrun, 2018) are well-established theories in the achievement motivation and emotion literatures, respectively, and clearly have strong similarities. Specifically, they both focus on individuals’ beliefs and cognitive appraisals targeting expectancies of success and personal competence (i.e., expectancy-/control-related appraisals), and values of learning and achievement (i.e., value-related appraisals), as prime determinants of motivation and emotions. We draw on EVT and CVT as frameworks of achievement motivation and emotion, respectively, which incorporate assumptions of other important and well-established theoretical lenses, including achievement goal theory, self-determination theory, and attributional approaches to motivation and emotion. Both EVT and CVT have influenced prior scholarship on MR and ER and share core propositions about motivational and emotional processes underlying learning (Berweger et al., 2022). As such, they provide a helpful foundation for comparing MR and ER in educational settings.

### 1.2. Regulating achievement-related motivation and emotion

In educational research, MR and ER have been studied in relative isolation from one another; they are embedded in largely disconnected literatures and research traditions with little cross-referencing, despite

their focus on the regulation of two closely intertwined phenomena. Drawing from both fields, conceptualizations of MR and ER differ in notable ways, but also share several fundamental assumptions. Following Wolters (2003), motivational self-regulation<sup>3</sup> in achievement settings refers to intended activities through which individuals initiate, maintain, or increase motivation to complete a task or goal. ER as defined by Gross (2015; Harley et al., 2019), in turn, generally encompasses any conscious or unconscious attempts to influence which emotions one has, when one has them, and how one experiences or expresses them. In both MR and ER accounts, regulation is fundamentally understood as targeting a desired motivational or emotional state, respectively, that provides a standard for the regulatory efforts exerted, and as driven by a discrepancy between the current state and that standard.

Specifically, both MR and ER models outline that regulation is set in motion when individuals detect a need for action (i.e., a regulatory problem) and form a regulatory goal towards achieving a desired state (Harley et al., 2019; Miele & Scholer, 2018; Schwinger & Stiensmeier-Pelster, 2012). Depending on the nature of the regulatory problem and the regulatory goal(s), individuals will select and implement regulatory strategies. MR and ER models further agree that both metacognitive as well as metamotivational and -emotional knowledge (i.e., knowledge about cognition, motivation, and emotion) and processes which involve continuous monitoring and potential adjustment of regulatory efforts are key constituents of skillful, target-oriented, and effective regulation (Engelschalk et al., 2017; Gross, 2015; Miele & Scholer, 2018). Additionally, both MR and ER models highlight that strategy selection and implementation is also shaped by more distal individual factors (e.g., regulatory competencies, motivational/emotional dispositions) as well as contextual factors (e.g., task characteristics, home vs. school/university setting, situational affordances/constraints, sociocultural norms; see also Frenzel et al., 2023). Based on the execution quality of individuals’ regulatory efforts (all things being equal), their motivation or emotions should be maintained or change in the desired direction, consequently impacting learning processes (e.g., effort, persistence, depth of cognitive processing) and achievement outcomes. As such, conceptually, MR and ER involve similar core processes.

Moreover, similar to other components of self-regulated learning (e.g., meta-/cognitive regulation), studying the types of cognitive and behavioral operations (i.e., strategies) that individuals can deploy situationally and habitually for achieving these goals lies at the heart of both MR and ER theorizing and research (Jacobs & Gross, 2014; Winne & Hadwin, 2012). Strategies can be defined as purposeful actions toward a predefined goal (Alexander et al., 1998). However, while MR is widely conceptualized as a willful process that requires students to actively control and (mainly) consciously monitor their motivation (Miele & Scholer, 2018; Schwinger & Stiensmeier-Pelster, 2012; Steuer et al., 2019), ER scholars posit that regulatory efforts need not be consciously enacted. Consequently, educational research on MR strategies implies a focus on explicit operations, whereas ER strategies include “processes that are under deliberate control and processes that operate implicitly” (Gross, 2015, p. 5).

Furthermore, the regulatory goals considered in the respective literatures differ. In educational contexts, maintaining or upregulating one’s own motivation, or enhancing its quality, to ultimately improve learning and performance, is typically considered as the focal goal of MR (Miele & Scholer, 2018; Schwinger & Stiensmeier-Pelster, 2012). Except for in research on self-control (Duckworth et al., 2019), downregulation of motivation for a specific task is not considered, even if indicated (e.g., when multiple tasks are in conflict). ER research, in contrast, highlights that regulation can be geared towards optimizing learning (i.e.,

<sup>3</sup> MR and ER can also encompass interpersonal co-regulation, which is, however, beyond the scope of this paper focusing on self-regulation of motivation and emotion.

instrumental goals), but can entail different goals. Striving to down-regulate/prevent negative emotions, and to upregulate/maintain positive emotions are considered core goals of hedonic ER (Harley et al., 2019). To attain these goals, students may engage in behaviors that do not cater to optimal learning such as skipping a boring class.

Finally, from a broader perspective, both MR and ER are part of self-regulated learning (Boekaerts, 1996; Winne & Hadwin, 2012; Zimmerman, 2000). However, SRL frameworks vary in the degree to which they explicate and differentiate between motivational and emotional processes. In some, MR and ER are subsumed under umbrella terms like affective regulation (Kim et al., 2020; Pintrich, 2004). Most commonly, managing emotions is seen as a means to upregulate motivation (Ilishkina, de Bruin, Podolskiy, Volk, & van Merriënboer, 2022; Miele & Scholer, 2018; Winne & Hadwin, 2012; Wolters, 2003). This implies that emotions (e.g., frustration, boredom) fulfill a signaling function and inform learners about their (lack of) progress or motivational states and trigger regulatory action. This idea is central to Miele and Scholer's (2018) framework addressing the role of metamotivational feelings in MR, which provides an initial step towards considering possible intersections of MR and ER. Similarly, emotions can also be viewed as sources of perceived cost that can propel students' MR (Wigfield & Eccles, 2000).

Taken together, conceptualizations of MR and ER share common ground but entail different assumptions about individuals' awareness of their regulatory efforts, as well as regulatory goals. The latter bears

important consequences for the types of regulatory strategies considered.

### 1.3. Comparing MR and ER strategies

MR and ER strategy taxonomies summarize strategies considered conceptually and empirically important in terms of representing prototypical regulatory efforts or predicting learner outcomes. Consequently, comparing the types of regulatory strategies differentiated in the respective fields can provide insight into conceptual and potential functional similarities and differences between MR and ER.

In MR research, influential taxonomies include those developed by Schwinger and colleagues (Schwinger, von der Laden, & Spinath, 2007; Schwinger & Stiensmeier-Pelster, 2012) and expanded upon by Engelschalk et al. (2016), all of which are grounded in Wolters' (1998, 1999, 2003) seminal typology and, together, cover nine different strategy categories (Fig. 1). In ER research, taxonomies have been derived from CVT (Pekrun & Perry, 2014) and expanded by Harley et al. (2019), Burić et al. (2016), and Stockinger et al. (2022, 2024).

In comparing MR and ER taxonomies, it becomes evident that the breadth of strategy categories differs between MR and ER. Most obviously, *reappraisal* involving modifications of mental representations and evaluations of the self, one's goals, and/or situational circumstances (Gross, 2015), addresses changes in emotion-relevant appraisals that map onto multiple MR strategy categories. Furthermore, MR and ER

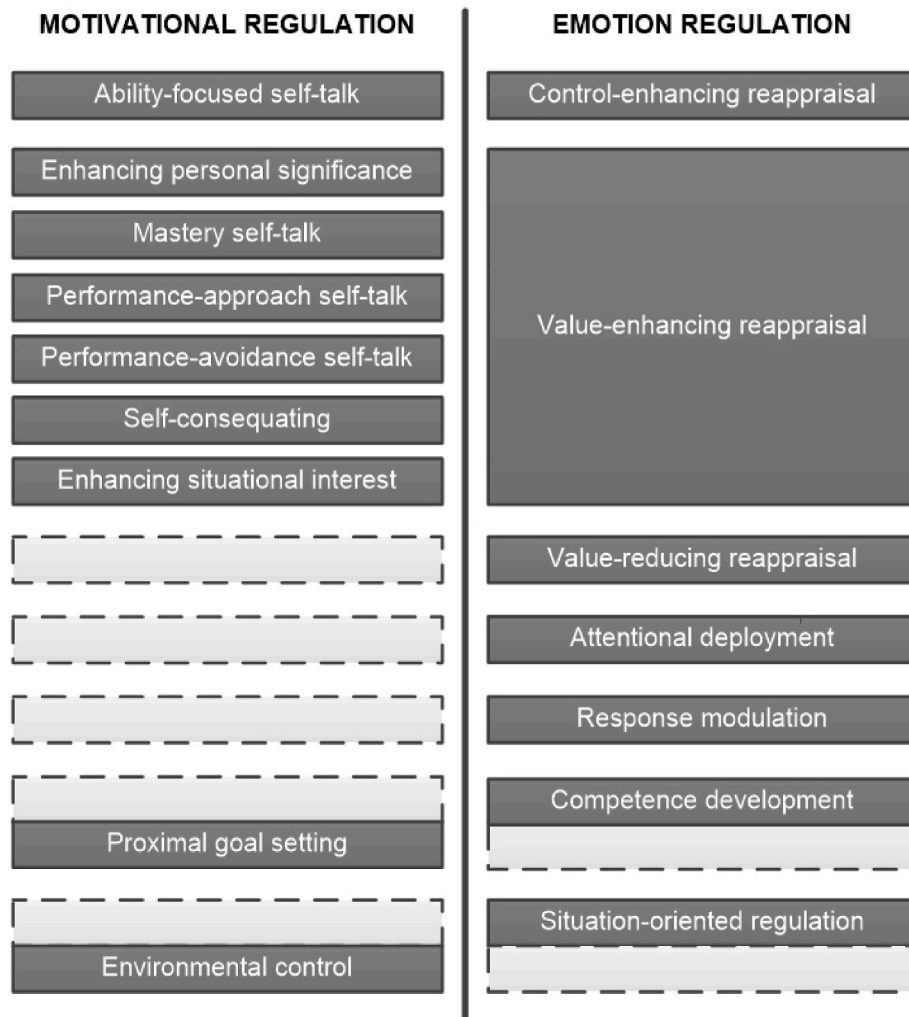


Fig. 1. Mapping common MR and ER strategies.

Note. Corresponding strategies are depicted by mirrored, labelled bars. Non-labelled bars indicate a missing but assumedly relevant strategy counterpart.

strategy taxonomies include both overt/behavioral and covert/cognitive processes and consider strategies that target person-internal determinants and constituents of motivation and emotion as well as strategies that involve changes in situational-contextual contingencies of students' learning.

Regarding person-internal processes, MR and ER share a focus on reappraisal strategies; in MR research, 'self-talk' denotes strategies that deploy such mechanisms to achieve the intended appraisal shift. MR-ER correspondence seem to be greatest for these strategies. Both consider recalibrating perceptions of personal competence and likelihood of success, namely *ability-focused self-talk* and *control-enhancing reappraisal*, respectively. Similarly, motivation and emotion can be regulated by increasing perceived value of tasks or outcomes (MR: *enhancing personal significance*, ER: *value-enhancing reappraisal*). *Enhancing situational interest* (MR) serves to increase the value of a task by making it more appealing. The MR strategies *mastery self-talk* (convincing oneself to work for the sake of learning itself), *performance-approach self-talk* (convincing oneself to work to attain positive consequences of good performance), and *performance-avoidance self-talk* (convincing oneself to work to avoid negative consequences of poor performance) involve activation or shifting of specific goals to increase valuation of the implied target. These strategies are not explicitly differentiated in current ER research (Harley et al., 2019). As value enhancement is relevant for emotion elicitation, these strategies also provide a means for ER. Similarly, envisioning positive incentives for completing tasks—*self-consequating*—to increase extrinsic values of learning should be relevant to ER.

ER taxonomies include two strategies targeting person-internal determinants of emotions that are not considered in current MR frameworks. One is *value-reducing reappraisal*, which serves to downregulate negative emotions such as anxiety or shame that are amplified by excessive valuation of achievement outcomes (Pekrun et al., 2023). As this strategy can facilitate shifting from avoidance-to approach-oriented motivation, it may also be relevant for MR. Similarly, shifting attention to or away from emotional stimuli (*attentional deployment*) might be conducive to conserving or increasing motivation. However, this strategy is not yet included in MR research.

Strategies that target emotional *response modulation* such as physiological modulation (e.g., relaxation), expression (overt display of emotion), or suppression (inhibition of emotional expression or experience) could also be relevant to students' MR: Students may, for instance, suppress their anxiety about an upcoming exam to regulate its debilitating motivational impact. This idea aligns with Miele and Scholer's (2018) MR model which lists response modulation as a strategy for managing metamotivational feelings as part of the MR process (see Corno, 1993), but it has yet to be included in MR research.

The ER strategy category *competence development* involves managing emotions via improving personal competencies to increase perceived control and chances for success (Burić et al., 2016; Pekrun & Perry, 2014), which should also make it highly relevant to regulating motivation as these processes are closely related to raising expectancies for success. This strategy category can be somewhat difficult to grasp theoretically. In some accounts, *competence development* is conceptualized as a subtype of *situation modification* strategies in the sense that it targets person-internal situations (see Harley et al., 2019). Recent evidence suggests that in educational contexts, the distinction between strategies that target external situations versus person-internal competencies is important in terms of linkages with different student outcomes (Burić, Sorić, & Penezić, 2016; Stockinger et al., 2022; Stockinger et al., 2024). Generally, competence-oriented regulation spans long-term processes, requires affective forecasting (similar to *situation-oriented regulation*), and can entail reliance on person-external resources (e.g., help-seeking by way of soliciting procedural or content-related study advice or additional explanation from instructors or knowledgeable friends; Karabenick, 2011) or person-internal resources (e.g., increasing effort). Essentially, *competence development* implies engaging in adaptive

learning behaviors in service of (i.e., as a means for) regulating emotions; from an MR perspective, in contrast, these learning behaviors constitute a focal outcome of individuals' self-regulatory efforts. *Proximal goal setting* (MR) can be conceptualized as an example of competence-oriented regulation and entails breaking tasks down into subtasks to facilitate expectancies for and experience of success and increase the manageability of the task. As perceived manageability of a task can impact students' control appraisals, this strategy should also be relevant for ER.

Finally, *situation-oriented* ER strategies (Pekrun, 2018; Pekrun & Perry, 2014) can target person-external contingencies. This includes situation selection strategies which involve approaching or avoiding situations expected to give rise to certain emotions. As actions undertaken to alter situations (situation modification) typically result in the creation of a 'new' situation (see Gross, 2015, on the blurry distinction between situation selection and modification), the MR strategy *environmental control* (shaping external learning environments to reduce distractions and foster motivation) can generally be viewed as related to *situation-oriented* ER. However, MR and ER are not entirely aligned here. *Environmental control* is not explicitly covered in current ER taxonomies but should be relevant by way of facilitating successful learning. *Situation-oriented regulation* includes avoidance strategies such as procrastination or skipping class. Probably because such behaviors entail disengagement from learning, they are not yet considered in MR research. Similarly, *social support seeking* (procuring connectedness/affiliation, emotional consolation, or advice; Rimé, 2024) is a common example of situation-oriented ER (Gross, 2015) that allows for sharing emotional experiences with others or soliciting comfort and empathy to impact one's current emotional state. To date, this strategy is not contained in MR catalogues but could be relevant for managing motivation to study as well, considering that social sharing can help individuals fulfill needs for relatedness (i.e., a prerequisite for study motivation from a self-determination theory perspective; Ryan & Deci, 2000).

Overall, current MR and ER strategy taxonomies only partly overlap, particularly regarding strategies involving reappraisal. However, in their current forms, these taxonomies also contain a considerable number of dissimilarities and unique aspects: Several MR and ER strategies lack corresponding counterparts, which can likely be traced back—at least partly—to differences in regulatory goals foregrounded in the respective literatures. As outlined above, we would expect that many MR strategies that lack matches in current ER taxonomies may also be used to regulate emotions, and vice versa, but evidence is lacking.

#### 1.4. Motivational and emotional regulation problems and strategy use

In SRL research more generally, self-regulation is fundamentally driven by the type of regulatory problem learners detect (Winne & Hadwin, 2012). Herein, 'problem' refers to a perceived discrepancy between an actual and desired state, as outlined above. Accordingly, MR is essentially geared towards motivational problems (i.e., low/inadequate motivation), whereas ER is geared towards emotional problems (e.g., downregulating negative emotions). Consequently, as motivation and emotion constitute related but distinguishable constructs, motivational and emotional regulation problems can be assumed to represent—at least partly—differentiable psychological phenomena and can thus be viewed as two separable pillars of students' self-regulation (Fig. 2). However, considering the above-described overlap in MR and ER strategies, as well as the functional interplay between motivational and emotional processes, many strategies covered may likely be multifinal in the sense that they can be used to regulate motivational and emotional problems (see Ben-Eliyahu, 2019, for similar ideas), but this assumption remains to be tested.

Furthermore, SRL research, including research specifically addressing MR (see overview in Eckerlein et al., 2022) and ER (e.g., Rottweiler et al., 2023; Rottweiler & Nett, 2021), broadly advocates that regulatory

	Motivational problem	Emotional problem
Type I	Low motivation due to low expectancies of success	Anxiety
Type II	Low motivation due to low subjective task value	Boredom

Fig. 2. Prototypical motivational and emotional problems considered in the present work.

Note. Type I and type II problems differ in their focal origin. Type I problems are primarily driven by low perceptions of competence given the task at hand resulting in low motivation due to a low expectancy of success (motivational Type I problem) or anxiety (emotional Type I problem), whereas type II problems are primarily driven by a lack of perceived relevance of the task at hand, resulting in low motivation due to a low subjective task value (motivational Type II problem) or boredom (emotional Type II problem).

strategies are most effective when they match situational and personal demands, which requires learners to more closely assess the nature and source of their regulatory problem at hand. In line with this basic assumption, MR scholars have drawn on EVT to classify motivational problems as pertaining primarily to low expectancies for success or primarily a lack of subjective task value of academic tasks (Engelschalk et al., 2016). Strategies should be matched accordingly: A student experiencing low motivation primarily because they are doubting their chances for completing a task should engage in strategies like *ability-focused self-talk* to increase perceptions of personal competence, whereas a student suffering motivationally primarily due to perceiving low value in a task may benefit from strategies *enhancing personal significance*. Prior research supports the idea that MR strategies can be categorized as primarily catering to either expectancy or value problems, or to both (Eckerlein et al., 2022; Steuer et al., 2019), and that higher education students frequently face both types of regulatory problems in their academic lives (Engelschalk et al., 2016).

Building on the conceptual similarities between EVT and CVT, this distinction between primarily expectancy- and value-related problems can be extended to emotions. Specifically, Pekrun and Perry (2014) propose that perceptions of control (which include expectancies of success) and value present core targets for ER: A student failing to see relevance in lecture content (value problem) should benefit from increasing perceived value to reduce boredom, whereas a student struggling with difficult content (expectancy/control problem) could seek study help to alleviate anxiety. Prior research on higher education students' achievement emotions indicates that anxiety and boredom constitute two of the most frequently experienced negative emotions that can profoundly impact their learning, achievement, and well-being (Goetz & Hall, 2013; Pekrun et al., 2023), making them prime candidates for students' regulatory efforts.

Taken together, expectancy-/control- and value-related motivational and emotional problems present core targets for students' MR and ER, yielding a  $2 \times 2$  classification of prototypical regulatory problems (Fig. 2). In this classification, building on Engelschalk et al. (2016), Type

I problems refer to experiencing either low motivation due to a low expectancy of success (motivational Type I problem) or anxiety (emotional Type I problem) primarily due to low perceived competencies or control over learning and achievement. Considering that low perceived competencies should matter motivationally and emotionally when individuals ascribe at least some relevance to the task at hand, Type I problems imply at least some degree of perceived task value, essentially rendering expectancy-/control-appraisals the primary target for regulation. Type II problems, in contrast, are primarily driven by a lack of perceived relevance of the material and task at hand, which can result in low motivation due to low subjective task value (motivational Type II problem) or boredom (emotional Type II problem). This type of problem can occur when perceived competence and expectancies for success are either low or high, rendering value beliefs a focal regulatory target. Students' regulatory strategy use should indeed be linked to the type of problem they are currently experiencing. However, it can be argued that students may draw on similar strategies to manage motivational and emotional problems during studying, especially when these can be traced back to similar origins, but empirical evidence is lacking.

## 2. Overview of the present research

In sum, previous scholarship on MR and ER has been siloed in separate literatures; their possible intersections, as well as similarities and differences in core processes, including the types of strategies students may use to regulate their motivation and emotions, have yet to be systematically considered. Accordingly, this study put the assumption that students may use similar strategies for regulating ontogenetically similar motivational and emotional problems to a first test. To this end, we created four variants of a hypothetical scenario (studying for an upcoming exam) using the classification outlined in Fig. 2 and asked students to report on their regulatory strategy use, yielding a  $2 \times 2$  within-subject design. The problem scenarios focused on motivational or emotional barriers to studying that implied instrumental regulatory goals (overcoming these barriers to continue studying), a frequently experienced scenario in higher education (Dresel et al., 2015). We situated our study in the context of higher education, as students reaching this level will have had extensive experience with academic performance evaluation and navigating concomitant motivational and emotional challenges; in fact, higher education generally necessitates and expects students to self-regulate their learning (Russell et al., 2022; Taub et al., 2022), rendering it particularly informative for studying possible intersections of different SRL components.

Following our theoretical deliberations, we hypothesized that designated MR strategies would also be used to address emotional problems, and ER strategies to address motivational problems (Hypothesis H1). Statistically speaking, we expected strong correlational correspondence in strategy use across motivational and emotional problems (H1a), and mean levels of use to reflect MR and ER strategies to be relevant for managing both motivational and emotional problems (H1b). We also expected correlational correspondence in strategy use among motivational and emotional problems stemming from similar origins to be even more pronounced than correspondence in strategy use among different motivational or different emotional problems (H2). Specifically, differences in correlations (H2a) and mean levels of strategy use (H2b) within ontogenetically similar motivational and emotional problems (i.e., type I vs. type II problems in Fig. 2)—that is, motivational problems pertaining to low expectancy of success and emotional problems involving anxiety, on the one hand, and motivational problems pertaining to low task value and emotional problems involving boredom, on the other—should be small in magnitude, especially relative to differences observed across motivational expectancy and value problems, and across anxiety and boredom problems.

### 3. Method

#### 3.1. Sample

German and Austrian undergraduate university students across different fields of study were invited to participate in the study via email (student listservs); additionally, we asked fellow researchers in the field of education to forward the invitation to students. The final convenience sample consisted of 1,466 students from 38 universities ( $M_{age} = 22.8$  years,  $SD = 3.5$ ); 1,033 (70.5%) identified as female, 413 (28.2%) as male, and 9 (< 1%) as non-binary. A total of 385 (25.3%) students reported having at least one parent born outside of Germany or Austria. Participants were enrolled in various programs including teaching (42.6%), law (9.2%), economics (8.2%), and psychology (5.7%). Most students (37%) were enrolled in their third semester; the full sample included students in their first up to their 12th semester. Students provided informed consent and received monetary compensation (8 Euro). The study was approved by the review board of the authors' institution and was in full accordance with the Ethical Guidelines of the German Association of Psychologists and of the American Psychological Association.

#### 3.2. Materials and procedure

We used a within-subject approach in which participants were exposed to the four motivational and emotional problems outlined in Fig. 2 based on established vignettes (Eckerlein et al., 2022; Engelschalk et al., 2016; Steuer et al., 2019). In a web-based environment created via SoSci Survey (Leiner, 2020), students imagined themselves studying for an upcoming exam and sequentially encountering each of the four target regulatory problems (see supplemental material, Fig. S1, for exact wording): 1) a motivational problem resulting from low expectancy of success, 2) an emotional problem consisting of the experience of anxiety, 3) a motivational problem resulting from low subjective task value, and 4) an emotional problem consisting of the experience of boredom.

For each scenario, students rated the likelihood of their using each of 18 regulatory strategies representing the MR and ER taxonomies depicted in Fig. 1 on a Likert-type scale ranging from 1 (*would definitely not do this*) to 6 (*would definitely do this*). Items were selected from the MR inventory developed by Schwinger et al. (Schwinger, von der Laden, & Spinath, 2007; Schwinger & Stiensmeier-Pelster, 2012) and extended by Engelschalk et al. (2015), as well as ER instruments developed by Burić et al. (2016) and Stockinger et al. (2022, 2024) to provide broad coverage of core strategies. All items are provided in the supplemental material.

Building on prior evidence indicating that even single-item assessments can be reliable and valid in repeated measurement designs (Allen et al., 2022; Gogol et al., 2014), we selected two items per strategy to ensure feasible questionnaire length using available data on factor loadings, corrected-item total correlations, and scale reliabilities. The broader ER categories *response modulation* and *situation-oriented selection* were operationalized via multiple scales, namely *physiological modulation* and *suppression* in case of the former, and *procrastination* as well as *social support seeking* in case of the latter. *Competence development* was operationalized via content-/study-related *help seeking*. These strategies form core representatives for their respective categories and are considered highly relevant to the regulation of negative emotions targeted in this research (Harley et al., 2019) and aligned with the focal scenario under study.

Our study design this involves a repeated-measures approach in which all participants were exposed to all four scenarios (or 'treatment conditions') in a within-subject design (Salkind, 2010). Herein, we sought to control for factors that could cause potential variation in focal outcomes (i.e., strategy use ratings) at the between-subject level (e.g., individual differences in regulatory competencies). Furthermore, the order of vignettes was counterbalanced across participants. Strategy items were presented in random order.

#### 3.3. Analyses

Analyses were conducted with Mplus 8 (Muthén & Muthén, 1998-2017). There were no missing data.<sup>4</sup> Prior to examining differences in MR and ER strategy use, we evaluated configural, metric, and scalar measurement invariance of each strategy across all four problem scenarios to ensure sufficient equality of factor loadings and item intercepts, a prerequisite for comparing correlations and means in strategy use.

An overview over the analyzed main models described in this section, and the corresponding hypotheses tested, is provided in Table 1. Correlations of strategy across regulatory problems were examined using a correlated-uniqueness approach (see Fig. 3). We created separate models for each strategy to estimate magnitudes of latent correlations of strategy use for motivational and emotional problems, across the expectancy/anxiety-value/boredom problem distinction (Model 1, Hypothesis H1a).

Model 1 included two correlated latent factors with four indicators loading onto each: For the motivational problem factor, indicators represented students' ratings of each of the two strategy items measured for the motivational expectancy and value problem scenarios; for the emotional problem factor, analogously, indicators represented strategy ratings for the anxiety and boredom problem scenarios. To maintain the invariance structure underlying our invariance models, factor loadings of the first two indicators of each factor were fixed to 1, and factor loadings of the two remaining indicators were constrained equal across factors. Type I and type II problems were modelled as method factors (i.e., common method variance in strategy ratings for motivational/emotional type I and motivational/emotional type II problems) via correlated uniquenesses to partial out their effects. Furthermore, the model contained correlated errors for repeatedly measured strategy items across the respective latent factors (see supplemental material for syntax). For each strategy, we estimated correlations among the latent factors and their 99% confidence intervals.

To provide a frame of reference for further evaluating the magnitude of correlations in regulatory strategy use for motivational and emotional problems (H2a), we compared them to correlations in strategy use for type I and type II problems estimated from a second model (Model 2). In this model, the latent factors represented type I problems (Fig. 2), derived from strategy ratings for the low motivation due to low expectancies for success and for the anxiety scenarios, and type II problems, derived from the strategy ratings for low motivation due to low task value and boredom scenarios. We used the same loading constraints as in Model 1. Analogously to Model 1, the motivational-emotional problem dimension was modelled using a correlated-uniqueness approach to

**Table 1**  
Main analytical models and corresponding hypotheses (overview).

Model	Hypothesis	Description
1	H1a	Examines correlational correspondence in strategy use across motivational and emotional problems
2	H2a	Examines correlational correspondence in strategy use across Type I and Type II problems
3	H1b	Examines differences in levels of strategy use between motivational vs. emotional problems
4	H2b	Examines differences in levels of strategy use between Type I vs. Type II problems

Note. See Fig. 2 for definitions of the regulatory problems.

<sup>4</sup> The survey was accessed by 2,148 students; 682 students either completed only the demographic section, or failed to complete a minimum of one of the four scenarios, and were excluded from the analyses. Participants were required to respond to all items to proceed through the survey.

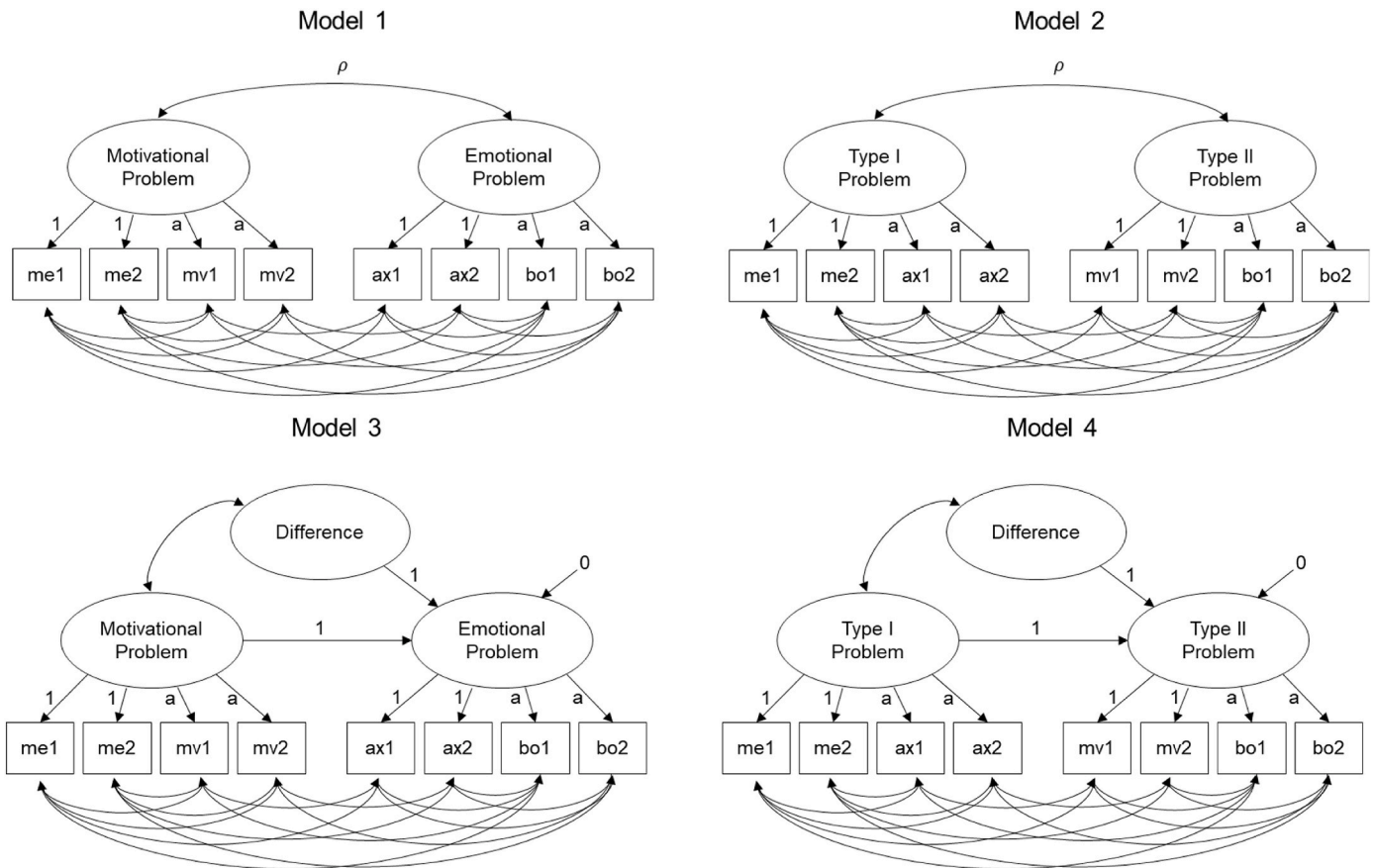


Fig. 3. Latent models for examining regulatory strategy use across regulatory problems.

Note. Upper panel: Models for examining correlational correspondence in strategy use across motivational and emotional problems (Model 1; Hypothesis H1a) and across Type I (low motivation due to low expectancy of success | anxiety) and Type II (low motivation due to low task value | boredom) problems (Model 2; Hypothesis H2a). Lower panel: Models for examining levels of strategy use for motivational vs. emotional problems (Model 3; Hypothesis H1b) and Type I vs. Type II problems (Model 4; Hypothesis H2b). Indicator labels pertain to strategy item ratings in the motivational Type I problem (me: low motivation due to low expectancy for success), the motivational Type II problem (mv: low motivation due to low task value), the emotional Type I problem (ax: anxiety), and the emotional Type II problem (bo: boredom) scenarios. Separate models were computed for each regulatory strategy.

partial out their effects; the model contained correlated errors for repeatedly measured items, and we computed latent correlations between the latent factors (type I and type II problems) and their 99% confidence intervals.

Next, we examined mean levels of strategy use across regulatory problems using a latent difference score approach. For our focal analysis of means of strategy use for motivational vs. emotional problems (H1b), we expanded Model 1 by including a third latent variable representing mean differences in strategy use between motivational vs. emotional problems (Model 3; see supplemental material for syntax and visual representations of the models). Again, separate models were computed for each strategy to obtain latent means and variances of strategy use for motivational problems and emotional problems, and an estimate of the latent mean difference. Based on these data, we computed effect sizes representing standardized mean differences in strategy use for motivational vs. emotional problems to examine whether MR strategies would also be used for regulating emotions, and vice versa.

In a final step, we created Model 4 to obtain latent means and differences in strategy use for type I vs. type II problems to allow for comparing differences in strategy ratings for the motivation-emotion with the type I-type II problem distinction (H2b). In other words, Model 4 allowed us to compare strategy use ratings for two different motivational and two different emotional problems with one other.

## 4. Results

### 4.1. Preliminary analyses

Internal consistencies of the regulatory strategy scales were satisfactory to excellent (.72–.92) for all but two scales, *ability-focused self-talk* and *control-enhancing reappraisal* (.63–.67).<sup>5</sup> With two items per strategy, we considered these values acceptable. Main analyses were conducted on a latent level to account for measurement error.

In a second preliminary step, we demonstrated scalar invariance of the strategy scales across problem scenarios (see supplemental material for details) as a prerequisite for computing and comparing latent correlations and means of regulatory strategy use.

### 4.2. Correlational correspondence of strategy use

Model fit statistics for the correlational models indicate good to acceptable fit with CFIs  $\geq .98$ , TLIs  $\geq .93$ , SRMRs  $\leq .06$ , and RMSEAs  $\leq .08$  for all but two models with borderline satisfactory RMSEAs (see supplemental material, Table S5). Table 2 provides latent correlations in strategy use between regulatory problems. The results for Model 1 reveal high positive correlations (.70–.89) of strategy use for motivational and emotional problems, indicating strong correlational correspondence in

<sup>5</sup> Descriptive statistics are reported in the supplemental material.

**Table 2**  
Correlational correspondence in strategy use across regulatory problems.

Strategy	Model 1: Motivational vs. Emotional Problems				Model 2: Type I vs. Type II Problems			
	r	SE	99% CI		r	SE	99% CI	
			LL	UL			LL	UL
<i>MR Strategies</i>								
Ability-focused self-talk	.72	.02	.70	.73	.66	.02	.63	.68
Enhancing personal significance	.77	.01	.76	.78	.75	.01	.74	.77
Enhancing situational interest	.79	.01	.78	.80	.76	.02	.74	.77
Mastery self-talk	.70	.02	.68	.72	.76	.04	.72	.80
Performance-approach self-talk	.84	.01	.83	.84	.81	.01	.79	.82
Performance-avoidance self-talk	.89	.01	.88	.89	.89	.01	.88	.89
Self-consequating	.85	.01	.85	.86	.83	.01	.82	.84
Proximal goal setting	.78	.01	.77	.79	.76	.01	.74	.77
Environmental control	.74	.01	.73	.76	.71	.01	.70	.73
<i>ER Strategies</i>								
Control-enhancing reappraisal	.79	.02	.78	.81	.52	.03	.46	.58
Value-enhancing reappraisal	.73	.02	.71	.75	.70	.02	.68	.72
Value-reducing reappraisal	.73	.01	.71	.74	.67	.02	.64	.69
Attentional deployment	.72	.01	.70	.73	.67	.02	.65	.70
Response modulation (physiological)	.85	.01	.85	.86	.84	.01	.84	.85
Response modulation (suppression)	.73	.02	.71	.74	.69	.02	.67	.71
Competence development (help seeking)	.82	.01	.81	.83	.78	.01	.76	.79
Situation-oriented regulation (procrastination)	.77	.01	.76	.78	.70	.01	.68	.72
Situation-oriented regulation (social support seeking)	.89	.01	.89	.90	.88	.01	.87	.88

Note. Reported are latent correlations and their standard errors. Confidence intervals (CI) were computed based on Fisher’s z-transformed correlations and back-transformed for reporting. For all *rs*, *p* < .05.

**Table 3**  
Mean levels of strategy use across regulatory problems.

Strategy	Model 3: Motivational vs. Emotional Problems					Model 4: Type I vs. Type II Problems				
	<i>M</i> <sub>MOT</sub>	<i>M</i> <sub>EMO</sub>	<i>M</i> <sub>DIFF</sub>	<i>SE</i> <sub>DIFF</sub>	ES	<i>M</i> <sub>TI</sub>	<i>M</i> <sub>TII</sub>	<i>M</i> <sub>DIFF</sub>	<i>SE</i> <sub>DIFF</sub>	ES
<i>MR Strategies</i>										
Ability-focused self-talk	4.32	4.31	-.01	.02	-.01	4.35	4.41	.06 <sup>a</sup>	.02	.08
Enhancing personal significance	3.64	3.66	.02	.02	.02	3.70	3.80	.09 <sup>a</sup>	.02	.11
Enhancing situational interest	3.47	3.53	.07 <sup>a</sup>	.02	.10	3.53	3.88	.34 <sup>a</sup>	.02	.48
Mastery self-talk	3.97	4.13	.17 <sup>a</sup>	.02	.21	3.92	3.60	-.32 <sup>a</sup>	.03	-.35
Performance-approach self-talk	3.91	4.02	.11 <sup>a</sup>	.03	.17	3.98	4.03	.04 <sup>a</sup>	.02	.06
Performance-avoidance self-talk	3.13	3.27	.14 <sup>a</sup>	.02	.21	3.18	3.09	-.09 <sup>a</sup>	.02	-.14
Self-consequating	4.73	4.72	-.01	.02	-.02	4.73	4.80	.06 <sup>a</sup>	.02	.10
Proximal goal setting	4.59	4.53	-.05 <sup>a</sup>	.02	-.08	4.60	4.42	-.19 <sup>a</sup>	.02	-.27
Environmental control	4.05	4.12	.06 <sup>a</sup>	.02	.08	4.05	3.72	-.33 <sup>a</sup>	.02	-.38
<i>ER Strategies</i>										
Control-enhancing reappraisal	4.63	4.65	.02	.02	.03	4.64	4.67	.02	.02	.05
Value-enhancing reappraisal	4.14	4.23	.10 <sup>a</sup>	.02	.15	4.10	3.76	-.34 <sup>a</sup>	.02	-.43
Value-reducing reappraisal	3.67	3.56	-.10 <sup>a</sup>	.02	-.11	3.68	3.75	.07 <sup>a</sup>	.03	.07
Attentional deployment	3.75	3.77	.02	.02	.02	3.70	3.95	.24 <sup>a</sup>	.02	.31
Response modulation (physiological)	4.34	4.37	.03	.02	.04	4.33	4.44	.11 <sup>a</sup>	.02	.15
Response modulation (suppression)	3.27	3.33	.07 <sup>a</sup>	.02	.09	3.28	3.24	-.03	.02	-.04
Competence development (help seeking)	4.26	4.25	-.01	.02	-.01	4.28	3.76	-.53 <sup>a</sup>	.02	-.64
Situation-oriented regulation (procrastination)	3.65	3.47	-.17 <sup>a</sup>	.02	-.19	3.69	4.23	.54 <sup>a</sup>	.03	.56
Situation-oriented regulation (social support seeking)	4.42	4.45	.03	.02	-.01	4.35	4.16	-.19 <sup>a</sup>	.02	-.32

Note. Reported are unstandardized latent means and standard errors, latent differences (DIFF) and standardized mean difference effect sizes (ES). MOT = motivational problem, EMO = emotional problem, TI = type I problem (low motivation due to low expectancy of success | anxiety), TII = type II problem (low motivation due to low task value | boredom). Latent means in bold print exceed the scale-midpoint (3.50), descriptively.

<sup>a</sup> *p* < .05.

the use of all MR and ER strategies across these problem categories, as expected (H1a).

Importantly, the correlations in strategy use between motivational and emotional problems (Model 1) were even significantly stronger than correlations in Model 2 (type I vs. type II problem) in terms of non-overlapping confidence intervals for the majority of strategies. On a descriptive level, regarding the magnitude of correlations, these patterns were even more pronounced. These findings suggest even stronger correlational correspondence in strategy use across study scenarios differing in their motivational vs. emotional focus, in contrast to those differing in their psychological origins (type I vs. type II problems; H2a).

#### 4.3. Mean levels of strategy use

Model fit statistics for the latent difference models indicate good fit with CFIs ≥ .96, TLIs ≥ .92, SRMRs ≤ .06, and RMSEAs ≤ .08 (and borderline satisfactory RMSEAs for *mastery self-talk* and *situation-oriented selection via procrastination*; for details, see supplemental material, Table S6). Table 3 provides latent means, standard deviations, and standardized mean differences. Focusing on the magnitude of latent means of strategy use derived from Model 3 which contrasted motivational and emotional problems, values above the scale midpoint imply that the respective strategy was, on average, likely to be used to address the respective regulatory problem. Most latent means exceeded this midpoint, closely mirroring the manifest mean-level ratings of strategy use (see supplemental material, Table S3, for means and 95% confidence intervals). These findings imply that most strategies, including those that emerged as unique MR and ER strategies that did not overlap, were also considered relevant to some degree for regulating emotional and motivational problems, respectively. Furthermore, latent mean difference in the use of MR and ER strategies for motivational vs. emotional problems were small in magnitude (range of effect sizes: |.01–.21|, median: |.06|), generally supporting H1b.

Furthermore, these differences in strategy use were notably smaller than those observed when contrasting mean levels of strategy use between type I vs. type II problems (i.e., when comparing two ontogenetically different motivational and two ontogenetically different emotional problems with each other; Model 4), reaching effect sizes up to .64 (range: |.04–.64|, median: |.15|). In other words, differences in

strategy use were more pronounced, relatively speaking, when comparing ratings across type I vs. type II problems, while accounting for the motivation-emotion dimension, than vice versa (H2b). These patterns are in line with the hypothesis that students may use similar regulatory strategies for managing motivational and emotional problems of similar origin.

## 5. Discussion

Motivation and emotion are highly intertwined, but research on regulatory strategies targeting these constructs have had little intersection, particularly in educational research; in fact, MR and ER have been rooted in separate research traditions. Theoretically, strategy catalogues proposed in the respective literatures suggests that MR and ER strategies partly overlap, and prior research on the motivation-emotion-interface as well as initial scholarship touching on possible MR-ER connections suggest that many MR and ER strategies might be relevant for addressing both motivational and emotional problems, as noted by Webster and Hadwin (2015), but evidence is lacking. To bring MR and ER research together and provide such evidence, we asked 1466 students from different universities (i.e., multi-site sampling) in two countries to report on their potential use of commonly examined MR and ER strategies in four variants of a typical academic situation (preparing for an upcoming exam) posing different motivational and emotional problems. We used a within-subject approach with established vignettes and SEM to account for measurement error to compare strategy use across motivational and emotional problems and to ultimately provide insight into possible intersections between MR and ER focusing on regulatory strategy use. Overall, our findings provide support for the assumption that MR strategies are also used to tackle emotional problems, and ER strategies to tackle motivational problems.

### 5.1. Summary and interpretation of findings

#### 5.1.1. Strategy use across similar motivational and emotional regulation problems (H1)

Across all strategies examined, strategy use was strongly correlated (Hypothesis H1a), and differences in mean levels of strategy use were small (H1b), across motivational and emotional problems pertaining to similar origins (i.e., low expectancies of success/anxiety vs. low task value/boredom). Essentially, these patterns suggest that students do not make much difference between motivational and emotional problems that trace back to similar psychological roots when it comes to the use of both MR and ER strategies. Even mean levels of use of many strategies that might be viewed as clearly emotional in nature (Gross, 2015; Miele & Scholer, 2018)—*physiological modulation* of feelings—were similar across motivational and emotional problems. For *suppression*, mean level differences between motivational and emotional problems were slightly more pronounced but still small in magnitude.

Similarly, mean level differences in use of *situation-oriented regulation* via *procrastination* between motivational and emotional problems were small in magnitude. This is particularly noteworthy when considering that procrastination is viewed as an indicator or outcome of unsuccessful/dysfunctional MR (Bäulke et al., 2021; Grunschel et al., 2016). One possible explanation is that procrastination can alleviate unpleasant emotional experiences connected to motivational problems (see Sirois & Pychyl, 2013). More work is needed to explain the rationale underlying students' selection of this behavior for managing motivational problems; possible first steps include examining connections with regulatory goals using, for instance, (semi-)structured interviews, and how procrastination impacts students' subsequent emotions and motivation. Considering relations between boredom and motivation (Goetz et al., 2019), study problems involving a lack of motivation due to low perceived value of material may inherently involve boredom that requires disengagement from the situation to recharge emotionally and, by extension, motivationally.

#### 5.1.2. Strategy use across similar vs. different motivational and emotional problems (H2)

Correspondence in strategy use across similar motivational and emotional problems was even stronger than that observed when comparing correlations (H2a) and mean levels of strategy use (H2b) across regulatory problems differing in their origin (i.e., when comparing motivational type I and type II problems, and emotional type I and type II problems with each other). This pattern is most pronounced when considering the standardized mean-level differences (i.e., effect sizes) in strategy use of the motivation-emotion (Model 3) relative to the problem origin (Model 4) contrasts. Methodologically speaking, this relative comparison of correlations and mean-level differences in strategy use between motivational vs. emotional problems with those emerging between type I and type II problems is important because it alleviates concerns about common-/single-source bias which may have influenced correlations of strategy ratings across problem scenarios, which should be born in mind when interpreting the present findings. Essentially, single-source bias leaves *differences* in correlations and mean levels of correlations unaffected or mitigated at best; accordingly, this contrast provides a frame of reference for gauging the magnitude of correlational and mean-level differences in strategy use when regulating motivational and emotional problems.

Substantively speaking, these findings further underscore the idea that students may select similar strategies for regulating motivational and emotional problems that involve similar psychological origins. They are also in line with the assumption that MR and ER are most effective when strategies used for regulation match the specific problem to be managed (Rottweiler et al., 2023; Steuer et al., 2019) and that regulatory strategies may generally serve multiple purposes (e.g., Ben-Eliyahu, 2019).

### 5.2. Theoretical, empirical, and practical implications

Taken together, our findings imply that future MR and ER research may need to consider extended taxonomies of strategies for regulating motivational and emotional problems. They also contain some surprising patterns which go beyond our focal hypothesis. In particular, not all strategies differed for type I and type II problems as expected based on past work on the situational fit of MR strategies (Eckerlein et al., 2022). For instance, levels of *value-enhancing reappraisal* were slightly higher for type I (low motivation due to low expectancies of success | anxiety) than for type II (low motivation due to low task value | boredom) problems, which is counterintuitive. In general, strategy fit is still an emergent field of research in educational MR and ER research, and more work on its determinants is needed.

Importantly, while this research underscores the need for joint MR-ER perspectives, it does *not* seek to make the case that the distinction between motivation, emotion, and their regulation is meaningless or obsolete; instead, it aims to build a case for systematically studying similarities and genuine differences between MR and ER, and to build a case for moving towards systematic examination of the interplay of MR and ER, and other components of SRL in future work. Such work is important for several reasons.

First, considering the interplay of MR and ER aligns with conceptualizations of SRL as involving simultaneous regulation of different components of learning (Ben-Eliyahu, 2019; Kim et al., 2020). Moreover, fragmentation of theories on related constructs can hinder scientific progress and communication with practitioners (e.g., Pekrun & Marsh, 2022; King and Fryer, 2024)—joint examination and conceptualization of genuinely connected phenomena can help avoid the proliferation of separate, potentially redundant theories and achieve theoretical parsimony.

Furthermore, one immediate implication that emerges from the present work is that combined interventions which jointly address motivation, emotion, and their regulation may be a way forward in supporting educational practice efficiently and effectively. To date,

intervention work in educational research has typically focused on supporting *either* motivation *or* emotion and their regulation in isolation, but our findings suggest that motivational and emotional regulation problems may be closely connected from learners' perspectives. Consequently, scaffolding MR and ER effectively may entail combined interventions that equip learners with a broader set of regulatory strategies that can be flexibly used for specific motivational and emotional problems. Moreover, treatments targeting one construct or its regulation may impact the other. Such spillover effects may be beneficial, but also harmful in some cases: For instance, teaching students to regulate perceptions of utility value (Rosenzweig et al., 2022) can enhance motivation, but may also boost anxiety about achieving envisioned outcomes. Such examples illustrate the importance of cultivating joint perspectives on MR, ER, and SRL more broadly, as a prerequisite for developing recommendations for educational practice and intervention work.

### 5.3. Limitations and directions for future research

In interpreting the present findings and deriving directions for future research, the following limitations are worth noting. First, while vignette-based approaches are common in educational research, students' ratings of strategy use for our hypothetical scenarios represent anticipated regulatory efforts. Research is needed that enriches the present findings by considering actual use of strategies to manage motivational and emotional problems encountered in authentic settings, also expanding upon our cross-sectional within-subject design using longitudinal, experience-sampling, or experimental between-subject approaches which allow better for causal inspection of determinants and outcomes of strategy selection.

Furthermore, future work should consider regulatory problems beyond those considered here (i.e., low expectancies for success, low value, anxiety, boredom), such as problems related to perceived costs that may involve other achievement emotions or motivational and emotional problems triggered by unexpected achievement outcomes (e.g., unexpected failure triggering disappointment). Nevertheless, the regulatory problems considered in the present work were derived from prominent motivation and emotion theories and can be viewed as prototypical challenges encountered the context of studying for important upcoming tests. In conjunction with these steps, future research should examine the types and functions of regulatory goals underlying students' strategy selection and implementation. Our vignettes prompted students to envision instrumental goals for regulating their motivation and emotions to sustain study efforts. However, students can adopt different goals for self-regulation (see Kim et al., 2023), and these should bear implications for their regulatory efforts.

Similarly, future research should probe the generalizability of our findings across different groups of learners, including learners at different levels of education, and examine how distal individual factors (e.g., motivational and emotional dispositions and regulatory competencies; gender) as well as contextual factors (e.g., educational and sociocultural environments and norms) may additionally shape students' MR and ER (Frenzel et al., 2023; Schwinger & Stiensmeier-Pelster, 2012). While the present within-subject design allows for controlling for individual variation in strategy ratings across regulatory problems, explicitly testing for further determinants of students' strategy use constitutes an important step towards understanding and fostering MR and ER in individuals. Ideally, this should also be based on representative samples and counteractive measures against self-selection biases. While the present study relied on a multisite recruitment procedure which yielded a large sample of undergraduates from different fields of study, it may not be accurately representative of the target population, which should be considered when interpreting the present findings.

Furthermore, we focused on a set of strategies commonly considered in MR and ER research, but these catalogues are non-exhaustive. For example, neither MR nor ER research currently considers strategies for

tackling problems arising in post-actional phases of studying. These include strategies targeting adaptive attributions of successes or failures (see, e.g., research on the motivational and emotional impact of attributional retraining; Dryden et al., 2021; Simonton & Garn, 2022). Future research thus needs to extend current MR-ER strategy taxonomies to obtain a fuller picture of regulatory efforts undertaken by students. This could be combined with using different measures of regulatory strategy use to probe similarities and differences in MR and ER across different modes of inquiry. Self-report measures of strategy use still constitute the canonical form of assessing both MR and ER (e.g., Kim et al., 2018; Schwinger, von der Laden, & Spinath, 2007; Stanoi & Ochnser, 2024); they allow for assessing specific overt as well as covert regulatory behaviors and can circumvent the problem of conflating regulation with mere emotional or motivational responding (e.g., McRae, 2013). As such, future studies could explore the use of open-ended interviews, think aloud protocols, experience-sampling designs, or observational approaches for assessing MR and ER strategies, in combination with non-self-report methods that allow for tracking physiological parameters of emotional and motivational states (e.g., Harley et al., 2015) that accompany regulatory efforts.

### 5.4. Conclusion

This study underscores the relevance of adopting joint perspectives on students' regulatory efforts when managing motivational and emotional problems that can substantially influence their personal and academic flourishing. It bears important implications for future research on different 'areas' of SRL which are typically studied in isolation (Kim et al., 2020). Fundamentally, as students may use both MR and ER strategies to regulate motivational and emotional problems, we need to revisit and systematically examine the effects of these strategies on motivation *and* emotion, as well as well-being and learning outcomes, to gain a better understanding of adaptive MR and ER.

### Conflict of interest

We have no known conflict of interest to disclose.

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### CRediT authorship contribution statement

**Kristina Stockinger:** Writing – review & editing, Writing – original draft, Visualization, Software, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Ulrike E. Nett:** Writing – review & editing, Methodology, Formal analysis, Conceptualization. **Markus Dresel:** Writing – review & editing, Methodology, Funding acquisition, Formal analysis, Conceptualization.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.learninstruc.2024.102009>.

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