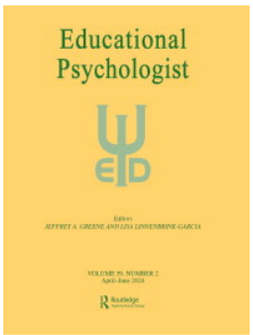

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The role of teachers' emotion regulation in teaching effectiveness: A systematic review integrating four lines of research

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ABSTRACT

Theoretical perspectives emphasize the relevance of teachers managing their emotions for positive teacher-student interactions and student outcomes (i.e., teaching effectiveness). Four largely distinct lines of research inspired by (1) Gross' process model of emotion regulation, the concepts of (2) coping, (3) emotional labor, and (4) emotional intelligence have tested this assumption empirically. Yet, the use of different terminology complicates reviewing the current state of knowledge. Thus, we suggest a theoretical integration and synthesize evidence across research traditions. A systematic literature search resulted in 68 relevant records. We identified typically adaptive external and internal strategies as well as expressive regulation and general regulation ability as the most prominent research topics across traditions. Our results revealed mostly negative relations between expressive regulation and teaching effectiveness, but in some instances expressive regulation appeared beneficial. We also found evidence of a positive correlation between teachers' external and internal regulation and their effectiveness, but most of these studies relied on teacher self-report questionnaires, hence, these results require cautious interpretation. In studies that went beyond teacher self-assessment and relied on student reports, classroom observations, or tests, general regulation ability also did not appear related to teaching effectiveness. Implications for theory and avenues for future research are discussed.

KEYWORDS

Emotion regulation; emotional intelligence; social-emotional competence; teacher-student interaction; student development

Emotions are an integral part of teaching (Frenzel, 2014; Hargreaves, 2000; Sutton & Wheatley, 2003). As a component of teacher well-being, they are related to students' emotions, motivation, and learning (de Ruiter et al., 2020; Diener et al., 2010; Frenzel et al., 2021). Thus, emotion regulation—the process of influencing which emotions one experiences and how one expresses them (Gross, 1998)—appears vital for teachers. This notion has been acknowledged from a theoretical perspective (Brackett et al., 2010; Jennings & Greenberg, 2009) and previous syntheses supported this view by demonstrating a relationship between teachers' emotion regulation and their well-being (Mérida-López & Extremera, 2017; Yin et al., 2019).

Although research regarding the role of teachers' emotion regulation in the quality of teacher-student interactions and ultimately in student outcomes has rapidly grown over the past decade, a synthesis of the evidence is still lacking. Therefore, obtaining a comprehensive overview of the existing evidence is difficult, especially, as different lines of research use different terms to describe closely related phenomena (e.g., emotion regulation, coping, emotional labor; Peña-Sarrionandia et al., 2015). The present systematic review closes this gap and also takes a meta-perspective on current research methods to investigate whether the existing evidence allows for valid conclusions regarding the relevance of emotion regulation for teacher education and professional development programs. Suggesting that a teacher's emotion regulation actually makes a difference for observable interaction quality or for students' experiences in the teacher's classroom, for instance, would be impossible if studies only relied on teachers' subjective evaluations of these variables. Furthermore, finding no relation between teachers' emotion regulation, interaction quality, and student outcomes would not necessarily imply that teachers' emotion regulation is irrelevant when prior research has primarily assessed how teachers generally regulate their emotions, disregarding that they may respond differently in the professional context. Therefore, this article not only summarizes the findings of prior research but also investigates whether results vary across studies, and discusses potential causes. On this basis, we highlight conceptual and methodological challenges in examining teachers' emotion regulation and its relation with the quality of teacher-student interactions and student outcomes. Furthermore, we outline avenues for future research.

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The concept of emotion regulation: Four theoretical perspectives

Emotions are internal, psychological processes consisting of multiple components: an affective core as well as cognitions, physiological arousal, expressive behavior, and action tendencies (Scherer, 1984). Psychological stress can be regarded as a subset of emotions that arise specifically when people appraise demands as taxing or exceeding their resources and as threatening their goals and well-being (Lazarus, 1993). At least four lines of research investigate the management of people's emotions and psychological stress.

Historically, the *coping* tradition paved the way to examine this phenomenon by introducing the idea that people may make behavioral and cognitive efforts to manage psychological stress (Lazarus, 1966; Lazarus & Folkman, 1984). Later, the concept of *emotion regulation*, which sparked interest in several psychological disciplines including developmental and clinical psychology (e.g., Cicchetti et al., 1995; Thompson, 1994), also took positive emotions into account. Drawing on this previous literature, Gross (1998) defined emotion regulation as the conscious and unconscious "processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (Gross, 1998, p. 275). The process of regulating one's emotions and emotional expressions specifically in the workplace to meet workplace demands is referred to as *emotional labor* and is part of a distinct line of research (Grandey, 2000). Finally, conceptualizations of *emotional intelligence* and emotional competence not only include the ability to accurately perceive, understand, and use emotions but also consistently incorporate abilities such as emotion management and stress tolerance as important prerequisites for effectively mastering situations (Bar-On, 2006; Mayer et al., 2008; Zins et al., 2004). Thus, a common feature of these lines of research is the assumption that people can modify their emotional experiences and expressions (also see Burić et al., 2017)—we use emotion regulation as an umbrella term here because it is neither limited to stress (like coping) nor the work-context (like emotional labor). Furthermore, significant overlap between the four traditions exists regarding the question of what constitutes adaptive emotion regulation.

Defining adaptive emotion regulation

All theoretical traditions assume that emotion regulation is adaptive if it helps to achieve a specific goal in a given situation, that is, generally promoting positive emotions and reducing negative emotions and stress (Carver & Connor-Smith, 2010; Gross, 1998; Mayer & Salovey, 1995). However, people sometimes strive to heighten negative emotions and downregulate positive emotions (Mayer & Salovey, 1995; Thompson, 1994). For instance, teachers occasionally hide their happiness and there are cases in which they up-regulate anger and disappointment to achieve work-related goals (Taxer & Frenzel, 2015). Yet, hedonic regulation is the most common type of emotion regulation among teachers, for example, exaggerating enthusiasm and down-playing anxiety (Taxer & Frenzel, 2015). Teachers can apply different strategies to achieve this.

Emotion regulation strategies

The emotion regulation, coping, and emotional labor traditions describe a number of strategies for managing emotions. Even though the lines of research use different terminology, there is significant conceptual overlap. The process model of emotion regulation (Gross, 1998) provides a framework to integrate the various strategies (Figure 1). The model suggests strategies can be grouped along the emotion generative process, that is, they may address the emotion-eliciting situation itself, the attention to and appraisal of the situation, or the emotional response (for a detailed description of strategies see Peña-Sarrionandia et al., 2015). The model can help predict whether a strategy will be adaptive across different contexts, keeping in mind that the effectiveness of a strategy is always situation-dependent (Sheppes & Gross, 2012). Within the emotional intelligence tradition, people who successfully choose adaptive strategies in a variety of situations are described as having a high *general emotion regulation ability*.

Strategies impacting the situation (external regulation)

Situation selection (left side of Figure 1) is a form of emotion regulation directly addressing the emotion-eliciting situation, in other words, *external* factors. Confronting the situation is one option, but both the Gross and the coping traditions most frequently discuss evading a situation, which has sometimes been referred to as distancing, escape-avoidance, or behavioral disengagement coping (Parker & Endler, 1992). Even though this strategy might alleviate stress in the short term, it can aggravate a problem over time and is therefore usually considered maladaptive (Carver & Connor-Smith, 2010).

Situation modification is the second form of external emotion regulation according to Gross (1998). This means to actively solve problems or seek instrumental support to change the situation in a way that its emotional impact is more favorable. Problem-focused coping describes literally the same phenomenon and refers to strategies that alter the stressor (e.g., problem solving, active coping, planning, seeking instrumental support; Parker & Endler, 1992). Strategies falling into this category are usually seen as adaptive (Carver et al., 1989; Sheppes & Gross, 2012).

Strategies impacting attention to and appraisal of the situation (internal regulation)

Once people face a potentially emotion-eliciting situation, they can apply *internal* regulation processes according to Gross, namely attentional deployment and cognitive change, to focus on or distract attention away from certain aspects of the situation and they can decide how to interpret these aspects (see center of Figure 1). Attentional deployment comprises, for example, rumination, distraction and thought suppression and the coping literature lists similar strategies including self-blame and mental disengagement (Parker & Endler, 1992). If at all, these strategies only allow for short-term relief and are therefore seen as maladaptive

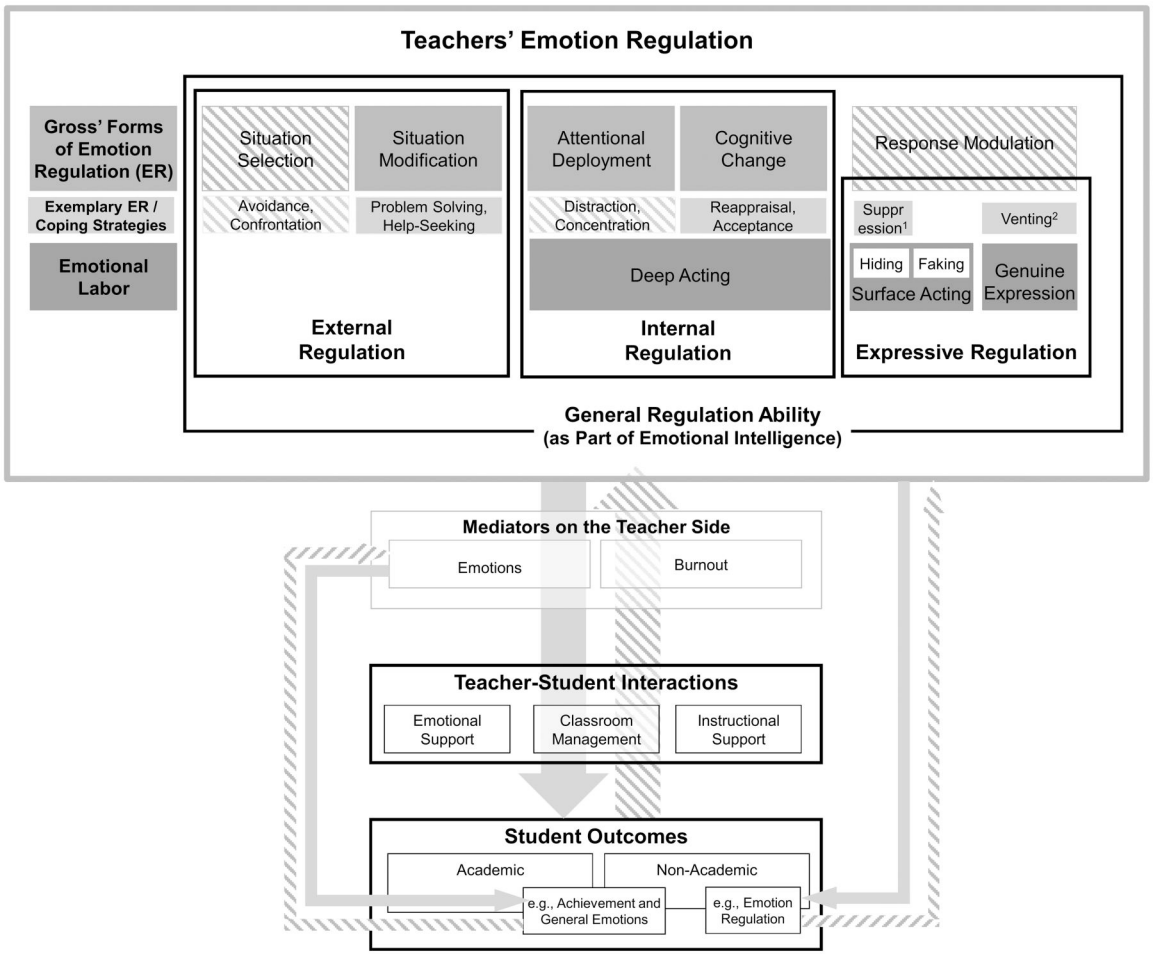

Figure 1. Heuristic framework on the role of teachers' emotion regulation in the quality of teacher-student interactions and student outcomes with teacher emotions and burnout as the central mediating pathways (also see Frenzel et al., 2021; Jennings & Greenberg, 2009). The top part illustrates the integrative view of emotion regulation underlying this review and the conceptual overlap between emotion regulation in the tradition of Gross, emotional labor, coping, and emotion regulation as part of emotional intelligence. Components of the framework that this review focused on are black-rimmed; parts that were not of primary interest are shaded. [1]Typically mentioned in the emotion regulation literature in the tradition of Gross, but not as a coping strategy; [2]Typically mentioned as a coping strategy, but not assessed in the emotion regulation literature.

(Peña-Sarrionandia et al., 2015; Sheppes & Gross, 2012). In contrast, cognitive reappraisal, the most prominent form of cognitive change, is typically considered adaptive because it involves changing one's interpretation of a situation in a way that alters its emotional impact (Gross, 1998). In addition to cognitive reappraisal, the coping literature frequently mentions other forms of cognitive change, such as humor and acceptance of the situation (Carver et al., 1989). Overall, internal strategies are considered to be especially helpful in uncontrollable situations.

Importantly, internal emotion regulation strategies are also prominent in the emotional labor tradition. Deep acting is a form of emotional labor in which people try to actually experience the emotion expected of them in their professional roles (Hochschild, 1983). Grandey (2000) notes that attentional deployment and cognitive change are key emotion regulation strategies that help people generate desired emotions.

Strategies impacting the emotional response

After an emotional response has unfolded, it is possible to modulate its behavioral, experiential, and physiological components (Gross, 1998) (see right side of Figure 1). The coping literature in particular describes a variety of strategies that fall into this category, for example, people may use substances and seek emotional support to find relief or regulate the expression of emotions by venting (Parker & Endler, 1992). In research from the emotion regulation perspective, expressive suppression is perhaps the most prominent form of response modulation (Izadpanah et al., 2019; Peña-Sarrionandia et al., 2015). Expressive suppression involves hiding one's current emotional state and is seen as maladaptive because it only modifies how people express their emotions (Sheppes & Gross, 2012). The emotional labor tradition describes a largely identical phenomenon, namely, hiding emotions. Interestingly, the field of emotional labor exclusively considers faking of emotions as another strategy that deals with a person's external appearance rather than their internal experience—surface acting is used as an umbrella term which includes both faking and hiding of emotions (Grandey, 2000). We will refer to all strategies impacting people's emotional expressions as *expressive regulation*.

Overall, the emotion regulation, coping, and emotional labor traditions all suggest conceptually similar strategies describing *how* people manage their emotions at different

stages of the emotion generative process (see Figure 1). In contrast, the emotional intelligence tradition is specifically interested in answering the question *if* people succeed in regulating their emotions in an adaptive way (Peña-Sarrionandia et al., 2015). Popular questionnaires from different traditions illustrate this point.

Assessment of emotion regulation: Instruments and challenges

Instruments from the coping (for an overview see Parker & Endler, 1992) and emotion regulation (for an overview see Izadpanah et al., 2019) traditions ask people to what extent they apply concrete strategies when dealing with their emotions and stress (for examples see Figure 2). Importantly, these questionnaires were developed without a specific focus on the workplace (even though they could easily be adapted for this purpose). In contrast, instruments from the emotional labor tradition explicitly ask how frequently people apply certain strategies on a typical day at work. A work-specific assessment is advantageous because variables that refer to a specific context are the best predictor of performance in this context (Ajzen & Fishbein, 1977). Furthermore, emotional display rules and professional requirements may force teachers to regulate their emotions differently in the school context than they would elsewhere (Sutton & Wheatley, 2003).

In contrast to these instruments that focus on specific strategies, the emotion regulation scales implemented in emotional intelligence questionnaires (for an overview see Wilhelm, 2005) ask people for global self-evaluations of their ability to modify their emotions. Thus, respondents have to make idiosyncratic interpretations of what it means to successfully manage emotions. If their lay ideas collide with the current state of empirical evidence it could impede a valid assessment (Brackett et al., 2006). For example, teachers tend to view expressive suppression as an effective strategy and might therefore conclude they are highly successful in managing their emotions when they continuously mask their true feelings, even though this approach has long-term negative consequences for their well-being (Burić et al., 2021; Sutton, 2004). Furthermore, the subjectivity with which people assess their general regulation ability makes these tools prone to self-serving bias, which is problematic because people tend to overestimate their emotional intelligence (Sheldon et al., 2014). Objective measurement approaches have been proposed as a solution, and here situational judgment tests are especially prominent (Aldrup et al., 2020). These tests ask participants to read vignettes describing emotionally challenging situations and to rate the effectiveness of different strategies for dealing with their emotions. The strategies resemble those suggested in the emotion regulation, coping, and emotional labor traditions. Yet, the emotional intelligence tradition is less interested in which specific strategy people usually apply, but rather in their general knowledge about effective strategies for managing their emotions. In other words, knowledge about the entire emotion generative process forms the basis for a person's *general regulation ability* (Figure 1, outer box).

Integrative summary

Even though we acknowledge differences between the outlined perspectives (i.e., generic view vs. context-specificity of emotional labor; regulation of all emotions vs. coping with negative emotions; specific strategies vs. general effectiveness as part of emotional intelligence), all share the assumption that people can modify their emotional experiences and expressions (also see Burić et al., 2017). The fields of emotion regulation, emotional labor, and coping have suggested specific and partly overlapping strategies that can be organized along the emotion generative process (Figure 1): Strategies aiming to prevent situations that elicit unintended emotions (= external regulation), strategies affecting the way people attend to and interpret the situation (= internal regulation), and strategies that are applied once an emotional response has already unfolded and only tackle, for example, the external appearance (= expressive regulation).

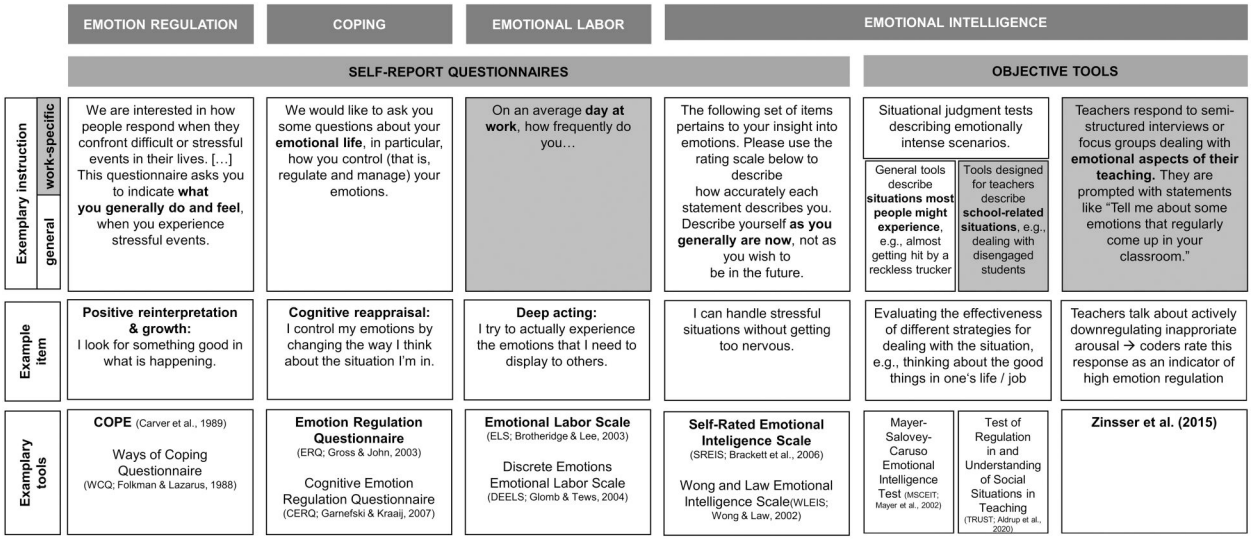

Figure 2. Assessment of teachers' emotion regulation across lines of research. Exemplary instructions and items are taken from the tools that are printed in bold.

The implicit assumption of the emotional intelligence tradition is that people selecting adaptive strategies have a high general regulation ability. Although specific emotion regulation strategies are not *per se* adaptive or maladaptive, there is consensus across perspectives that strategies used early in the emotion generative process and those modifying the emotion-eliciting situation and its meaning are, in the long-term, most conducive to one's emotion regulation goals in a given situation (e.g., Carver et al., 1989; Lee et al., 2016; Sheppes & Gross, 2012). Accordingly, prior research found that strategies like problem solving and cognitive reappraisal were most strongly associated with positive affective outcomes, whereas maladaptive emotion regulation (e.g., expressive suppression) were negatively related to positive outcomes (Aldao et al., 2010). Below, we outline how this might translate to teaching effectiveness—which we use here as an umbrella term for the quality of teacher-student interactions and student outcomes.

Why could emotion regulation play a role in teaching effectiveness?

Theoretical perspectives, such as the prosocial classroom model (Jennings & Greenberg, 2009), highlight the potential importance of teachers' emotion regulation for positive teacher-student interactions in class (also see Brackett et al., 2010) as well as for students' academic and nonacademic outcomes. Quality teacher-student interactions are defined by high levels of emotional support (e.g., positive teacher-student relationships, consideration of students' interests and needs), classroom management (e.g., proactive strategies for handling classroom disturbances, smooth transitions between activities), and instructional support (e.g., cognitively challenging tasks, feedback) (Pianta & Hamre, 2009; Praetorius et al., 2018). We describe student outcomes as academic when they explicitly refer to school and as nonacademic if they are not limited to this context (Jones & Kahn, 2017; Roeser et al., 2000). For example, academic achievement, achievement-related emotions, in-school conduct, engagement in learning, attitudes and beliefs about oneself as a learner and about school reflect academic outcomes. In contrast, general social-emotional competences and outcomes are considered to be nonacademic, for example, the ability to recognize and regulate emotions, students' effective collaboration with others, adaptation to social norms, empathy, positive peer relationships, and well-being including students' general emotional experience. Pathways through teachers' emotions, teachers' burnout, and modeling of emotion regulation appear plausible to understand the mechanisms linking teachers' emotion regulation to teaching effectiveness (see Figure 1).

Pathway via teachers' emotions

Teachers using emotion regulation strategies that are adaptive in most situations, such as situation modification and cognitive reappraisal rather than expressive suppression, experience less negative and more positive emotions overall (Burić et al., 2017; Lee et al., 2016). In their framework of the links between teacher emotions and student outcomes, Frenzel et al. (2021) suggest that teachers' emotions can have a direct effect on student emotions via emotional contagion as well as an indirect effect on student outcomes by improving the quality of teacher-student interactions.

Direct effect via emotional contagion

Emotional contagion means that teachers may automatically transmit their own emotions to students (Hatfield et al., 1993). Students who sense their teacher's enthusiasm, for example, enjoy class more (Keller & Becker, 2021). Thus, if teachers use situation selection as an emotion regulation strategy by choosing classroom activities they genuinely find exciting or when they reflect on why seemingly boring content is indeed enjoyable, this might trigger similar emotions in their students. In contrast, the role of expressive regulation, which does not modify teachers' actual emotional experience, might be rather complex. That is, students even view teachers faking their enjoyment as more enthusiastic, but reversely, trying to hide negative emotions appears more difficult as students may notice subtle changes in, for example, their teachers' facial expressions, tone of voice, or gestures (Burić, 2019; Jiang et al., 2016; Sutton & Wheatley, 2003). Thus, the valence of the emotion could make a difference and, contrary to the general assumption that expressive regulation is maladaptive, upregulating positive emotions could be associated with benefits for students.

Indirect effect via teacher-student interactions

Frenzel et al. (2021) hypothesize that teachers' emotions indirectly affect student outcomes via their impact on teacher-student interactions. First, emotions have a social function and can strengthen or impair relationship quality (Fischer & Manstead, 2008). For example, harsh responses to misbehaving students tend to coincide with problems managing student conduct and less closeness and warmth in the teacher-student relationship (de Jong et al., 2014). Expressive suppression might prevent such inappropriate emotional outbreaks, but the negative emotions still exist and likely impede the formation of positive relationships (Jiang et al., 2016). Thus, internally regulating anger, for example, by taking students' perspective and understanding reasons for their behavior could be more effective (Kumschick et al., 2018; Okonofua et al., 2016). Second, emotions carry nonverbal messages informing students about the degree to which teachers believe in their abilities. Teachers expressing anger about a bad grade, for example, convey that they attribute failure to a students' lack of effort, whereas expressing compassion would suggest that teachers attribute low achievement to a lack of ability and these messages have differential consequences for students' motivation (Weiner, 2000). Hence, in this situation using cognitive reappraisal allows teachers to align their desired emotional expression with their inner states to authentically show irritation rather than pity. Third, emotions affect cognitive functioning. More specifically, the broaden-and-build theory

(Fredrickson, 2001) suggests that positive emotions widen whereas negative emotions narrow a person's repertoire of thoughts and actions. Furthermore, prior research indicates that negative affective experiences impair teachers' recall of professional knowledge and are related to self-focused attention and reduced cognitive empathy (Mor & Winquist, 2002; Seiz et al., 2015; Trauernicht et al., 2021). Therefore, adaptive emotion regulation could support teachers in responding to their students, retrieving their knowledge, and a broader repertoire of teaching strategies even though it requires additional cognitive resources. This is because using emotion regulation strategies that permanently change one's emotions (e.g., cognitive reappraisal) consume cognitive resources only for a short time (Ortner et al., 2013).

Pathway via burnout

Empirical evidence reveals a relation between burnout, lower interaction quality, and poorer academic outcomes for students (Arens & Morin, 2016; Klusmann et al., 2022). Theoretical perspectives suggested that this is because teachers who feel depleted of their emotional resources may invest less effort into preparing engaging and well-structured lessons and respond less encouragingly and more critical to their students (Klusmann et al., 2022; Maslach & Leiter, 1999). In this context, teachers' emotion regulation could be relevant because seeking colleagues' advice to solve problems and accepting unchangeable situations rather than masking anger might reduce the likelihood of experiencing burnout symptoms. Empirical evidence has indeed shown that adaptive emotion regulation is associated with lower levels of burnout (Mérida-López & Extremera, 2017; Yin et al., 2019).

Pathway via (implicitly) teaching emotion regulation

As illustrated above, the main mechanism linking teachers' emotion regulation to student outcomes is the quality of teacher-student interactions. However, additional pathways seem possible for students' own emotion regulation as an outcome. First, teachers implicitly model how to manage one's own emotions. Second, teachers can explicitly instruct students on this topic (Denham et al., 2012). Social-emotional learning curricula for students, such as the RULER approach (Brackett et al., 2019), integrate this idea and offer professional development opportunities for teachers before they implement the program in their classes.

We would like to close this section by emphasizing that the described links are likely reciprocal. For instance, one could speculate that rather than causing student misbehavior, expressive suppression may be a consequence thereof. After all, student misbehavior induces anger (de Ruiter et al., 2020; Frenzel et al., 2009; Hagenauer et al., 2015); because teachers often perceive anger as inappropriate in their professional role, they might become more prone to use expressive suppression unlike those teachers seldom exposed to anger-inducing situations (Sutton, 2004).

Present review

Theoretical perspectives indicate that teachers' emotion regulation is important (e.g., Jennings & Greenberg, 2009). Whereas prior research syntheses revealed positive relations with teacher well-being (e.g., Mérida-López & Extremera, 2017; Yin et al., 2019), to our knowledge a systematic review on the role of teachers' emotion regulation in the quality of teacher-student interactions and student outcomes is lacking. We neither know whether empirical evidence generally supports this assumption nor whether the methodological approaches in previous studies allow for a sound answer to this question. Therefore, we posed the question: Which insights can prior research provide about the relation between teachers' emotion regulation, the quality of teacher-student interactions, and student outcomes? Our primary goal was summarizing previous findings, but we also aimed to understand typical methodological approaches and how two central distinguishing features—the sole reliance on teacher questionnaires and profession specificity of the assessment—may impact the findings. We also explored whether the results might depend on students' age as a potentially relevant sample characteristic.

This systematic review contributes to the research field in several ways. First, interest in teachers' emotional characteristics has rapidly increased following the introduction of prominent models such as the prosocial classroom model by Jennings and Greenberg (2009). However, the heterogeneity of terminology complicates keeping track of relevant studies at a glance, which makes a synthesis that integrates different lines of research particularly valuable. Therefore, we suggested organizing the various strategies from Gross' emotion regulation, the coping, and the emotional labor traditions along the emotion generative process and argued that a person's general regulation ability as conceptualized in the emotional intelligence perspective heavily relies on their success in selecting the most adaptive strategy (Figure 1; also see Peña-Sarrionandia et al., 2015).

Second, this research synthesis allows us to understand what the field currently knows about the relation between teachers' emotion regulation, interaction quality, and student outcomes. This knowledge is vital for researchers and supports teachers, teacher educators, school psychologists, principals, and other stakeholders in the education system in evaluating the benefits of promoting teachers' emotion regulation. Third, this article points out questions that have remained unanswered to date. For instance, we identify potential correlates of teachers' emotion regulation that prior research has widely neglected (e.g., specific aspects of interaction quality or certain student outcomes). Lastly, we provide an overview of different research approaches, discuss what the field can learn from them, and which methodological challenges remain to ensure the validity of results.

The heuristic framework (Figure 1), largely based on the prosocial classroom model (Jennings & Greenberg, 2009), illustrates the hypothesized role of teachers' emotion regulation in the quality of teacher-student interactions and student outcomes. We expected a positive relationship between

the quality of teacher-student interactions and (1) teachers' general regulation ability, (2) regulation strategies typically considered to be adaptive (e.g., situation modification, cognitive reappraisal), and (3) a negative relation for strategies seen as maladaptive in most contexts (e.g., expressive suppression). Faking of emotions might be an exception to this rule because this strategy is mostly applied to convey positive emotions (Taxer & Frenzel, 2015). Even though it only changes teachers' outward appearance and comes at an emotional cost to teachers, students seem to get the impression that their teachers experience more positive emotions (Burić, 2019). We made similar assumptions regarding student outcomes but expected the relations to be weaker overall because student outcomes are less proximal to teachers' emotion regulation than teacher-student interactions.

Lastly, we examined whether the findings were robust to methodological and sample characteristics. In terms of the *rater perspective,* we speculated the correlations in the emotion regulation, coping, and emotional labor traditions, which solely use teacher questionnaires, were larger when teachers also reported on the correlates. This is a typical phenomenon when only one source of information is used resulting, for example, from people's general tendency to perceive themselves and their environments in a certain way (Podsakoff et al., 2012). In addition to this phenomenon, called common method bias, the self-report questionnaires in the emotional intelligence tradition are susceptible to subjective interpretations that might not necessarily reflect how others perceive the respondent (Brackett et al., 2006). This should further reduce the relations when the correlates were not measured from the teacher perspective but, for example, with student questionnaires or classroom observations. The idiosyncratic teacher perspective should be less problematic for the objective tools from the emotional intelligence tradition. Nonetheless, one could expect smaller correlations here compared to research in emotion regulation, coping, and emotional labor traditions because these tools measure knowledge rather than typical emotion regulation strategies. Capturing a broader repertoire of strategies and people's ability to adapt their strategies to specific situations could compensate for this potential limitation. Regarding *work-specificity,* we assumed weaker correlations when a general rather than a work-specific assessment tool was used because professional requirements may motivate teachers to apply different strategies in school than in their daily lives (Ajzen & Fishbein, 1977; Sutton & Wheatley, 2003).

Beyond examining whether results depend on methodological aspects, we used information on grade level to explore students' age as a potentially relevant factor. After all, one could speculate that teachers' social-emotional competence is particularly relevant for young students as they are more dependent on adult support to regulate their emotions (Calkins & Hill, 2009). Inversely, student disengagement represents a particular challenge during adolescence potentially eliciting more anger in teachers and placing higher demands on their emotion regulation (Frenzel et al., 2009; Wang & Eccles, 2012).

Method

Literature search

We conducted our literature search in PsycInfo, Web of Science, and ERIC in May 2022 without date restrictions and updated the search in April 2023 (see online supplement for a detailed description of the search strategy). The database search yielded 4,668 records from ERIC, 1,095 records from PsycInfo, and 789 records from Web of Science. After removing duplicates, 6,137 records remained for title and abstract screening. We supplemented our database search to identify relevant articles we may have missed. After screening the reference list of all eligible studies from the database search, we used Google Scholar to find articles citing the studies we had identified as relevant. We then contacted nine authors who had published at least two relevant articles in the field requesting unpublished material. Finally, we screened the reference lists of these distinguished researchers. These techniques led to 171 additional eligible studies.

(Pre-)screening process and inclusion criteria

The PRISMA diagram (Page et al., 2021) summarizes the number of studies we retained in each step of the (pre-)screening process (Figure 3). The first author prescreened the abstracts, conducted the full-text screening, and extracted relevant information from the final set of records. A trained research assistant additionally read the full texts ($\kappa = .71$; 94.5% agreement regarding the question of whether none versus any of the exclusion criteria were met) and extracted relevant information ($\kappa = .78$) from 20.0% of the included records to verify the inter-rater reliability. The online supplement comprises detailed information on the reviewed articles, the exclusion criteria, the review protocol, and the extracted information (Online Supplement Tables A1–A4). The data supporting the findings of this study are freely available http://dx.doi.org/10.23668/psycharchives.13494

We included studies in our research synthesis that met the following criteria. First, the measure of *emotion regulation* had to align with our definition, that is, it had to refer to teachers' management of emotions and psychological stress. Of the 503 records we assessed for eligibility after prescreening, 174 did not measure a relevant predictor. Second, studies had to measure a relevant *outcome* related to aspects of teacher-student interaction (i.e., emotional support, classroom management, instructional support) or student outcomes (e.g., motivation, achievement, social behavior). We excluded 103 studies not fulfilling this criterion.

Third, we included records describing relevant *analyses* (i.e., bivariate correlations or comparable statistics). We kept three studies only reporting standardized regression coefficients and two studies only mentioning an effect was not statistically significant without providing the exact coefficient. One study (Koca et al., 2021) only reported mean comparisons, which we converted to r (Borenstein, 2009). If a study assessed teachers' emotion regulation and teaching

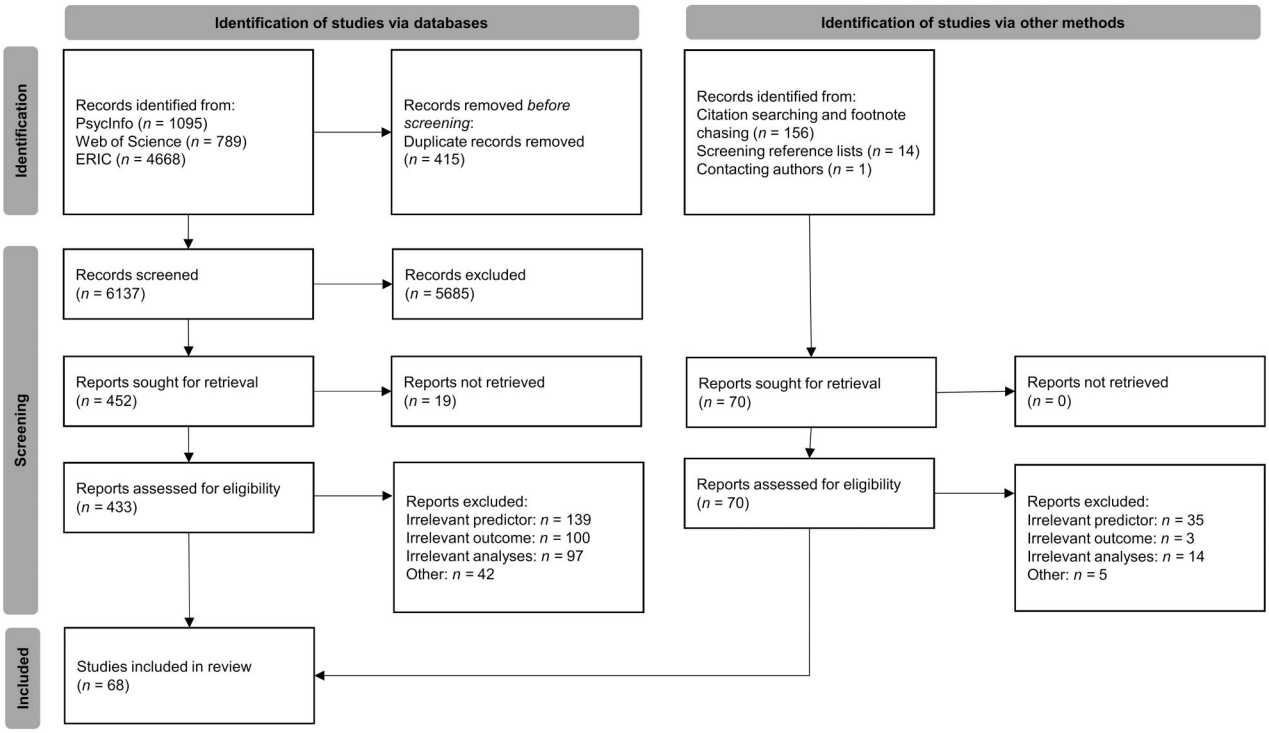

Figure 3. PRISMA diagram of the literature search process.

effectiveness without analyzing the relation between them in a way that allowed us to answer our research questions, for example, because authors combined different types of emotion regulation or focused on teachers' total emotional intelligence score rather than examining the emotion regulation subscale separately, we requested this information via e-mail. In the end, we excluded 111 studies not reporting relevant analyses. Similarly, we excluded 23 records not reporting quantitative results. Fourth, we excluded studies that did not have a *sample* of at least ten[1] regular or special education teachers across preschool to tertiary education; 14 records did not meet this criterion and were excluded. Fifth, nine studies were *duplicates;* they analyzed the same sample and variables as another record but provided less information on the sample and study variables. Lastly, we limited our database search to records written in Roman characters. Still, the additional search strategies yielded one Chinese article, which we excluded during the screening process. Thus, after full-text reading, 68 records remained (database search: 55, additional search strategies: 13; see Online Supplement for a full list of all included studies).

Analytic strategy

Before beginning our main analyses, we examined whether there were any emotion regulation strategies for which only a limited number of studies were available so that we could not draw substantive conclusions (a list of findings for the excluded strategies is in Online Supplement Table A5). As illustrated in Online Supplement Table A4, most research in external and internal regulation strategies concentrated on typically adaptive external and internal strategies (e.g., problem solving, cognitive reappraisal). Regarding response modulation, the predominant strategies referred to the way emotions are expressed (e.g., expressive suppression, faking emotions, venting of emotions). Thus, we concentrated on external and internal strategies that are usually considered adaptive, and on expressive regulation as a form of response modulation because research on other strategies was too sparse. We also included teachers' general regulation ability.

We then conducted analyses for each correlate in combination with each considered external, internal, and expressive emotion regulation strategy, and with general regulation ability to answer our central research question. Specifically, we counted the number of studies finding a relation that was statistically significant at $\alpha < .05$ in the expected direction (versus relations that were non-significant or statistically significant in the unexpected direction). We counted studies reporting multiple correlations for an emotion regulation-correlate combination (e.g., because multiple types of student engagement were assessed as academic outcome) as evidence of a link if at least 10.0% of the reported relations were statistically significant in the expected direction. We chose to conduct analyses at the study level rather than at the level of single effect sizes to avoid the risk of results from some studies with a large number of effect sizes predominating our findings. We recoded correlations from studies assessing negative qualities of teacher-student interactions and maladaptive student outcomes to harmonize the interpretation of coefficients.

[1]We chose a sample size of at least 10 teachers because correlations are highly unstable in very small samples (Schönbrodt & Perugini, 2013)

Results

In the following, we describe sample and methodological study characteristics before examining our heuristic framework on the links between teachers' external, internal, and expressive regulation strategies, general regulation ability and the quality of teacher-student interactions and student outcomes.

Sample characteristics

The research synthesis is based on 44 journal articles, 19 theses, three proceedings papers, and two book chapters published between 2009 and 2023 ($Md = 2018$, $M = 2017$, $SD = 4.00$). The 68 included records reported results from 69 independent samples from 23 countries—mostly the USA ($k = 28$), followed by Turkey ($k = 5$), China ($k = 4$), Australia, Canada, Croatia, and Greece ($k = 3$). The teacher samples comprised between 11 and 1,447 teachers ($M = 261.36$, $SD = 324.97$). As summarized in Table 1, 75.6% of the teachers were female and on average $M = 39.46$ years old. The majority of samples included only in-service teachers ($k = 64$) who had $M = 12.48$ years of job experience. Student samples were described in 21 studies: They comprised between 152 and 18,814 students (54.8% female) and on average 15 students per teacher. Most samples included either only secondary school teachers ($k = 20$) or a combination of secondary school, elementary school, and, in some cases, early childhood and tertiary education teachers ($k = 18$). Teachers in 18 studies taught early childhood, kindergarten and/or elementary school classes, eight samples comprised educators at the tertiary level, and three samples special education teachers. Only 22 studies provided information on the school subject: 14 samples included participants teaching different subject domains, four assessed English, and each one mathematics, physical education, law, or dental hygiene teachers.

As summarized in Table 1, central sample characteristics differed between lines of research and types of emotion regulation: The emotional intelligence tradition measuring general regulation ability had the smallest ($M = 155.18$ teachers) and the coping tradition the largest teacher samples ($M = 475.00$). Whereas studies in the Gross tradition most often examined pre- and elementary school teachers, the emotional labor tradition considered secondary school teachers most frequently.

Research methods

Assessment of emotion regulation

Research in the emotional intelligence tradition was predominant ($k = 28$) with 18 studies applying questionnaires [mostly the WLEIS (Wong & Law, 2002); $k = 7$] and ten using objective tools [mostly the MSCEIT (Mayer et al., 2002); $k = 6$]. Among the 17 studies from the emotion regulation perspective, the ERQ prevailed (Gross & John, 2003; $k = 14$). The COPE (Carver et al., 1989; $k = 5$) and the Coping Scale for Adults (Frydenberg & Lewis, 1997; $k = 4$) dominated in the 15 samples with a coping-specific

Table 1. Characteristics of the included studies depending on the line of research and the type of emotion regulation.

		Line of research				Regulation strategy		
	Total	Emotion regulation	Coping	Emotional labor	EI: general ability	External	Internal	Expressive
Number of samples (k)[b]	69[a]	17	15[1]	10	28	18[a]	29[a]	28[a]
Year of publication (M)	2016.90	2018.47	2014.79	2018.60	2016.36	2015.41	2017.75	2018.11
Journal article (%)	64.71	64.71	78.57	80.00	53.6	76.47	60.71	70.37
Teachers								
Sample Size (M)	261.36	305.29	475.00	250.30	155.18	411.94	268.55	376.68
Proportion Female (M)	75.61	87.23	68.72	69.63	74.36	73.65	79.76	77.93
Age (M)	39.46	38.53	38.75	39.57	39.91	38.71	38.44	39.03
Job Experience (M)	12.48	12.37	13.78	14.77	11.55	10.78	12.81	13.95
Students								
Sample Size (M)	1591.33	4362.80	319.00	1535.00	556.67	319.00	3302.38	3686.71
Proportion Female (M)	54.76	50.71	48.30	57.00	56.41	48.30	52.81	53.37
School (%)[c]								
PreK – Elementary	52.17	70.59	53.33	40.00	46.43	55.56	58.62	57.14
Secondary	55.07	41.18	60.00	70.00	53.57	55.56	44.83	50.00
Tertiary	13.00	0.00	13.33	20.00	17.86	11.11	3.45	7.14
Special Education	4.35	5.88	0.00	10.00	3.57	0.00	6.90	7.14
ER Assessment								
Objective tool (%)	14.49	0.00	0.00	0.00	35.71	0.00	0.00	0.00
Work-specific (%)	33.33	11.76	33.33	100.00	21.43	33.33	31.03	46.43
Correlate Assessment[d]								
T Questionnaire (%)	53.62	47.06	86.67	50.00	39.29	77.78	51.72	57.14
T Scenarios (%)	8.70	23.53	6.67	0.00	7.14	16.67	13.79	7.14
S Questionnaire (%)	23.19	17.65	6.67	20.00	35.71	5.56	17.24	17.86
Observation	14.49	17.65	0.00	10.00	21.43	0.00	13.79	10.71
Test / GPA	2.90	0.00	0.00	10.00	3.57	0.00	3.45	3.57
Common Method (%)	60.87	70.59	93.33	50.00	42.86	94.44	65.52	64.29

EI: emotional intelligence; T: teacher; S: student.
[a]Two samples were from the same study.
[b]The total sum is smaller than the sum across cells in this row because some studies used instruments from two lines of research or assessed multiple regulation strategies; the sum of the percentages does not add up to 100.00% because some studies: [c]included samples with different school types and [d]used multiple methods for assessing the correlat and one study did not report the rater.

instrument. The ten studies on emotional labor most often applied the DEELS (Glomb & Tews, 2004; $k = 3$). The assessment instruments utilized in the emotional labor tradition were all work-specific and explicitly referred to the teaching context, which was less common in the emotion regulation (11.8%), emotional intelligence (21.4%), and coping (33.3%) literature.

Assessment of the correlates

In terms of correlates of teachers' emotion regulation, 50 studies examined teacher-student interactions [mostly emotional support ($k = 36$) and classroom management ($k = 22$)] and 28 studies investigated student outcomes (academic: $k = 20$; nonacademic: $k = 9$). Importantly, academic (e.g., school-related misbehavior, engagement, intrinsic motivation, achievement) and nonacademic (e.g., emotional distress, general socio-emotional problems, prosocial behavior, emotional intelligence) student outcomes comprised a rather wide range of constructs.

Researchers frequently relied on the teacher perspective to assess the correlates. The majority of all studies used teacher questionnaires (53.6%). For instance, teachers rated students' emotional symptoms and peer problems (Poulou, 2017) or the degree to which children disturbing classroom activities was demanding for them (Schipor & Duca, 2021). Other studies captured teachers' likely response to a vignette where a hypothetical student was bullied, displayed emotion regulation difficulties, or misbehaved (8.7%). For example, teachers assessed how likely they would be to choose supportive and punitive strategies in response to student behavior problems as well as the presumed quality of the relationship with the hypothetical child (Runion, 2021). Grades (1.4%), standardized achievement tests (1.4%), classroom observations (14.5%), and student questionnaires (23.2%) were less common. In these studies, students rated, for example, their academic engagement in the target teachers' class and whether they perceived the classroom climate as supportive, classroom management as effective, and instruction as cognitively activating (Burić & Frenzel, 2021). Other studies (e.g., Brown et al., 2018; Hu et al., 2018) asked trained observers to rate teachers' interactions with students based on the classroom assessment scoring system (for a description see Pianta & Hamre, 2009), which assesses different dimensions such as negative classroom climate (one aspect of emotional support), behavior management (one aspect of classroom management), and quality of feedback (one aspect of instructional support).

The methods for assessing the correlates differed across lines of research: The teacher perspective was more prevalent in coping (93.3%) and emotion regulation (70.6%) than in emotional labor (50.0%) and emotional intelligence (46.43%) research. Furthermore, studies on external regulation strategies more frequently used teacher questionnaires and teachers' responses to hypothetical scenarios (94.4%) than did studies on expressive (64.3%) and internal regulation strategies (65.5%). Thus, potential differences between lines of research and regulation strategies might be attributable to different methods for measuring the correlates.

Study design

The majority of studies were cross-sectional (88.0%) and, even if more than one measurement time point was included, the analyses were rarely longitudinal (for exceptions see Braun et al., 2020; Wang et al., 2021). Therefore, we concentrated on the within-wave correlations. A nested data structure emerged in 21 studies because, for example, several students reported on their engagement in a single teacher's classroom. Failing to consider the dependency of the data might result in underestimated standard errors and increased Type I error (Snijders & Bosker, 2012). Twelve studies attended to this problem either by aggregating data at the teacher level or by using multilevel modeling.

Testing the heuristic framework of teachers' emotion regulation

To test our heuristic framework, we first examined whether it was possible to integrate similar emotion regulation strategies across different theoretical perspectives according to where in the emotion generative process they unfold (Figure 1, upper part). Then, we provide an overview of the relations of teachers' emotion regulation with teacher-student interactions and student outcomes (Figure 1, lower part).

Integrating emotion regulation strategies

Our heuristic framework draws on Gross' idea that strategies applied in similar steps of the emotion generative process should have similar effects. Therefore, we checked whether the included strategies (Table 2), which we categorized as external, internal, and expressive regulation showed similar relations with our correlates. Studies finding positive, negative, and null relations were distributed similarly across the different strategies within the overarching external and internal categories (Figures 4 and 5). For example, active coping, social problem solving, and planning as external strategies revealed similar result patterns. This suggests that it is less important which specific action people take to modify the emotion-eliciting situation and allows us to combine these strategies as external emotion regulation without potentially missing differential relations with teaching effectiveness. Relatedly, different terms describe the phenomenon of people changing their internal experience (e.g., cognitive reappraisal, positive reframing, deep acting) across research traditions. Again, there were no systematic differences between the specific internal strategies. This allowed us to describe results at the level of the overarching category of internal regulation without potentially missing important nuances. In contrast, expressive strategies showed a diverse pattern of relations with our correlates (Figure 6). Hence, an integrative approach did not seem appropriate here and we carefully considered the specific expressive strategies in the following analyses.

Table 2. Included emotion regulation strategies for each overarching type of regulation and number of studies examining these strategies in combination with each correlate.

	Emotion regulation strategies	*k*[a]	*GI*	*ES*	*CM*	*IS*	*AO*	*NO*
External regulation	Active modification, (pro-)active coping Taking action to solve the problem	6	1	1	1	0	4	0
	(Refocus on) planning Making a plan of action	6	3	1	0	0	2	0
	Suppression of competing activities Focusing on solving the problem and putting other things aside	2	1	0	0	0	1	0
	Problem-focused coping Combination of planning and active strategies	4	0	2	0	1	0	1
	Seeking instrumental support, social problem solving Seeking someone's advice on how to deal with the situation	8	3	0	4	0	1	0
Internal regulation	Positive refocusing Drawing attention to positive things that have nothing to do with the problem	2	0	1	0	0	1	0
	Cognitive reappraisal, positive reappraisal / reinterpretation/ reframing, emphasizing the positive Looking at positive aspects of the problem, changings one's perspective on the situation	22	4	13	6	1	5	3
	Acceptance Accepting that the situation cannot be changed and learning to live with it	3	1	0	0	0	2	0
	Humor Joking about the situation	4	1	2	0	0	1	0
	Deep acting Trying to actually experience the emotions that one must show	7	1	4	2	2	3	0
Expressive regulation	Genuine expression of positive emotions Letting out the positive emotions one truly feels	2	0	1	0	0	1	0
	Genuine expression of negative emotions, venting of emotions, confrontive coping[b] Letting out the negative emotions one truly feels	7	3	1	0	0	4	0
	Faking emotions Expressing emotions that one does not truly feel	5	0	2	1	1	4	0
	Expressive suppression, hiding emotions Not showing the emotions that one feels	18	1	11	6	2	7	2
	Surface acting Combines faking and hiding	5	1	3	1	1	1	0

[a]The total number of studies is smaller than the sum across all cells in this row because some studies assessed multiple correlates.
[b]We distinguished genuine expression of positive and negative emotions because expressing positive emotions was likely to have positive relations with the correlates, whereas we expected the reverse for genuine expression of negative emotions;
GI: general interaction quality; ES: emotional support; CM: classroom management; IS: instructional support; AO: academic student outcomes; NO: nonacademic student outcomes.

Teachers' external regulation, interaction quality, and student outcomes

We identified 18 studies, mostly from the coping literature (83.3%), examining external regulation strategies typically considered as adaptive (e.g., seeking instrumental support, active modification of the situation, planning). As summarized in Table 3, evidence shows statistically significant, positive relations with emotional support (50.0% of the studies), classroom management (60.0%), instructional support (100.0%), and general interaction quality (100.0%). Thus, teachers intervening early in the emotion-generative process by changing the situation achieved better interaction quality. In contrast, statistically significant, positive relations with academic (40.0%) and nonacademic (0.0%) student outcomes occurred less frequently. As our heuristic framework (Figure 1) illustrates, student outcomes are rather distal from teachers' emotion regulation, which could explain this result. Overall, the statistically significant, positive relations between external regulation and teaching effectiveness were small (66.7% of all *r*s and βs $\leq$ .30; Online Supplement Figures A1–A4 display all correlations depending on the emotion regulation strategy).

In terms of potential moderators, external regulation appeared relevant across grade levels even though we should note that only one study was conducted in tertiary education. Regarding the role of methodological characteristics, the majority of studies solely relied on teacher questionnaires (94.4%) making it difficult to examine whether the relations we found hold, for example, when observers rate interaction quality or students report on their own outcomes. The few studies assessing emotion regulation specifically in the work context (33.3%) were no more or less likely to produce statistically significant, positive results.

Teachers' internal regulation, interaction quality, and student outcomes

We found 29 studies from the emotion regulation (58.6%), coping (17.2%), and emotional labor (24.1%) traditions investigating internal regulation strategies that are commonly seen as adaptive (e.g., cognitive reappraisal, deep acting, and humor). Multiple studies found statistically significant, positive relations with emotional support (52.6%) and general interaction quality (80.0%), but not with classroom management (12.5%) and instructional support (0.0%). Similarly, statistically significant, positive links with academic (25.0%) and nonacademic (33.3%) student outcomes were rare. The statistically significant, positive relations we found were mostly small (61.5% of all *r*s and βs $\leq$ .30). Hence, positive links between internal strategies and teaching effectiveness only showed for facets of teacher-student interaction comprising emotional content, but overall these strategies did not appear relevant. Even though this finding contradicted our hypotheses, it was in line with our heuristic framework insofar as it revealed strategies that are

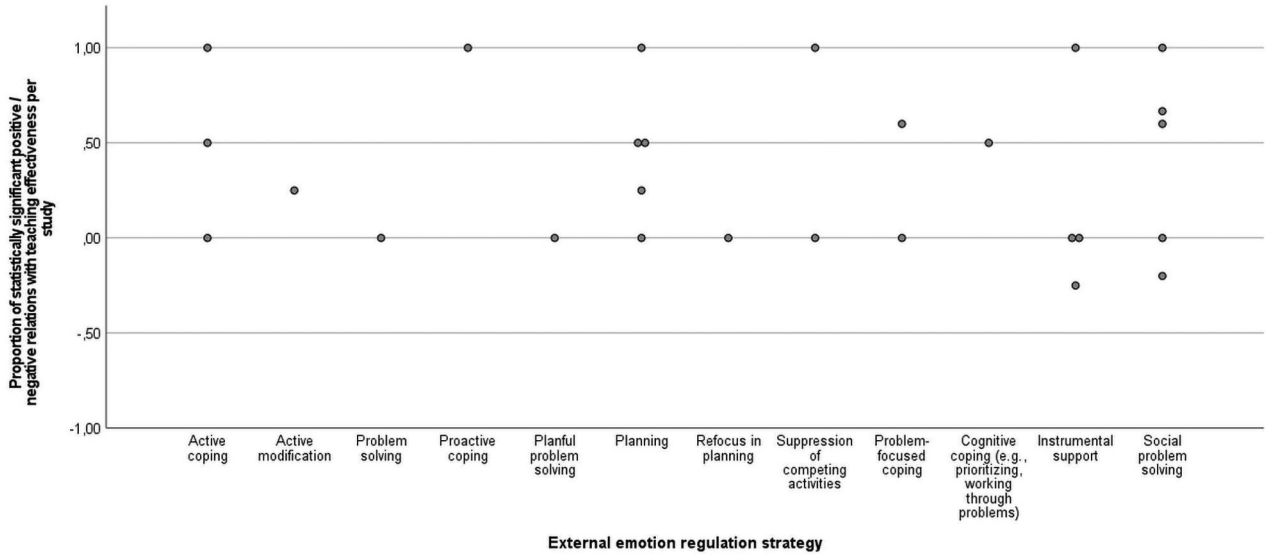

Figure 4. Relations between teachers' external emotion regulation strategies and teaching effectiveness.

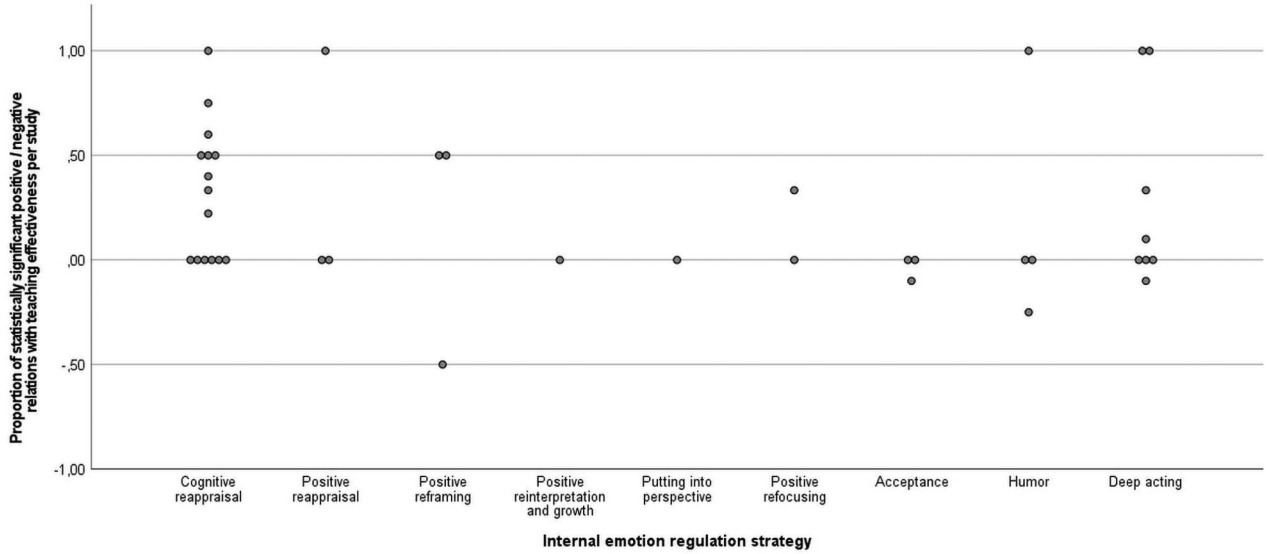

Figure 5. Relations between teachers' internal emotion regulation strategies and teaching effectiveness.

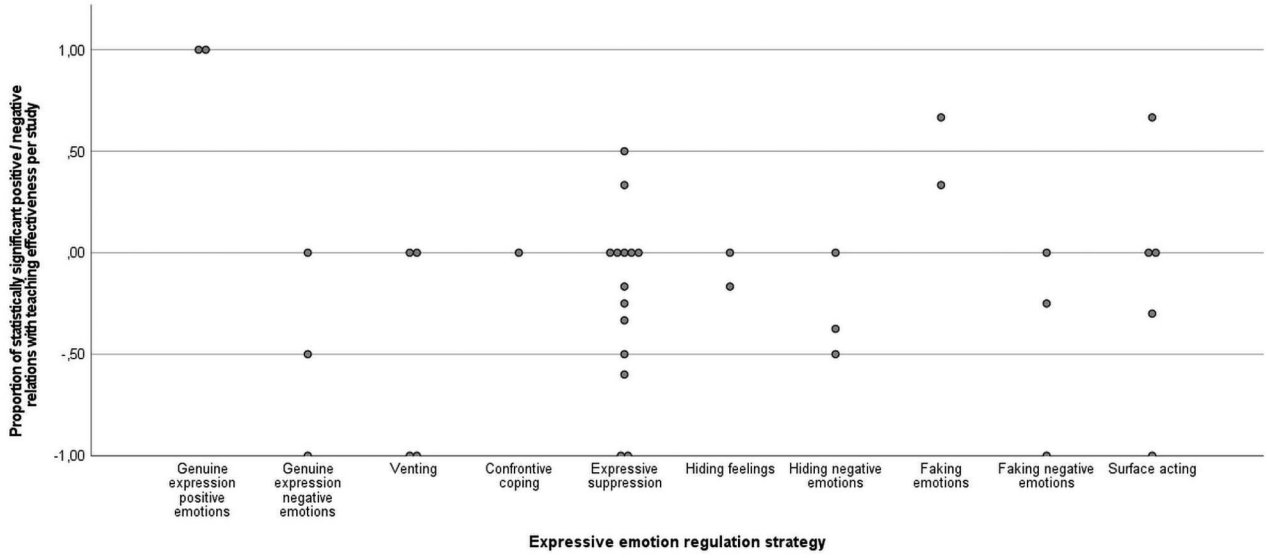

Figure 6. Relations between teachers' expressive emotion regulation strategies and teaching effectiveness.

Table 3. Proportion of studies finding statistically significant positive and negative relations between teachers' emotion regulation and the correlates.

	Teacher-student interaction								Student outcomes			
	General quality		Emotional support		Classroom management		Instructional support		Academic		Nonacademic	
Emotion regulation	+	−	+	−	+	−	+	−	+	−	+	−
General Ability	33.3	16.7	**47.1**	23.5	**30.0**	0.0	12.5	**37.5**	**62.5**	0.0	25.0	0.0
External	**100.0**	0.0	50.0	0.0	**60.0**	20.0	**100.0**	0.0	40.0	0.0	0.0	0.0
Internal	**80.0**	20.0	**52.6**	0.0	12.5	12.5	0.0	0.0	25.0	0.0	33.3	0.0
Expressive	0.0	40.0	**21.4**	**42.9**	0.0	**71.4**	0.0	66.7	20.0	20.0	0.0	100.0
Genuine positive			100.0	0.0					100.0	0.0		
Genuine negative	0.0	66.7	0.0	0.0					0.0	50.0		
Surface	0.0	0.0	33.3	66.7	0.0	100.0	0.0	100.0	0.0	0.0		
Suppression	0.0	0.0	18.2	**27.3**	0.0	**66.7**	0.0	50.0	0.0	28.6	0.0	100.0
Faking			0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0		

Cells where at least 50.0% of the studies found statistically significant correlations are filled in gray; cells including at least 3 studies are printed in bold; empty cells refer to emotion regulation-correlate combinations that have not been examined in the included studies.

applied later in the emotion-generative process might be less effective in changing one's emotions and the associated consequences.

Pre- and elementary school teachers' emotion regulation was related with interaction quality and student outcomes more often compared to studies with secondary school students (75.0% vs. 37.5%). Regarding the robustness of results for different methodological characteristics, most studies assessing the correlates from the teacher perspective found statistically significant positive correlations regardless of whether they applied work-specific (75.0%) or general (60.0%) tools to assess internal emotion regulation strategies. In contrast, statistically significant relations were less frequent in studies including other-rated correlates, especially when combined with general questionnaires (33.3% vs. 50.0% for work-specific instruments).

Teachers' expressive regulation, interaction quality, and student outcomes

Our literature research yielded 28 studies from the emotion regulation (44.8%), coping (20.7%), and emotional labor (34.5%) perspectives on expressive regulation strategies (e.g., expressive suppression or hiding of emotions, genuine expression of negative emotions, faking). Across these strategies, we found evidence of a statistically significant, negative relation with classroom management (71.4%), instructional support (66.7%), and nonacademic student outcomes (100.0%), which were mostly small (77.3% of all $rs \leq |.30|$). These findings partly support our heuristic framework as they indicate that teachers who fail to intervene early in the emotion-generative process and are therefore forced to either express negative emotions or emotions that they do not truly experience, have lower teaching effectiveness. There was less support for a negative relation with general interaction quality (40.0%) and results were mixed for emotional support and academic outcomes. The relation with these correlates is potentially negative for some external strategies but positive for others, which suggests that integrating them is inappropriate.

Genuine expression of positive emotions (100.0%, $r = .59$) and less surface acting (66.7%, $.24 \leq r \leq .26$) were linked with teacher perceived relatedness and alliances with students and a less negative classroom climate from the observer perspective (Brown et al., 2015, 2018; Taxer & Frenzel, 2015). In line with the idea that teachers can only mask their emotions to a limited extent, some studies found negative relations between expressive suppression and emotional support (27.3%), for example, when secondary school teachers reported using more suppression, their students perceived the classroom climate as less supportive (Burić et al., 2022). At the same time teachers relying on expressive suppression reported statistically significantly more sensitivity and non-verbal participation with children and students perceived more communion in their classes (Donker et al., 2020; Ocak Karabay, 2019). Though not significant, early childhood teachers applying more expressive suppression were also observed to react to students' positive emotional displays in a more supportive way (Swartz & McElwain, 2012). Moreover, surface acting correlated positively with teachers' perceived quality of alliances with students in another study (Valenti et al., 2019).

Further underpinning the complex role of expressive regulation, secondary school teachers who applied faking more often had students reporting higher intrinsic motivation, positive affect, and engagement (Burić, 2019; Burić & Frenzel, 2021). Similarly, genuine expression of positive emotions correlated with more student engagement (Wang et al., 2021). In contrast, specifically faking negative emotions was linked to more student disengagement as were hiding positive emotions and genuinely expressing negative emotions (Wang et al, 2021, Wang & Burić, 2023).

Exploring the robustness of the results, there were no striking differences depending on students' grade level. Regardless of whether studies included teacher self-reported outcomes or another perspective, 60.0% of the studies with a general expressive regulation questionnaire and 75.0% of the studies with a work-specific assessment found statistically significant correlations.

Teachers' general regulation ability, interaction quality, and student outcomes

We included 28 studies considering teachers' general regulation ability. Whereas some studies found statistically significant, positive relations with emotional support (47.1%) and

academic student outcomes (62.5%), there was less evidence for such links with classroom management (30.0%), instructional support (12.5%), general interaction quality (33.3%), and nonacademic student outcomes (25.0%). Thus, the link with teaching effectiveness appeared generally weaker compared to the results from research considering specific regulation strategies. This points toward the necessity for zooming into the general regulation ability-box (Figure 1, upper part) and for taking a nuanced look at the specific actions teachers take in the emotion generative process.

When the relations were statistically significant and positive, they were often moderate or large (62.5% of these *r*s and βs $> .30$), perhaps, because they mostly resulted from studies prone to common method bias. Specifically, statistically significant, positive correlations were most likely when the same person rated both teachers' general regulation ability and the correlates (work-specific: 100%, general: 66.7%), but less common when researchers combined teacher questionnaires on their general regulation ability with other methods for assessing the correlates (42.9%, all general) or when they assessed general regulation ability with objective tools (work-specific: 33.3%, general: 28.6%). Notably, studies solely using self-report questionnaires had significantly larger samples ($M = 267$ teachers) compared to studies with more laborious assessments ($M = 77$), which could provide an alternative explanation for the diverging findings. In addition, results depended on sample characteristics. Studies at the pre- or elementary school level were least likely to find statistically significant correlations. Perhaps, the frequent focus on nonacademic student outcomes, such as students' emotional intelligence, emotional symptoms, and peer problems (Polat & Ulusoy-Oztan, 2009; Poulou, 2017), provides an explanation.

Publication bias

We included theses and conference contributions in addition to journal articles and book chapters to reduce the risk of publication bias. Theses and conference contributions accounted for 35.3% of the included records. The proportion of studies finding evidence for the hypothesized relations was similar across publication types (published: 65.9%, unpublished: 60.0%). Hence, we concluded that publication bias did not have a major impact on our findings.

Discussion

The teaching profession is emotionally intense and teachers' emotions not only shape their own subjective well-being but are also perceived by the students they teach (Evers et al., 2004; Frenzel, 2014). In this context, emotion regulation has been emphasized as one relevant predictor of effective teaching (Brackett et al., 2010; Jennings & Greenberg, 2009). Research in this field has rapidly increased in the last decade but various terms have been used to investigate conceptually related phenomena (e.g., emotional intelligence, emotional labor). Therefore, we aimed to combine the existing evidence from different lines of research to summarize what the field has learned thus far and what it still needs to discover. We identified 68 journal articles, theses, chapters, and conference papers providing insights into the role of teachers' emotion regulation in the quality of teacher-student interactions and student outcomes. Strategies that were defined in similar terms across lines of research mostly had similar relations with correlates, which supported our integrative idea. At the same time, strategies affecting different steps of the emotion generative process and teachers' general regulation ability had differential relations with correlates.

Teachers using external regulation perceive better interaction quality

Teachers' using external regulation strategies reported higher-quality interactions with their students. This supports the assumption posed across lines of research that modifying the emotion-eliciting situation itself is most adaptive (Lazarus & Folkman, 1984; Sheppes & Gross, 2012). Whether students or observers share the teachers' positive evaluations of interaction quality remains an open question and calls for caution when interpreting these results. Considering the central role that external regulation plays from a theoretical perspective, it seems surprising that empirical research in this regard is not yet available. Perhaps, this is because the coping tradition is the only one commonly assessing external regulation strategies.

Significant but ambiguous role of expressive regulation

Expressive regulation showed the closest relation with teaching effectiveness—even when the correlates were rated from a different perspective than that of the teacher. Surface acting and suppressing the expression of emotions were linked to worse classroom management, less instructional support, and poorer nonacademic outcomes for students.

However, we also obtained unexpected results indicating that expressive regulation may have benefits even though it is typically conceived as maladaptive and associated with lower well-being for teachers (e.g., Burić et al., 2021; Sheppes & Gross, 2012). First, faking played an ambiguous role showing a relation with poorer academic student outcomes in one study but with better academic outcomes in two others. As suggested in the emotional labor tradition, it is important to consider whether teachers regulate the expression of positive or negative emotions (e.g., Wang et al., 2021). For instance, teachers often fake positive emotions, which could lead students to perceive their teachers as more enthusiastic and, in turn, to experience greater motivation (also see Burić & Frenzel, 2021). In contrast, if teachers fake negative emotions, for example by exaggerating their anger about misbehavior or their disappointment about students' disengagement, this reactive classroom management strategy may rather reinforce negative student behaviors (Wang et al., 2021). Generally, considering the valence and intensity of emotions could be fruitful across lines of research because these factors determine which strategy

people choose and the effectiveness of regulation varies between emotions (Matthews et al., 2021; Olatunji et al., 2017).

Second, whereas some studies found the expected negative relation with emotional support, others indicated that expressive suppression and surface acting might be linked with more sensitivity toward students or communion. Perhaps, this reflects a tendency of highly committed, supportive teachers to hide negative emotions because they view this as part of their professional role (e.g., Sutton, 2004). To better understand when expressive suppression has a positive rather than a negative relation with emotional support, future research could therefore include teachers' beliefs about emotional displays in the work context as a moderator. In summary, the unexpected results illustrate the value of an integrative perspective. Whereas single counterintuitive results within one research tradition might remain unnoticed, accumulating the evidence across fields uncovers questions that call for a more nuanced examination.

Few effects for internal regulation

At first glance, our results indicated that internal regulation has a positive relation with emotional support and general interaction quality—these results were similar across the Gross, coping, and emotional labor traditions. However, there was only limited evidence that students and external observers also notice differential behavior depending on teachers' use of internal regulation. This underpins the relevance of considering methodological study characteristics before drawing substantive conclusions.

Despite these results, the field should not yet disregard the relevance of internal regulation. After all, prior research largely focused on cognitive reappraisal and deep acting. Only a few studies examined acceptance, but to date the concept has been limited to acceptance of the situation, whereas acceptance of emotions has widely been neglected (Izadpanah et al., 2019). A broader conceptualization of acceptance could be worthwhile because mindfulness trainings, which include but are not limited to acceptance, can improve the quality of teacher-student interactions (Jennings et al., 2017). Furthermore, attentional deployment and other forms of cognitive change than reappraisal have rarely been examined calling for more research on additional internal strategies. Importantly, these studies will only answer the question of whether improving teachers' internal regulation is a promising strategy to achieve observable changes in interaction quality and student outcomes if they go beyond the sole reliance on teachers' self-report data and ideally use a work-specific assessment.

Scant evidence for a relation with general regulation ability

General regulation ability was unrelated to teacher-student interactions and student outcomes as reported by others than the teachers themselves. Thus, we may have concluded that teachers' emotion regulation is irrelevant for teaching effectiveness if we had only considered research from the emotional intelligence tradition. Instead, our integrative review revealed that to understand the role of teachers' emotion regulation in their effectiveness it might be necessary to focus on specific strategies (e.g., expressive regulation) as in the Gross, coping, and emotional labor traditions. Perhaps, the blending of multiple emotion regulation strategies, as it implicitly occurs when asking for teachers' general regulation ability, masks effects if only a few of many approaches are associated with effective teaching or if a strategy that one expects to be harmful, is in fact, beneficial or vice versa. Examining specific strategies also brings practical benefits because it conveys which specific strategies are related to which aspect of effective teaching; this knowledge could help tailor interventions.

Regardless of the limitations of self-report questionnaires on emotion regulation in the emotional intelligence tradition, the objective tools developed in this field could draw attention to an important aspect that has been overlooked in the remaining lines of research. These instruments ask participants to evaluate the effectiveness of different emotion regulation strategies in a specific situation. This is important because the *strategy-situation fit hypothesis* assumes that it is not merely the frequent use of a specific strategy that defines effective emotion regulation, but rather the ability to choose from a broad repertoire of strategies the one that is most appropriate in a given situation (Haines et al., 2016). For example, cognitive reappraisal may be adaptive specifically for relatively minor or short-term issues or in unchangeable situations. However, when teachers are frequently confronted with similar issues at work, it would be more adaptive to solve the underlying problem rather than taking a different perspective on the situation. For example, seeking advice from colleagues or professional development may be more appropriate to avoid emotion-eliciting situations in the future. Most studies applying objective tools from the emotional intelligence tradition did not find effects but this could be due to small samples and the frequent use of the MSCEIT (Mayer et al., 2002), which measures emotion regulation in everyday situations largely unrelated to the emotional demands of teaching (e.g., worries about a broken car and paying bills). More research with profession-specific situational judgment tests (e.g., Aldrup et al., 2020; Friedman, 2014), which ask teachers to evaluate emotion regulation strategies in response to typical work-related situations (e.g., anger about student disengagement) could therefore prove useful.

Avenues for future research

We would like to highlight overarching points to consider in future research in addition to the specific ideas for future research in teachers' general regulation ability, their external, expressive, and internal regulation outlined above. These studies will be most valuable if they are adequately powered, longitudinal, and apply appropriate statistical methods (e.g., multilevel analyses to account for nested data structures; for

a more extensive discussion of this issue see Frenzel et al., 2021).

Open questions regarding our heuristic framework

Looking at our heuristic framework, we identified several gaps that have received limited attention in prior research. First, with the exception of the coping tradition, studies often considered a rather narrow repertoire of emotion regulation strategies. Specifically, external and internal regulation strategies that are typically maladaptive, such as avoidance or rumination, and types of response modulation that do not tackle the expression of emotions (e.g., emotional support search) are underrepresented. Therefore, future research may profit from broadening the view to avoid overlooking strategies potentially showing a link with the quality of teacher-student interactions and student outcomes. Additionally, identifying the strategies most closely associated with teaching effectiveness is relevant from a practical perspective because interventions could specifically focus on these strategies.

Second, instructional support and student outcomes have rarely been examined as correlates of teachers' emotion regulation. Thus, caution in drawing final conclusions is especially warranted regarding these correlates. Even though we think it is important to examine a broader range of correlates of teachers' emotion regulation, the variables should be selected based on theoretical considerations. For instance, emotion regulation may have a complementary rather than a leading role in promoting aspects of interaction quality closely related to content. Furthermore, when extending our knowledge about the link between teachers' emotion regulation and student outcomes, we recommend focusing on variables proximal to students' classroom experiences. Perhaps, finding no relationship between teachers' emotion regulation and rather stable student characteristics not directly related to the school context, such as social and emotional difficulties (e.g., Poulou et al., 2018), is not surprising and one should instead consider students' engagement or satisfaction regarding the teachers' instruction.

Third, previous studies have primarily focused on isolated links but a comprehensive test of the suggested processes is still lacking. A striking research gap exists regarding emotions as a potential mediator between teachers' emotion regulation and their teaching effectiveness. Picking up our discussion of the findings on expressive regulation, using emotion regulation to reduce negative emotions might prevent harsh reactions and a negative classroom climate. Yet, generating positive emotions appears necessary for teachers to display warmth and establish positive relationships with students (Pianta & Hamre, 2009).

Interplay with student and other teacher characteristics

Even though the main effects might be small, as indicated by our systematic review, emotion regulation could interact in meaningful ways with additional variables. One ostensibly obvious fact is that teachers require emotion regulation the most when they actually experience emotions. For instance, students with externalizing behavior problems frequently elicit negative emotions in teachers and might therefore require especially high levels of emotion regulation (de Ruiter et al., 2020; Spilt et al., 2011). Similarly, prior research found a relationship of anger and anxiety with classroom disturbances, a lack of student motivation, and students' hostility toward the teacher (de Ruiter et al., 2020; Frenzel et al., 2009; Hagenauer et al., 2015). Thus, teachers' classroom management skills could prevent challenging social interactions with students and, in turn, negative emotions and the necessity to regulate them (Dicke et al., 2015; Voss et al., 2017). Moreover, beginning teachers, in particular, still need to refine their practical teaching skills, may feel overwhelmed by the new demands, and could therefore profit more from emotion regulation than their more experienced colleagues do (Dicke et al., 2015; Voss et al., 2017). Furthermore, and as outlined in the theoretical background, emotion regulation can enable teachers to use their professional knowledge (Seiz et al., 2015). However, emotion regulation cannot compensate for gaps in professional knowledge. For example, if pedagogical content knowledge is high, teachers' emotion regulation will enable them to use their knowledge to create cognitively challenging lessons and provide learning support (Kunter et al., 2013) even when they are in emotionally challenging situations. However, if pedagogical knowledge is low, an important precondition for high quality instruction might be lacking. Thus, in addition to investigating main effects of emotion regulation, one might also consider interactions with other teacher characteristics. In a similar vein, the cultural context might moderate the strength of relations. For instance, collectivistic cultures value emotions less than individualistic cultures do and tend to appraise the expression of negative emotions as a threat to interpersonal harmony potentially making effective emotion regulation more relevant (Matsumoto et al., 2008). Interestingly, expressive suppression can have positive social consequences in collectivism, which could lead to reverse effects than one would expect from an individualistic perspective (Butler et al., 2007).

Limitations

In this article we aimed to provide the first comprehensive overview of prior research on the relation between teachers' emotion regulation, teacher-student interactions, and student outcomes. Therefore, we included studies from different lines of research that diverge in their operationalization of emotion regulation. Most notably, emotional intelligence questionnaires ask participants whether they can manage their emotions, but it remains unclear whether they in fact choose effective regulation strategies. Rather, questionnaires in other research traditions and emotional intelligence tests assess what people do to regulate their emotions more concretely. Thus, it is unclear whether all studies actually measured the same underlying construct. A similar problem applies to the heterogeneous instruments assessing the correlates included in this review.

Furthermore, we decided to consider theses, proceedings papers, and book chapters in addition to studies from peer-reviewed journals to reduce the risk of publication bias and allow for a more exhaustive overview of the field. However, this approach may have reduced the quality of the included studies. Follow-up analyses showed that journal articles included more participants, used work-specific measures, and relied solely on the teacher perspective more often than theses, proceedings papers, and chapters did. Thus, journal articles were not clearly superior in terms of these quality criteria. Nonetheless, we cannot rule out other potential limitations such as lower quality of data collection and analyses in studies from sources other than journals.

In addition, it is important to consider that this research synthesis is based on cross-sectional studies. Hence, we cannot draw causal conclusions and, as outlined earlier, a reciprocal relation appears plausible. Thus, longitudinal studies are needed to understand the interplay between teachers' emotion regulation strategies and student behavior. Experience sampling studies could especially offer in-depth insights into this process (e.g., de Ruiter et al., 2021). Furthermore, interventions specifically addressing teachers' emotion regulation (e.g., components from the Emotionally Intelligent Teacher Workshop; Brackett & Katulak, 2007) would generate knowledge about causal mechanisms.

Lastly, the vote-counting approach did not allow calculating overall effect sizes and we could neither determine the statistical significance of potential moderators nor account for correlations between them. A meta-analytical approach would have been preferable in this regard (Borenstein, 2009), but we were concerned that computing an overall effect size was not appropriate. On the one hand, there was a relatively small number of relevant records for most correlates. On the other hand, huge heterogeneity in the research field exists. Together, this posed the threat of single, potentially very specific studies to confound the effects.

Conclusion

There are good theoretical arguments to assume that the way teachers handle their emotions and psychological stress is important for the quality of teacher-student interactions and, in turn, student outcomes (Jennings & Greenberg, 2009). Researchers from different traditions—emotion regulation as defined by Gross, emotion regulation as part of emotional intelligence, coping, and emotional labor—have examined this question. However, they have used different terminology to refer to the phenomenon of emotion regulation making an integrative approach inevitable to merge the knowledge from different traditions. Even though our synthesis indicated that expressive suppression could have a small (mostly negative) relation with teaching effectiveness, it is currently not possible to provide a final answer to the question of whether teachers' emotion regulation is relevant for effective teaching. More methodologically sophisticated research is needed that should ideally assess emotion regulation considering (a) specific strategies, (b) the professional context, and (c) teaching effectiveness from the student or observer perspective. Several promising avenues for future research also exist regarding the mediating role of emotions and the interplay with other teacher and student characteristics. Addressing these topics will uncover which emotion regulation strategies are related to different aspects of teaching effectiveness and will also provide a more profound understanding of the conditions when emotion regulation is most relevant for effective teaching. These insights are highly relevant from an applied perspective. After all, emotion regulation might turn out to be an especially valuable teacher characteristic that not only promotes occupational well-being (Mérida-López & Extremera, 2017) but at the same time helps teachers have high-quality teacher-student interactions, thus fostering students' positive development.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

The data that support the findings of this study are openly available in PsychArchives (http://dx.doi.org/10.23668/psycharchives.13494) along with the PRISMA protocol (https://doi.org/10.23668/psycharchives.5374).

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