Emotion Regulation in Achievement Situations: An Integrated Model

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Abstract

Achievement emotions are critical because of their impact on success and failure in important domains such as learning. These emotions may be modified via emotion regulation (ER). The dominant process model of ER (PMER; Gross, 1998, 2015), however, provides a domain-general account of ER strategies and has not had substantial contact with theories of achievement emotions such as Pekrun's (2006) control-value theory (CVT) and the academic achievement literature. Moreover, ER has not been a focal point of major theories related to achievement emotions, such as CVT. We propose an integrated model of ER in achievement situations (ERAS) that integrates propositions about the generation of emotions from CVT with propositions about how emotions are regulated and types of ER strategies from PMER. The ERAS model also offers new propositions regarding how different achievement situations, object foci, and time frames, as well as discrete emotions with different appraisal patterns, impact ER strategies.

Keywords: emotion, emotion regulation, achievement emotion, academic emotion, affect

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When a student blames himself for getting a low mark on an important test, he may experience negative emotions such as shame and guilt. These emotions might motivate him to re-double his efforts or change his studying habits to improve his grade in the class. On the other hand, he might be so ashamed that he just gives up on doing well in the course altogether. As shown in this hypothetical situation, emotions are triggered in response to goal-related situational events, and one of the reasons they are so important is because of the ways they shape our behavior to protect or advance our goals. In another hypothetical situation, a student might feel relief after a successful and high-stakes class presentation and collapse in front of the television after school to recharge. She might, however, surrender so thoroughly to relief that she forgets to study for an exam or lets the relief transition to pride and overconfidence that leads her to minimize further studying—to her academic peril. These examples highlight that both negative (shame) and positive (e.g., relief) emotions can lead to outcomes that are either aligned or misaligned with students' academic goals, depending on how they deal with these emotions. As such, the goodness of fit between emotions—whatever they are—and academic success lies in how students regulate them.

If everyone could effectively regulate their emotions, students' experiences in classrooms, study halls, and exam writing would be markedly different. Boredom, shame, and anxiety would be rare, fleeting states, and students would reap the academic benefits of finding enjoyment and pride in their academic labors. As it stands, however, emotions are often a source of challenge for students and teachers alike, and while a good deal of research has been conducted on emotions in academic settings (Pekrun, et al., 2002; Pekrun & Linnenbrink-Garcia 2014), little guidance is available to students, teachers, or researchers on how to apply emotion regulation (ER) strategies to academic settings.

To address this issue, our goal is to combine two separate theoretical frameworks and related strands of empirical research to develop a model of ER in academic achievement situations, namely J. Gross's (Gross, 1998; 2015) process model of ER (PMER) and R. Pekrun's (2006, 2017; Pekrun & Perry, 2014) control-value theory (CVT) of achievement emotions. The dominant process model of ER (Gross, 1998, 2015) provides a domain-general account of the effectiveness of different ER strategies, but has not had substantial contact with theories of achievement emotions such as the CVT. Moreover, the major focal point of theories related to achievement emotions, such as the CVT (Pekrun, 2006; Pekrun & Perry, 2014), has been emotion generation not regulation. In this article we propose a process model of achievement ER to overcome the current fragmentation of these literatures and provide a coherent set of new and integrative propositions to guide research on the regulation of achievement emotions. Such a model also has implications for practitioners, such as teachers, who can leverage an enhanced understanding of achievement ER in their classrooms to not only help prevent emotions from derailing learning (e.g., boredom, hopelessness), but to foster the kinds of emotions that will promote academic achievement (e.g., enjoyment, pride). Indeed, the timeliness of an integrated and extended model of ER in achievement situations for researchers and educators is also apparent from publications that have highlighted compatibilities between CVT and PMER (Antoniadou & Quinlan, 2018; Harley, Lajoie, Frasson, & Hall, 2017; Jarrell & Lajoie, 2017).

In the first section of this article we briefly conceptualize achievement emotions and explain why regulating them is important. Next, we provide a summary of the process model of ER (Gross, 1998, 2015) followed by a précis of the CVT (Pekrun, 2006, 2018). We then outline our integrated process model of achievement ER and discuss implications for research and practice.

Achievement Emotions: What They Are and Why We Need to Regulate Them

Achievement emotions are emotions that arise in situations related to meeting competence-based standards of quality (Ashkanasy & Humphrey, 2011; Barsade, Brief, & Spataro, 2003; Pekrun, 2006), such as writing a final exam or engaging in a class debate. Such emotions play a critical role in students' learning and performance at school, which in turn influences grades, program entry, jobs, ratings by supervisors, and ultimately socio-economic status and a host of other essential outcomes (Meece, Wigfield, & Eccles, 1990; Pekrun, 1992; Pekrun, Lichtenfeld, Marsh, Murayama, & Goetz, 2017; Pekrun & Linnenbrink-Garcia, 2014). Achievement emotions can support achievement by fostering motivation, focusing attention and cognitive resources on achievement-related activities (e.g., when experiencing enjoyment of a task), and promoting situationally-appropriate information processing and self-regulation (Pekrun, Elliot, & Maier, 2009; Pekrun & Perry, 2014).

According to the taxonomy of achievement emotions that is part of Pekrun's (2006) CVT, these emotions can be characterized by valence, activation, object focus, and time frame. *Valence* refers to the pleasantness (i.e., positive valence; e.g., enjoyment, hope) or unpleasantness (i.e., negative valence; e.g., frustration, anxiety) of an emotion. *Activation* corresponds to the degree of physiological activation (i.e., arousal; Russell, Weiss, & Mendelsohn, 1989). In addition, achievement emotions can arise from a focus on either an achievement activity or an outcome (*object focus*). Enjoyment from studying a chapter is an example of an *activity* emotion, whereas anger about one's low score on an exam is an example of an *outcome* emotion. The *time frame* can be prospective (future-oriented), concurrent (present moment), or retrospective (past-oriented). The emotions that are elicited from recalling how one did on an exam are *retrospective* emotions because they involve thinking about a success or failure that has already happened (e.g., joy, pride, shame, or frustration). *Prospective* emotions, on the other hand, are emotions related to future activities and outcomes, for example,

experiencing anxiety while thinking about one's potential grade on an exam one does not feel prepared to take. *Concurrent* emotions include emotions aroused from an activity one is currently undertaking, such as enjoyment or boredom during a lecture.

Typically, positive activating emotions such as hope, pride, and enjoyment are positively related to achievement, and negative deactivating emotions such as boredom and hopelessness are detrimental to achievement (Goetz & Hall, 2013; Pekrun et al., 2017). The relationship between achievement and positive deactivating emotions (e.g., relief) as well as negative activating emotions (e.g., anxiety, anger, shame), on the other hand, is more nuanced (Pekrun, 2006; Pekrun, Goetz, Titz, & Perry, 2002). Negative activating emotions are often maladaptive to achievement but can help individuals succeed in some cases. Shame, as we saw in the opening example, can motivate us to invest effort and avoid failure (Turner & Schallert, 2001). However, such emotions can also have negative implications for achievement by undermining interest and intrinsic motivation (Pekrun & Perry, 2014) and consuming cognitive resources needed for task performance (Meinhardt & Pekrun, 2003).

Since the emotions we experience in these often high-stakes achievement contexts can both help and hinder performance, it is in our best interest to make efforts to regulate (i.e., attempt to control) them. There are a variety of ways we can regulate achievement emotions, though not all are equally effective, nor equally feasible, depending on the situation.

The Process Model of Emotion Regulation

Emotion regulation (ER) refers to the conscious or unconscious attempts people make to influence which emotions they have, when they have them, and how they express and experience them (Gross, 2015). The importance of ER in achievement settings stems from the positive or negative impact that achievement emotions have on achieving success and avoiding failure. In

short, ER can help mitigate or negate the influence of emotions that stand in the way of success, and enhance the experience (and corresponding benefits) of emotions that can bolster it.

The process model of ER (PMER; Gross, 2015) holds that emotions arise from a sequence that begins with a psychologically relevant situation that is attended to and gives rise to appraisals that reflect one's assessment of how one believes the situation will impact one's goals. The resulting emotional response (which may change the situation that gave rise to the emotion in the first place) is not, however, the only place one can intervene. Instead, PMER proposes that ER strategies can be organized into five different families of strategies based on where in the emotion-generative process they will have their primary impact: situation selection, situation modification, attentional deployment, cognitive change, and response modulation. Thus, goals, strategies, and outcomes represent three core features of the PMER (Gross, 2014). Goals are what an individual is trying to accomplish while ER strategies are the processes one engages in to achieve them. Outcomes are the consequences of trying to achieve a goal using a strategy. We use these three features to organize our précis of PMER below.

Emotion Regulation Goals

Individuals' goals to regulate emotions can be *hedonic,* where the motivation is to down-regulate (reduce) unpleasant states and up-regulate (increase) pleasant states (Larsen, 2000), or *instrumental*, where the motivation comes from instrumental goals or cultural norms associated with academic success (Tamir, 2009). In instrumental ER, goals help ensure that efforts made to regulate an emotion further one's success. For example, a student might remind herself of the importance of doing well on an exam she should continue studying for (instrumental) rather than giving in to frustration and/or anxiety and blowing the unpleasant studying session off for a party or favorite television show that would take her mind off the exam (hedonic).

The desirability or undesirability of an emotion is tied to the match between the emotion and the situation, rather than just to the pleasantness/ unpleasantness of the emotion. This accounts for the fact that sometimes ER strategies are deployed to down-regulate the intensity or expression of positive emotions in situationally non-optimal contexts (e.g., joy over an A while listening to a friend share the news that he received an F). The former examples of ER are *intrinsic* ER, where the goal is to regulate one's own emotions. Individuals can also formulate and pursue goals to regulate other's emotions (*extrinsic* ER), such as deciding to console a friend who got an F. Thus, ER goals involve considering the motivation to experience pleasant emotions versus advance one's success, as well as the direction an emotion is regulated in (i.e., magnitude or duration) and who is doing the regulating.

Five Families of Emotion Regulation Strategies

Gross's (1998, 2015) PMER holds that ER strategies can be divided into five different families, each of which entails altering an emotional trajectory by intervening at a different point in the emotion generative process: situation selection, situation modification, attentional deployment, cognitive change, and response modulation. *Situation selection* involves taking action that makes it more likely that one will be in a situation that will give rise to desirable emotions and less likely that one will be in a situation that stands to give rise to undesirable emotions. *Situation modification* refers to taking an action to modify a situation in order to avoid its undesirable emotional impact. *Attentional deployment* involves directing one's attention with the intention of influencing one's emotional response. *Cognitive change* involves modifying one's appraisals of a situation in order to change its emotional impact. *Response modulation* involves altering the way one is experiencing and/or expressing an undesirable emotion after it has manifested.

Emotion Regulation Outcomes

One key finding is that various ER strategies have quite different affective (e.g., emotional), cognitive, and social outcomes. Cognitive change and response modulation (e.g., suppression) are two of the most popular ER strategies to measure and contrast, and research has shown that they differ in all three outcome domains. Cognitive change is not only more effective in regulating affective responses, but also improves memory and enhances performance on exams when compared to no regulation or suppression (see Gross, 2014, 2015, for review). In social situations, suppression has been shown to lead to higher blood pressure and less liking from social interaction partners, while cognitive change has no detectable adverse consequences for social affiliation (Butler et al., 2003).

A meta-analysis on the effectiveness of cognitive change, response modulation, and attentional deployment to modify emotional outcomes found that response modulation had a small effect and cognitive change strategies a small to medium effect, whereas attentional deployment strategies had no effect on emotional outcomes (situation selection and modification were not examined; Webb, Miles, & Sheeran, 2012). Gross (2014) cautions, however, against drawing broad conclusions about the effectiveness of one ER strategy over another because effectiveness varies by contexts such as prior emotional intensity and culture. Webb and colleagues' (2012) findings also highlighted the influence that moderators such as the to-be-regulated emotion can have on ER outcomes.

Overall, the process model provides a flexible, general framework of ER, which is a strength, but also a limitation when constituent features of situational contexts are not accounted for. We review features of achievement situations below in our précis of the CVT.

The Control-Value Theory of Achievement Emotions

Pekrun's (2006, 2018; Pekrun & Perry, 2014) CVT holds that achievement emotions depend on the perceived controllability of achievement activities and outcomes that are valued

(i.e., subjectively important). Achievement emotions are thought to arise when individuals feel in control over, or out of control of, academic activities and outcomes that are important to them. The CVT also outlines how achievement emotions can arise from one's focus on either an achievement activity or an outcome (object focus) and by whether this focus is prospective, concurrent, or retrospective (time frame). Each of these subjective features of achievement situations are described below.

Appraisals of Control and Value

The CVT explains the role that control and value appraisals play in the generation of achievement emotions. *Perceived control* refers to appraisals of control over actions and outcomes (controllability), whereby such control can be exerted by oneself or external factors (agency). Perceived control also determines the subjective likelihood of obtaining outcomes (also see Marsh et al., 2019). For example, a student can have expectations about their capacity to adequately prepare for a test (control over action) and believe that their preparations will help them succeed on the exam (control over outcome). After the exam, the student may attribute their high grade to their own preparation efforts (internal locus of causation of success outcome) or to the exam being easy (external locus of causation).

Perceived value involves both the perceived degree of importance for oneself (goal relevance) and perceived direction (positive vs. negative; i.e., goal congruence in terms of events either supporting goal attainment [positive direction] or impeding goal attainment [negative direction]). With regard to goal relevance, activities and outcomes can be important in and of themselves (intrinsic value) or because of their instrumental functions for obtaining desired consequences (extrinsic value). An example of intrinsic value would be appraising learning in a chemistry lab as important because the contents are interesting. In this case, the value stems from the activity itself. An example of extrinsic value would be appraising learning as important

because of its influence on earning a good grade in the course. In this case, the value stems from something external to the activity itself.

Generation of Achievement Emotions

Different kinds of control and value appraisals are assumed to instigate different discrete achievement emotions (e.g., enjoyment vs. anxiety), including prospective outcome emotions, retrospective outcome emotions, and activity emotions (see Table 1 for a summary). *Prospective outcome emotions* are elicited when individuals direct their appraisals toward future success or failure. Prospective, anticipatory joy and hopelessness are expected to be triggered when there is high perceived control (joy) or a complete lack of control (hopelessness). For example, a student who believes she has the resources to excel in a test may feel excited about the prospect of receiving a high grade. Conversely, a student who believes he is incapable of mastering the test material may experience hopelessness. Prospective hope and anxiety are aroused when there is uncertainty about control. When the focus is on anticipated success, hope is experienced and when the focus is on anticipated failure, anxiety is experienced. For example, a student who is unsure about being able to master an exam may hope for success, feel anxious about failure, or both. All prospective outcome emotions are thought to also depend on value—they are more intense when the outcome is perceived to be important.

Experiencing failure or success can elicit some *retrospective outcome emotions*, such as joy and sadness, independent of one's prior expectations and appraisals of control. In contrast, disappointment and relief are assumed to depend on the perceived match between expectations and actual outcome. A student is likely to experience disappointment when anticipated success does not occur and relief when anticipated failure does not occur. Other retrospective outcome emotions, including pride, shame, gratitude, and anger are thought to be shaped by causal attributions of the outcome to oneself or others (e.g., teachers, peers; see Weiner, 1985, 2018).

Pride or shame is experienced when attributing success or failure, respectively, to oneself. Anger and gratitude, on the other hand, are typically aroused when failure is attributed to an external agent or force. Anger might be aroused from blaming a bad grade on the 'unclear instructions' a teacher provided, whereas gratitude might be aroused from appreciating how a good grade on a group assignment came from a strong group member providing leadership. As with prospective outcome emotions, value is essential to eliciting retrospective outcome emotions.

Regarding *activity emotions*, if a task has positive value and meeting the demands of the task is appraised as manageable, then working on the activity is enjoyable. In contrast, if an activity is *negatively* valued it is likely that feelings of anger may be elicited for having to complete it. For example, a negatively valued task that is perceived as requiring too much effort is likely to be experienced as aversive. Finally, boredom is aroused when the task lacks any intrinsic or extrinsic value. This can be the case both when task demands are too high and imply a lack of control, and when task demands are too low and imply lack of challenge (Pekrun et al., 2010).

In summary, CVT describes how object foci and time frames provide contextual information that shapes appraisals and achievement emotions (Table 1). Beyond individual appraisals, additional components of the CVT address the role of social environments for the generation of achievement emotions, the effects of these emotions on cognition, motivation, and performance, and their relative universality across socio-cultural contexts. The theory also comprises a reciprocal effects model considering the linkages between achievement emotions, their outcomes, and their antecedents over time (Pekrun, 2006; for empirical evidence, see, e.g., Pekrun et al., 2014, 2017). The theory implies that achievement emotions can be regulated by targeting any of the components of these reciprocal feedback processes, which makes it possible to differentiate between various types of regulation (situation-, appraisal-, emotion-, and

competence-oriented regulation; Pekrun & Perry, 2014). However, the theory does not provide a more detailed account of these different types of ER.

-- Table 1 about here –

The Integrated Model of Emotion Regulation in Achievement Situations

The integrated model of emotion regulation in achievement situations (ERAS; see Figure 1) proposes that achievement emotions are generated through a four-phase process (situation, attention, appraisal, and response; Gross, 2015; black rectangles). This process starts with an achievement situation that is attended to and gives rise to appraisals that reflect one's assessment of how one believes the situation will impact one's goals. As with CVT and PMER, our model proposes that emotional responses can, in turn, alter the achievement situation, but also one's situation-related appraisals and attention (illustrated by the arrows flowing from response to each of the three previous phases of the emotion-generative process). An emotional response can, for example, either help focus one's attention or make focusing on an achievement situation challenging. Similarly, emotions influence the direction of appraisals in subsequent loops of the emotion-generative process. The ERAS model also proposes that ER strategies can be organized into five families (situation selection, situation modification, attentional deployment, cognitive change, and response modulation; Gross, 2015; dark grey rectangles in Figure 1) that correspond to five different points within the emotion-generative process that individuals can target to regulate their emotions. These five points include intervening prior to and during a situation.

-- Figure 1 about here --

Insight into the regulation of emotions in achievement situations relies, however, on the identification and understanding of core features of each of the four phases of the emotion-generative process. These features include the individual versus social and high- versus low-evaluative nature of the achievement situation, object foci and time frame perspectives of attention, key appraisals (control and value), and different emotional responses (see bold, black-font labels and white rectangles above each emotion-generative phase in Figure 1). Many of these features can serve as specific targets for ER strategies. For example, cognitive change can target appraisals of control and value. The core features of each of the four phases of the achievement emotion-generative process also provide affordances and constraints related to the implementation and potential effectiveness of ER strategies. For example, one's ability to realistically downplay the value (cognitive change strategy targeting appraisals of value) of an exam with a large contribution to one's grade is limited (high-evaluative feature of the particular achievement situation).

Moreover, the impact of a core feature (e.g., time frame) on ER strategies is not limited to the strategy (attentional deployment) it traditionally corresponds to based on its phase in the emotion-generative process (attention). For example, attentional features of achievement situations, such as time frames, can constrain not just attentional deployment strategies, but also situation modification strategies. Situation modification is less likely to help regulate undesirable retrospective emotions because the achievement situation that elicited the emotion has likely ended, implying that the opportunity to change the situation in a more favorable direction has passed as well. The impact of multiple core features of the emotion-generative process on each of the families of ER strategies is illustrated in Figure 1 by the pale-grey line that flows from the pale-grey rectangle that encompasses all four of the emotion-generative processes to each of the five families of ER strategies. As such, the influence of the core features of the emotion-

generative process is typically broader, impacting each of the five ER strategies. In comparison, the five families of ER strategies primarily impact one point in the emotion generative process. This distinction accounts for why the arrows pointing from the ER strategies to the emotion-generative process phases in Figure 1 do not simply run in two directions.

In summary, the ERAS model advances propositions about how core achievement-related features of the emotion-generative process (e.g., object foci and time frames) impact ER strategies. These propositions provide insight into how the five families of ER strategies can best be used to target their corresponding emotion generative-processes in an achievement context (e.g., situation modification strategies target the academic situation). In the following sections we first describe each of the core features of the emotion-generative process in achievement situations (e.g., situation, attention) before describing how these features impact each of the five families of ER strategies in academic achievement situations.

Axes of Achievement Situations

We propose that achievement situations can be broadly classified along two axes: individual versus social and high-evaluative versus low-evaluative. Achievement situations can involve varying degrees of interaction with others. We define *individual* situations as those involving a single person whereas *social* situations involve multiple people and, at minimum, one-way communication between individuals. Achievement situations in their very nature involve some level of evaluation, even if it is implicit. However, situations can vary in how evaluative they are. Thus, we define *high-evaluative* situations as those that involve a formal achievement-related assessment of the individual or group, such as exams and graded assignments. In contrast, informal, implicit assessments of students' participation or performance in class by a teacher represent *low-evaluative* situations.

Studying, classroom, and test-taking (Pekrun et al., 2002) represent prototypical examples of individual low-evaluative, social low-evaluative, and individual high-evaluative academic situations which we focus on in this article. While individuals can study in environments, such as crowded libraries, around other people, studying situations most commonly involve students advancing their academic goals independently[1] and without formal, explicit assessment. Classroom situations are considered most social in nature when students are engaged in group work or discussion and less social during lectures where students passively learn and teachers lecture. Regardless of the degree and type of social interaction, classroom situations are distinct from individual studying and are often low-evaluative[2]. Evaluations are most often done individually and through written tests and assignments in traditional Western educational settings. Given the relative sparsity of formally evaluative social situations in most academic settings, we focus our discussion in this article on individual evaluative situations.

When considering ER strategies, the ERAS model proposes that achievement situations can be ranked in the following manner on a continuum ranging from the broadest to narrowest range of available ER strategies and tactics: *individual low-evaluative situations* (e.g., studying), *social low-evaluative situations* (e.g., attending class), *individual high-evaluative situations* (e.g., tests), and *social high-evaluative situations* (e.g., group project presentations). Moreover, the individual versus social and high- versus. low-evaluative characteristics of an achievement situation are thought to exert a greater influence on the selection and implementation of *situation selection, situation modification,* and *attentional deployment* strategies than on *cognitive change* and *response modulation* strategies (see section on "propositions for specific strategies" below).

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[1] A studying group that is taking turns sharing and summarizing information represents an example of a social studying situation.

[2] A group presentation of an assignment in class represents an example of a high-evaluative classroom situation

Next, we further characterize individual versus social and high versus low-evaluative axes of achievement situations and how they introduce affordances and constraints to the regulation of achievement emotions. We close this section with a brief discussion of interactions between individual differences and achievement situations.

Individual versus social achievement situations: Situating intrinsic and extrinsic ER. The ERAS model proposes that in highly social situations, particularly collaborative situations such as group work, individual versus social characteristics of the situation can provide both affordances and constraints to ER. First, ER in social situations can be both intrinsic and extrinsic[3] (Gross, 2015), rather than exclusively intrinsic like in individual situations such as studying alone. This means that individuals need to attend to the emotions of others, not just their own. By attending to, and when necessary, helping to regulate others' emotions, one can resolve or avoid conflict and negative group dynamics (e.g., disrespectful communication) that tend to beget negative emotions for all involved. Regulating negative group emotions might prevent sustained negative interaction loops (Linnenbrink-Garcia, Rogat, & Koskey, 2011) and low cohesion and performance (De Dreu & Weingart, 2003; Jehn, & Mannix, 2001). For collaborative achievement situations, we therefore propose that ER is likely to be most effective when it aims to regulate both one's own and group members' emotions. We also propose that even if intrinsic ER goals are not intentionally implemented, if extrinsic regulation is successful and the emotional climate of the group improves, the regulator's emotional state is likely to do the same.

Relatedly, we propose that intrinsic ER may not be an effective long-term strategy for regulating one's emotions if there are unresolved conflicts or diverging goal commitments in the

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[3] Intrinsic ER refers to an individual attempting to regulate their own emotions, whereas extrinsic ER refers to an individual attempting to regulate another person's emotions.

group. For example, if a student withdraws her attention from group work to relieve boredom (intrinsic ER: attentional allocation; avoidance-focus regulation; Näykki, Järvelä, Kirschner, & Järvenoja, 2014), this may annoy group members who expect active participation from everyone. However, intrinsic ER may be prioritized when the person with the potential to create an interpersonal conflict recognizes this and takes steps to regulate his own emotions before he sparks a conflict. For example, it might be better to bite one's tongue (expression suppression) than to impulsively snap at an annoying question from a group member. In this situation, not suppressing one's annoyance could lead to a conflict with shunned group members who find the response inappropriate. While intrinsic ER might be prioritized in such a situation, following up with extrinsic ER would be appropriate. For example, if the individual could suppress their frustration long enough to explain their idea another way, their frustration might be replaced by pride when a grateful group member praises their explanatory prowess, thus extrinsically regulating their emotion.

Recent research has revealed that extrinsic ER can take different forms, including co-regulation, where individuals assist one another's regulation, and socially-shared regulation, where some or all of the group members aim to regulate themselves together in order to reach a shared goal (Järvelä, Volet, & Järvenoja, 2010; Naykii et al., 2014). Whether co- or socially-shared regulated forms of extrinsic ER are appropriate for a given group and at a given moment will likely depend on a number of factors, including the intensity of the emotions being experienced, previous regulatory steps, as well as the aforementioned individual differences.

Regardless of the make-up and contexts of groups and the emotions their members are experiencing, the propositions of the ERAS model can be applied to the regulation of achievement emotions that arise in these social situations. We focus our examples of extrinsic ER on the regulation of concurrent achievement emotions in classroom situations which are the

most common settings where students engage in collaborative work and extrinsic ER (see Table 2).

High- versus low-evaluative achievement situations: Situating high and low stakes. Stakes (i.e., important consequences) in achievement situations are typically higher when achievement is evaluated. The ERAS model differentiates between high-evaluative (e.g., exams) and low-evaluative (attending class) situations, although the level of evaluation can vary within these categories. Stakes represent one source of variation. For example, stakes are typically higher in a final exam than a quiz, although these are both high-evaluative achievement situations. The ERAS model proposes that higher stakes achievement situations produce more intense emotions (except for boredom) that are generally harder to regulate and which further constrain the selection, implementation, and effectiveness of certain ER strategies and tactics, such as reappraisal. Moreover, higher stakes situations can increase the extent of emotional backlash and discourage the use of competency-compromising tactics that may have been otherwise implemented (e.g., skipping a class or quiz vs. final exam to regulate anxiety). This proposition concerns ER goals, where ER strategies and tactics that support achievement competency rather than compromising competency (i.e., hedonic aims that deteriorate learning) will have higher long-term effectiveness in regulating emotions. This also involves considering the long-term rather than just the short-term consequences, which intersects with the next emotion-generative phase: attention (see below section on "Object Focus and Time Frame"). In other words, skipping a high-stakes achievement situation like an exam might temporarily relieve anxiety, but the consequences of failing the associated course stand to arouse negative emotions later, and at potentially higher levels (e.g., anxiety over graduating).

Interactions between individual differences and achievement situations. Individual differences such as personality and gender are best understood as distal antecedents of emotion

that influence emotion by affecting appraisals (e.g., see research on stereotype threat; Goetz et al., 2013). The influence of individual differences on appraisals, emotions, and ER may depend on the situation. For example, if a student is introverted, neurotic, and low in social competence he may appraise a social situation, such as a group assignment, as difficult to manage and feel anxious or hopeless. These feelings may then influence what ER strategies he considers available, feasible, and situationally appropriate. He might not consider (or dismiss) attempting to resolve a group conflict, and instead disengage from group work. The opposite might apply for a student who is extroverted, low in neuroticism, and highly socially competent. As such, we propose that individual differences, such as differences in personality traits and competencies, can interact with achievement situations to facilitate and constrain ER strategies.

Attention: Object Focus and Time Frame

Object focus and *time frame* are key determinants of achievement emotions (Pekrun, 2006; Pekrun & Perry, 2014) because they shape the attentional lens which influences what aspect(s) of a situation are attended to and are, in turn, appraised. As described above, one's focus of attention can be directed toward an achievement activity or an achievement outcome (*object focus*) and by one's temporal perspective on this activity or outcome (*prospective, concurrent,* or *retrospective*). These attentional features therefore represent concrete targets to shift attention in order to regulate achievement emotions. We illustrated above (see section on stakes) how shifting one's temporal focus from the present to the future might help individuals prioritize and adopt instrumental goals, such as doing well on an exam, rather than hedonic goals, such as reducing anxiety. Instrumental goals are likely to better serve them in meeting their long-term achievement goals.

When considering ER strategies, the ERAS model proposes that *attentional deployment*, *cognitive change*, and *response modulation* strategies are the most flexible, that is, effective and

easy to implement across situations, object foci, and timeframes. In contrast, *situation modification* is constrained to the regulation of situations with prospective and concurrent time frames, and *situation selection* strategies can only be effectively used to regulate situations with a prospective time frame. These propositions are discussed in more detail below in the section on individual ER strategies.

Appraisals: Control and Value

In fleshing out the *appraisal phase*, the ERAS model holds that appraisals of *control* and *value* are central mechanisms in the generation of different achievement emotions (i.e., emotional response; Pekrun, 2006; Pekrun & Perry, 2014). Accordingly, they represent especially good targets for reappraisal (*cognitive change*) strategies, particularly, because they can jointly influence the generation of different discrete emotions when considered in unison with object foci and time frames (see Table 1).

Emotional Response: Discrete Achievement Emotions

One's emotional *response*, such as whether one is angry or bored, can have different implications for achievement outcomes. Moreover, because of the different properties of discrete achievement emotions, ER strategies cannot be applied uniformly with the same success. Indeed, a meta-analysis by Webb and colleagues (2012) found that the to-be-regulated emotion moderated the effectiveness of ER strategies to modify emotional outcomes, particularly, for emotions in different quadrants of the valence x activation space. We focus our discussion of regulating discrete emotions in the next section on four of the most prominent emotions in the achievement emotion literature: Enjoyment, anxiety, anger, and boredom. These states were also chosen because they occupy three out of the four combinations of valence and activation (positive activating; negative activating; negative deactivating; i.e., quadrants of the circumplex model). The overlap of anxiety and anger in the negative activating quadrant highlights the

historical focus on this quadrant (particularly anxiety; Zeidner, 2007, 2014) while also providing an opportunity to highlight considerations for regulating different emotions from a common quadrant.

Next, we advance propositions that describe how each of the five families of ER are affected by the four achievement emotion phases and their core features summarized above (individual vs. social and high- vs. low-evaluative axes of the achievement situation, object foci and time frame perspectives of attention, key appraisals [control and value], and different emotional responses). While academic achievement situations are used below to provide a case study and more fleshed out examples for these specific ER strategies, the ERAS model is a domain-general model of achievement ER.

Propositions for Specific Strategies

Situation selection. For selecting academic achievement *situations*, typical (i.e., individual low-evaluative) studying situations tend to be the most flexible since studying is often undertaken on students' own time outside of the confines of school. When it comes to typical class situations (i.e., social low-evaluative) there are fewer options that do not involve skipping and compromising competence, such as selecting electives a student believes may elicit more intrinsic motivation and interest. Overall, using situation selection is typically easier for university students than for K-12 students because of the more limited choices K-12 students have over their academic schedules and courses. Typical test-taking situations (i.e., individual high-evaluative), on the other hand, are the most restrictive because they are often highly structured and strictly monitored. Students interested in passing a test are unlikely to be able to ask for help during tests or skip them, no matter how anxiety provoking they may be.

In terms of *time frame* and *object focus*, situation selection strategies are best suited to regulating prospective emotions (e.g., up-regulating anticipatory enjoyment, down-regulating

anxiety), because learners have the greatest number of opportunities to approach or avoid a

situation before they find themselves in it and experience undesirable emotions as a result.

Concurrent emotions (e.g., up-regulating task enjoyment, down-regulating anger), on the other

hand, can only be regulated by situation selection if the learner has the option of selecting a new

situation after engaging with one. Situation selection ER strategies are unlikely to be effective

for regulating retrospective emotions as the opportunity to intervene has most likely passed. See

Table 2 for additional examples of situation selection strategies across test-taking, classroom,

and studying situations as well as related object foci and time frame perspectives.

　　　　With regard to *discrete emotions*, situational selection is hypothesized to be generally

viable for regulating all achievement emotions. For example, when students have the opportunity

to find more manageable situations and tasks, anxiety and boredom may be down-regulated.

Situation selection may be also particularly effective for regulating anger when teachers or other

students are the targets of external attributions of control. A change in class or course could

potentially be made to replace the people one is currently interacting with to individuals

perceived as more constructive, fair, and less disruptive and hindering. Electing to switch one's

achievement situation to regulate enjoyment may be inappropriate if one is motivated purely by

hedonic goals (e.g., countering boredom), whereas it could be a wise choice if one is motivated

by both instrumental and hedonic goals. For example, a student driven purely by hedonic goals

could drop a boring history class for a wine tasting class that may not help him work toward his

goal of graduating. In the long run, this could lead to him feeling guilty or ashamed for wasting

money and time. A student holding both emotion regulation goals, on the other hand, might drop

the same history class but replace it with a different course that would count toward her major or

minor and help her graduate.

Situation modification. The ERAS model purports that one can modify an achievement situation by altering tasks or the learning environment through action or design (i.e., modification of the external situation), or by increasing one's competencies (i.e., modification of one's internal situation; described as *competence-oriented regulation* in CVT; Pekrun, 2006, 2018). Situation modification that targets enhancing competency is based on the principle of reciprocal causation that achievement activities and their outcomes reciprocally influence achievement emotions (and their antecedents; Pekrun & Perry, 2014). In other words: a learner can influence his emotions by altering his level of competency, which can increase chances to succeed, reduce the likelihood of failure, and support appraisals of competence. This aligns with our earlier hypotheses that ER strategies that do not compromise competence will be more effective than purely hedonic approaches.

As with situation selection and modification, the characteristics of an achievement *situation* (individual vs. social and high- vs. low-evaluative) influence the availability and effectiveness of situation modification strategies, where attempts to engage in ER in studying situations are the least effected and constrained and test-taking situations are the most. Studying sessions are typically more open-ended than classes or tests, for example, in terms of available time. This characteristic makes studying ideal for deploying competency-oriented strategies to enhance achievement, such as deep learning strategies (Winne, 2011; Winne & Hadwin, 2008) which may take more time and effort than simply reading through material but can lead to better learning outcomes and greater self-efficacy. In class, options for competency-oriented situation modification are limited to those that do not disrupt the class or result in shifting attention away from ongoing activities for too long which could result in difficulties following or participating in a lesson. They can also be constrained by the individuals in one's group.

In test-taking situations, learners are likely to have limited opportunities to modify the situation because these situations are typically tightly administered, especially with regard to time and access to resources. One exception may be seating, when it is not assigned. Sitting away from distracting classmates and near friends may provide a measure of reassurance and minimize frustrating distractions.

As for *object focus* and *time frame*, situation modification is well suited to regulate both concurrent as well as prospective emotions but less well suited to regulate retrospective emotions. Competency-oriented modification strategies are ideal for regulating concurrent emotions when these strategies target altering aspects of the situation responsible for triggering undesirable emotions. For example, a learner might alter feelings of anxiety in a test that arose from noticing the quantity of items by answering easy questions first and returning to difficult questions later. Situation modification strategies can be used to regulate emotions arising from prospective outcome foci by setting goals and making plans to approach the situation in a specific way (see Table 2 for examples). Situation modification is less likely to help regulate undesirable retrospective emotions because the achievement situation that elicited the emotion has likely ended, implying that the opportunity to change the situation in a more favorable direction has passed as well. See Table 2 for additional examples of situation modification strategies across test-taking, classroom, and studying situations as well as related object foci and time frame perspectives.

In terms of *discrete emotions* situation modification may help enhance appraisals of control and, in turn, help downregulate anxiety and anger when the learner makes a meaningful modification to the achievement situation, especially one related to enhancing domain-specific knowledge and skills (i.e., competency) which stands to warrant a reappraisal under changed circumstances (Zeidner, 2014). Competency-enhancing situation modification can similarly help

learners to downregulate boredom arising from tasks being too challenging rather than under-challenging. Alternatively, situation modification strategies, especially those that target changes to an individual's goals, subsequent standards, and task monitoring may help alleviate boredom that arises from insufficient task-related challenge. For example, focusing on a deeper understanding of material (e.g., mastery goal) or class placement (top 5% of the class; performance approach goal) that may be more challenging to achieve than mere completion can help alleviate boredom. Changing one's goals can lead to cognitive change because doing so involves a shift and potential corresponding enhancement in value that either emphasizes the importance of the learning material itself or performance-related aspects of a situation. Similar to situation selection, other ER strategies may be more appropriate to use to regulate enjoyment.

Attentional deployment. As with situation selection and modification, the characteristics of an achievement *situation* (individual vs. social and high- vs. low-evaluative) influence the availability and effectiveness of attentional deployment strategies. These strategies are the least constrained in studying situations and the most constrained in test-taking ones. Even if a learner is not at home, she is not likely to be reprimanded for putting on headphones and listening to music to focus attention on work and/or drown out other conversations while *studying*. Students wishing to do well in a *class* are, however, more likely to avoid using some attentional deployment strategies[4], such as distraction, for fear of missing something important in a lecture context or losing the beat of a discussion or group work. Strategies that shift attention and thoughts away from an *exam* rather than to it may result in a negative outcome when the student returns with less time than when he mentally departed. Attentional deployment strategies must therefore be used with caution in exam-taking contexts.

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[4] Attentional deployment strategies such as focusing one's attention on content could be seen as a hybrid strategy that also targets internal situation modification in terms of competence enhancement.

These strategies are appropriate to regulate emotions with any combination of *object focus* and *time frame*. Keeping one's attention squarely on an exam or lesson rather than letting one's eyes wonder can help one remain focused and avoid becoming distracted by unpleasant stimuli (e.g., a student crying while writing an exam). This is an example of an attentional deployment ER tactic targeting a concurrent activity or outcome emotion. Prospective and retrospective attentional deployment strategies function in a similar fashion: both involve shifting attention away from either a future visualization or past recollection of an activity or outcome. Accordingly, switching attention away from the particular activity (e.g., a frustrating class) or outcome (e.g., a failed exam) occupying one's thoughts provides an opportunity to elicit a different emotion. For example, rather than visualizing how poorly an exam will go, a student could force herself to imagine a more positive outcome. See Table 2 for additional examples of attentional deployment strategies across test-taking, classroom, and studying situations as well as related object foci and time frame perspectives.

With regard to *discrete emotions*, attentional deployment is hypothesized to be a viable strategy to regulate anxiety and anger, especially if the intensity is high and the learner can afford to re-direct their attention elsewhere for the necessary period of time. Moreover, tactics such as taking a break from doing something that is necessary, but not very stimulating (e.g., proof-reading a term paper for grammatical errors) might help one to later return refreshed rather than continue feeling bored. Focusing one's attention on a different target, and one that is likely to generate a different emotion, is also a particularly effective way of regulating enjoyment. For example, focusing one's attention on the visible despair of a friend who failed an important exam one aced can help down-regulate the expression of joy about one's own success.

Cognitive change. The ERAS model proposes that appraisal mechanisms for control and value are particularly influential in the generation and regulation of achievement emotions.

Alterations in these appraisals are not as intertwined with the characteristics of the *situation* (individual vs. social and high- vs. low-evaluative) as the previous ER strategies, with the exception of the importance of 'stakes' (e.g., important consequences in high-evaluative situations). As proposed above, higher stakes are hypothesized to be positively related to the intensity of emotions (except for boredom, which may be reduced when stakes are high). The CVT predicts that this relationship is mediated by subjective appraisals of value, where higher stakes situations are appraised as being more important due to their greater influence on learners' academic achievement and achievement-contingent future opportunities. As such, high stakes achievement situations lead to more intense emotions. Higher intensity emotions can be harder to regulate with cognitive change strategies than others (attentional deployment; Sheppes, Scheibe, Suri, & Gross, 2011). In addition, higher stakes achievement settings stand to influence the degree of potential emotional backlash from achievement-compromising hedonic strategies. Skipping a quiz might not put one in a precarious position to pass a course, but skipping a final exam would. How one thinks about the stakes of an achievement situation can be influenced through cognitive change, although reappraisals to bolster outcome expectancies (control), for example, have limits for realistic students. Accordingly, the higher the stakes of an achievement situation, the more constrained and challenging it will be for cognitive change strategies to be effective, especially competence-compromising hedonic approaches.

Cognitive change strategies, like reappraisal, can also be used across *object foci* and *time frames* because they are person-internal. In contrast to situation selection and modification, they are well suited to also regulate retrospective achievement emotions. Control appraisals are the most affected by object focus and time frame (see Tables 1 and 2). For example, one might raise one's expectancies for success on an upcoming exam by reminding oneself of all the studying one did (prospective outcome ER application). After failing an exam, on the other hand, this

tactic would not be effective. For appraisals of value, outcomes must be judged as at least somewhat valuable for an emotion to be triggered from focusing on an upcoming/potential or past success or failure (see Table 1). Therefore, appraisals of control and value are generally a good target for cognitive change strategies for outcome-focused emotions. Concurrent activity emotions have a similar relationship with these appraisals although tasks do not need to be appraised as valuable in order for an emotion to be elicited (e.g., boredom). See Table 2 for additional examples of cognitive change strategies across (1) value and control appraisals, (2) test-taking, classroom, and studying situations and (3) related object foci and time frame perspectives.

With regard to *discrete emotions*, ER tactics that have the potential to lead to a subsequent appraisal of heightened control are likely to be effective at regulating anxiety. Reappraising one's causal expectations is likely to help reduce anxiety, especially if there is a discrepancy between perceived versus actual control (underestimation of competencies and the likelihood of success). Moreover, control-oriented cognitive change may be more effective than value reduction because minimizing value can at the same time reduce both intrinsic and extrinsic motivation[5]. Reducing excessive outcome value, however, is likely to be effective because it does not jeopardize motivation based on intrinsic activity value.

Due to the importance of perceived control in the generation of both outcome-focused and activity-focused anger (i.e., a control-dependent emotion; Pekrun, 2006), ER strategies and tactics that target appraisals of control are the most likely to be effective for this emotion. Given the focus on external forces in limiting one's control over an achievement situation, reappraisals should enhance action-control and action-outcome expectancies for current and future

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[5] Value reduction can be a double-edged sword due to conflicting effects on emotion and motivation, in contrast to increasing control which should generally be beneficial.

achievement activities. Reappraisal strategies related to current activities may also necessitate the learner accepting that the activity is not as controllable as she would like, but perhaps not so uncontrollable that success is not possible.

ER strategies and tactics that target boredom should include reappraisals that enhance the subjective value of an academic achievement situation. Reappraisals that enhance subjective control are also effective means to regulate boredom when subjective control is appraised as low (challenge too great). Similarly, the most generally effective ER tactics to increase enjoyment would be to re-appraise achievement situations as more controllable and valuable. Counter-hedonic, social scenarios represent the most common scenario under which someone would down-regulate their positive emotions in an academic achievement situation. For down-regulating enjoyment, response modulation and attentional deployment are more appropriate.

Response modulation. Similar to cognitive change strategies, characteristics of the achievement *situation* (individual vs. social and high- vs. low-evaluative) are less relevant for response modulation strategies than for situation- and attention-oriented strategies. The specific tactics one uses to implement them are, however, more subject to change in availability or effectiveness, depending on the situation. Consuming alcohol, for example, may not be possible in achievement settings, such as classroom and test-taking contexts. Pursed lip breathing to down-regulate anxiety, on the other hand, (in addition to being more instrumental) can be done quickly and without any materials regardless of the situation. The ERAS model proposes that these strategies can also be selected and implemented before, during, or after an achievement activity. Accordingly, the ERAS model has the fewest propositions about response modulation (see Table 2 for additional examples of response modulation strategies). With regard to *discrete emotions*, it is hypothesized that response modulation will be the least effective at regulating anxiety, anger, and boredom, but effective at regulating behavioral expressions of enjoyment

which are often associated with instrumental goals to regulate this achievement emotion in social (i.e., interpersonal) contexts.

Implications and Future Directions

Through integrating and extending propositions from PMER and CVT, the ERAS model provides guidance on the elements of achievement situations that influence and constrain ER. Alone, the PMER provides a flexible framework and testable hypotheses to examine different types of ER strategies, but as a domain-general theory, little guidance on how these strategies might be used in achievement situations. On the other hand, the CVT provides a detailed framework and testable hypotheses to examine the generation of achievement emotions and their relationship with achievement, but little insight on how these emotions can be regulated and how different person-internal and external elements of achievement settings influence their regulation. As an integrated and extended theory, the ERAS model leverages the advantages of PMER and CVT to bridge their respective gaps and guide future research and practice related to achievement ER. We highlight implications for both in this section.

Implications for Research

The ERAS model provides guidance regarding dimensions of situations and emotions that research on ER in education should consider: classification of achievement situations along individual versus social and high-evaluative versus low-evaluative axes; how situations are contextualized by different object foci and time frame perspectives; the influence of appraisals of value and control; and when different discrete emotions are targeted for regulation. It also provides testable hypotheses to guide research on achievement ER. These contributions stand to help build a coherent subfield of ER research, where researchers can use a common theoretical framework and language that builds upon and extends current emotion and motivation theories. The ERAS model also stands to support replicability and generalizability in research through

advocating the importance of examining and reporting core person-internal (e.g., appraisal dimensions, object foci, and time frames) and external (e.g., situation classification) features in achievement ER research. For example, without an understanding of the core features of the four phases of the emotion-generative process, one might inappropriately generalize findings about ER interventions targeting prospective emotions to concurrent emotions. Similarly, one might fail to identify the nature of a situation (high- vs. low-evaluative and individual vs. social) as a potential factor limiting the effectiveness of an ER intervention when it is transplanted from one study (and situation) to another. Without reporting these core features, researchers are deprived of critical information to understand, interpret, and inform their own research on achievement ER.

To help guide research in the emerging field of ER in achievement situations, we outline a number of future directions that can be organized in two sets. The first set is largely methodological in nature and deals with testing the propositions advanced in this article. The second set expands the scope by considering the role of individual and developmental differences. Specific research questions are proposed, though these should not be seen as an exhaustive list.

Testing propositions of the ERAS model. To evaluate the propositions advanced in our model, future studies could assess and report relevant yet often over-looked design and context details. This includes providing sufficient detail about the achievement situations in which emotions were elicited and regulated to classify them as individual versus social and high-evaluative versus low-evaluative. Being able to reliably classify an achievement environment is essential to situating findings and comparing them across studies to advance understanding of their influence on ER, particularly when the effectiveness of ER strategies is moderated by context (Webb et al., 2012). Related research questions include: What kinds of ER strategies do

students use in different achievement situations? Are there differences in occurrence and intensity of the to-be-regulated emotions between these situations? Do situation and ER strategies interact in influencing emotions? And if so, which characteristics of the situation and ER are responsible for these interactions?

Similarly, researchers could attend to object focus and time frame perspectives of emotions. For example, when using a self-report measure directly after an achievement situation, one can ask participants how they feel in that moment (concurrent), how they feel about their just-presented results (concurrent, outcome), or how they felt during a now-completed achievement activity (retrospective, activity). These differences in the attentional framing of emotions have implications for assessing findings related to, for example, the effectiveness of an ER intervention administered before, during, or after the achievement situation. Related research questions include: What kinds of ER strategies do students use to regulate emotions that differ in terms of object focus and time frame perspectives? Are there differences in occurrence and intensity of emotions that differ along these dimensions? Do object focus, time frame, and type of ER strategy interact in influencing emotions?

A related future direction under the umbrella of emotion measurement is conducting more research on multimodal and online assessment of emotions (D'Mello, Dieterle, & Duckworth, 2017; Harley, Bouchet, Hussain, Azevedo, & Calvo, 2015; Mauss, Leveonson, McCarter, Wilheim, & Gross 2005). Given the dynamic nature of emotions, assessments regarding the effectiveness of ER strategies and related interventions should include data channels where information such as latency (how long an ER intervention typically needs to take effect) and duration (how long the effect typically lasts) are captured. Multimodal programs of research provide a means of overcoming limitations of self-report measures while leveraging their benefits (see Harley, 2015). Using a multimodal program of research to measure achievement

ER can also provide convergent validity for different measures, particularly for the measurement of discrete emotions. Given that the effectiveness of ER strategies not only depends on context but also on the type of emotion to be regulated, a developed literature on the regulation of achievement emotions must draw on studies that use valid and reliable measures of both ER and discrete emotions. Toward this end, we recommend that researchers assess, at least, a subset of different emotions that are of particular relevance for achievement (e.g., enjoyment, anxiety, anger, and boredom).

Related future directions include: How long are emotions activated (seconds, minutes) and at what intensity before students (or others) attempt to regulate them? How long does it take to regulate emotions with different ER strategies? For how long (seconds, minutes, hours) are emotions typically successfully regulated in achievement situations? Does this differ for different discrete emotions and emotions that differ in object focus, time frame, intensity, and situational context? What kinds of information (e.g., instrumental behavior, facial expression, prosodic features of speech, performance) do individuals use to identify whether they should help someone regulate their emotions? Does the effectiveness of ER strategies vary when used extrinsically versus intrinsically? What guidelines could be developed for determining whether an ER intervention was successful?

Expanding the scope: Individual and developmental differences. Future research might explore the role of inter-individual (personality, cultural) and intra-individual (developmental) differences in ER in achievement settings. As noted, the ERAS model proposes that individual differences can interact with achievement situations to facilitate and constrain ER strategies. For example, someone with a strong performance-approach goal orientation might have a hard time down-regulating the value of a high grade in a class where she is competing with other students. Goals can also be changed, however, to be aligned with a more adaptive goal

orientation and help regulate emotions. Differences in goals (and perhaps underlying goal orientations) is a reported source of conflict in group work and thus goal setting serves as a relevant target for both extrinsic and intrinsic achievement ER. As such, future research should investigate how individual differences shape the use of ER strategies in achievement settings.

Goal orientations and differences in achievement motivation also present a relevant lens to examine developmental changes in ER. Examining ER in achievement settings during child and adolescent development represents another critical area of future research. Developmental studies on achievement ER might help bridge the gap between research on ER in achievement settings and the more situationally-general research on ER in children and adolescents (Bariola, Gullone, & Hughes, 2011). Childhood and adolescence are transformational times where changes in developing brain, behavioral, and cognitive systems influence regulatory competence (Steinberg, 2005). For example, maturation of the frontal lobes in late adolescence is associated with regulatory competency, but puberty tends to heighten emotional arousability which makes regulating emotions challenging (Steinberg, 2005). Furthermore, prior to early adolescence, cognitively demanding ER strategies, such as reappraisal, could be less effective because of limited cognitive capacities. One way that such ER strategies may be made more accessible to younger children is by having adults, such as teachers, provide instruction on how to use them. Doing so would provide younger students with not only a reminder to use an ER strategy, but specific details on how they might implement such a strategy. Davis and Levine (2013) found that children (6-13 years) who received a reappraisal instruction significantly downregulated their level of sadness in an experimental setting. Follow-up analyses using the same sample (Davis, 2016) found that children in the experimental reappraisal conditions did not significantly differ from those in the control condition (where children did not receive any ER instructions) in downregulating sadness and upregulating happiness. Nonetheless, these results suggest that

reappraisal strategies achieve similar outcomes as whatever strategies students may have used to regulate their emotions in the control condition. It may therefore be helpful to consider implementing adaptive strategies (see Table 2) using teacher or parent instruction. For example, a teacher might draw connections between class content and real life to underscore its importance and relevance and increase students' interest (increase value) rather than expect students to do this themselves (cognitive change). Similarly, a teacher who has just assigned students to engage in group work might suggest that all groups start by focusing on establishing what they do know, rather than dwelling on what they don't know about a task (attentional deployment).

In addition to brain and cognitive development heightening the need for, and eventually supporting effective ER, social influences, including parents' ER behavior also contribute to the development of ER (Bariola et al., 2011). Emotion coaching from parents that attends to, values and involves discussion of emotions versus a more dismissive philosophy (Gottman, Katz, & Hooven, 1996) could lead to greater habitual usage of reappraisal (John & Gross, 2004). At school, achievement situations at different grade levels offer varying degrees of autonomy and perceived peer and teacher support (McMahan & Thompson, 2015; e.g., less course choice in earlier grades and larger class sizes with different teachers and students in later grades) which can constrain situation selection and modification] strategies. Indeed, this means that some of the examples, particularly of situation selection strategies (see Table 2), may not apply to younger students, or apply with a narrower range of options. For example, elementary school students might not be able to leave the house to study at a library like a college student, but they can probably move from the kitchen table to their bedroom or vice versa.

While the ERAS model does not provide development-specific propositions, it acknowledges that developmental differences, like individual differences, can interact with

achievement situations to facilitate and constrain ER strategies. Developmental research questions might include: What aspects of development (e.g., social, cognitive) are associated with effective implementation of which ER strategies? And how do developmental changes impact children and adolescents' meta-awareness of optimal situation/strategy mapping and their ability to effectively implement strategies?

A mature literature on achievement ER has the potential to provide robust, evidence-based recommendations for how achievement ER strategies can be tailored to different profiles of people (e.g., high in conscientiousness, performance approach orientation) at different developmental stages, and in diverse achievement situations, including those calling for co- or socially-shared as well as intrinsic ER.

Implications for Practice

While the field of achievement ER is in its infancy, teachers and other practitioners could use the ERAS model to enrich their understanding and application of ER strategies in several ways. First, the ERAS model can help teachers to understand the factors that influence their students' emotions, in and outside of their classrooms, including factors that facilitate or constrain the regulation of these emotions. These insights can help increase the *effectiveness* of teachers' use of ER. Second, teachers might draw on examples provided throughout the article and in Table 2 to help *broaden their repertoire* of ER strategies. Third, the ERAS model highlights applications of ER in a multitude of achievement contexts, which could lead to both *greater flexibility* and *increased use* of ER in achievement situations.

Teachers might use the ERAS model to take a more proactive approach to supporting students' emotional well-being, particularly those who they know have special difficulty, rather than only reacting to tears and outbursts. A teacher might, for example, encourage anxious students to visualize an exam they were successful in to downregulate anxiety before an

upcoming examination (attentional deployment). Alternatively, a teacher might send out an email to students the night before an exam encouraging them to re-think bodily feelings of anxiety as beneficial and not a cause for worry (reappraisal; Brady, Hard, & Gross, 2018). This example also highlights how teachers might use the ERAS model to help students regulate their emotions outside of the class (rather than just during class time). Teaching studying skills is another example of something teachers can do to help students increase their competency during individual study time and thus help prevent negative emotions such as hopelessness when help is not accessible (competence-oriented regulation; Pekrun, 2006).

Greater variety and understanding of emotion and ER through the ERAS model might also empower teachers to integrate approaches to regulating emotions in their lesson plans. For example, a teacher might highlight the importance of a concept for students' lives outside of the classroom (reappraisal: increase value; see Harackiewicz, Tibbets, Canning & Hyde, 2014 for a review of interventions focused on increasing the value of learning) or discuss how the brain is changeable and gets stronger through exerting effort, facing challenging tasks, and trying new strategies (reappraisal: increase control; Yeager, et al., 2016). Encouraging students to talk about their expectations and task understanding, for example, could yield insight into conflicts and help resolve them by making discrepancies explicit (situation modification).

Applying the ERAS model in the classroom: An example. To highlight how teachers might use the ERAS model to improve student affect we return to one of the examples from the beginning of the article. In this example, a student—let us call him Sam—blamed himself for getting a low mark on a test and experienced shame and guilt as a result. Sam's teacher would like to help him feel better, so she tries to take stock of Sam's current achievement situation to understand how Sam might regulate his emotions in this situation. She notices that Sam is unusually quiet and subdued-looking during a class discussion that occurred right after grades on

the unit test were shared. The teacher realizes that Sam cares too much about her opinion of him to risk creating a conflict by going to the bathroom and never returning (situation selection). Similarly, Sam is too concerned about grades to completely tune out (perhaps by remembering his winning soccer goal the day before; attentional deployment) and risk missing something. The teacher might consider that Sam limiting his involvement in discussion is more about concealing his emotions from others (suppression) than changing the situation to make himself feel better (situation modification). Thus, the teacher thinks she could regulate Sam's emotions by encouraging him to focus on the present (attentional deployment).

The problem is, the teacher already tried to engage Sam in the discussion to no avail. After taking stock of the current situation and attempting ER through attentional deployment, the teacher decides to consider the cause of Sam's shame. According to the ERAS model, Sam's shame arises from focusing on a negative outcome that has already occurred (retrospective outcome emotion). To help Sam, the teacher considers how Sam appraises the failure in terms of control and value. The teacher's familiarity with the ERAS model helps her realize that shame is often experienced when one blames oneself for failing to achieve. Based on this information, the teacher decides to remind Sam that there will be several other tests and assignments in the term, thus he should not be too upset about a single grade (reappraisal; decrease importance). Alternatively, the teacher could discuss studying strategies with the class in an attempt to increase Sam's appraisal of being able to perform well in the future (reappraisal; increase control).

In the end, the teacher notes that another student might be more successful at helping Sam feel better. She has students work in pairs and makes sure that Sam is paired with his supportive friend, Claire, who seems content with her similar grade. When she passes by the pair a little later, she hears Claire encouraging Sam. "It's not that big a deal, there will be others. Just

do better on those." The teacher smiles. If Sam believes Claire, it should help reduce his shame and motivate him to re-double his efforts or change his studying habits to improve his grade in the class. The teacher continues her patrol, feeling that her job is, for the moment, done.

Future directions for practice. As the field of achievement ER matures, it will have the potential to make specific recommendations regarding which ER strategies work best in specific situations to regulate different emotions generated in response to different object foci and time frame perspectives. Such advances will also help inform the development of technology-based intelligent systems capable of providing emotional support tailored to individual students based on their individual differences and real-time emotional and learning trajectories (Harley, et al., 2017). In other words, students could access intelligent systems not just for help with studying strategies, but also managing their emotions as they complete homework and prepare for tests. A mature field should also include accessible versions of academic materials, including teacher manuals and other pedagogical resources as well as dissemination at teacher (and other practitioner) conferences. Until then, the ERAS model provides educators with an achievement-specific model to better understand ER in their professional contexts and specific examples to help them improve their students' affect.

Concluding Comment

In this article, we have reviewed the assumptions of PMER and the CVT which have had limited contact to date and proposed an integrated process model of achievement ER and several applications and future directions for ER research. A primary goal in constructing this integrated model was to leverage and build upon insights from these two theories and offer guidance and direction to future studies interested in developing or implementing ER strategies in achievement situations. Toward this end, we have advanced propositions and examples about the differential effectiveness of the five families of ER strategies when they are: (a) implemented across

achievement situations with different characteristics (individual vs. social and high- vs. low-evaluative axes); (b) when situations are contextualized by different object foci and time frame perspectives; and (c) when different discrete emotions are targeted for regulation.

In doing so, the ERAS model aims to help reveal the complexities and nuances of how emotions are regulated in achievement situations and shine a light on key affordances and constraints associated with their regulation. It is a big-picture model in a budding literature (e.g., Ben-Eliyahu & Linnenbrink-Garcia, 2013; Brady, Hard, & Gross, 2018; Brooks, 2014; Davis, 2016; Gumora, & Arsenio, 2002; Hall et al., 2007; Harley, Jarrell, & Lajoie, in press; Hulleman, Godes, Hendricks, & Harackiewicz, 2010; Jamieson, Peters, Greenwood, & Altose, 2016; Jamieson, Mendes, Blackstock, & Schmader, 2010; Leroy, Grégoire, Magen, Gross, & Mikolajczak, 2012; Nielson & Lorber 2009; Sorić, Penezić, & Burić, 2013; Struthers & Perry, 1996; Vuorela & Nummenmaa 2004; Wilson, Barnes-Holmes, & Barnes-Holmes 2014; Yeager et al., 2014), as inquiry on achievement emotions started to flourish just fifteen years ago (Pekrun, 2006). The propositions made—built largely on empirical and theoretical work from disparate research areas—require further research in achievement ER to evaluate both in and outside of the academic domain. Indeed, the ERAS model, including the situation classifications, is intended to be applicable to other achievement domains such as work, sports, and performing arts. In the workplace, an example of a social high-evaluative achievement situation is a job interview. An example of an individual low-evaluative achievement situation could be looking for bugs in a videogame as part of a quality assurance department in a videogame studio. Finally, a preliminary board meeting about where to make investments represents an example of a social low-evaluative workplace achievement situation. Regardless of the specific achievement domain, the ERAS model can be used to help lay the foundations of a program of research that is

necessary to meaningfully advance the study of emotions and how we can regulate them in some of our most critical moments: achievement situations.

Much work remains to be done to advance reliable, context, and emotion-specific recommendations regarding when and how individuals should leverage ER strategies to help them regulate their own or others' emotions to enhance achievement. In many ways, this research direction is a natural next step for achievement emotion research. We have learned (and still are learning) much about the mechanisms of and outcomes associated with achievement emotions, but if we are to truly exploit these complex psychological processes in the pursuit of enhancing achievement, we must find effective and reliable ways of regulating them. The ERAS model offers a roadmap to help us do just this.

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Table 1

Summary of Basic CVT Assumptions and Prototypical Achievement Emotions

| Object Focus | Appraisal | | Emotion | Example |
	Value	Control		
Outcome: Prospective	Positive (Success)	High	Anticipatory joy	*I'm going to be so happy when I ace that exam!*
		Medium[a]	Hope	*I've studied everything. I should be ready and able to do well on the exam but I'm not 100% sure.*
		Low	Hopelessness	*I need to understand this play for the essay, but Shakespearean English is beyond me. I'm resigned to the fact that I won't succeed.*
	Negative (Failure)	High	Anticipatory relief	*I finally understand these formulas—I will be able to pass the exam, hooray!*
		Medium[a]	Anxiety	*Think I get the main concepts, but not sure that will be enough to pass the lab.*
		High	Hopelessness	*I'm not even sure it's worth showing up for the exam. Tomorrow has F written all over it.*
Outcome: Retrospective	Positive (success)	Irrelevant	Joy	*I got an A!*
			Relief	*I had expected to do poorly on this assignment but I didn't do badly after all!*
		Self	Pride	*Yes! I figured that complicated diagram out all by myself.*
		Other	Gratitude	*Thanks! I would have been lost for the rest of his lecture if you hadn't translated his explanation for me.*

Negative (failure)	Irrelevant		Sadness	*No, I'm not going out. Bummed out about the exam grade.*
			Disappointment	*What a disaster—I was sure to make it and now all my hopes are gone.*
	Self		Shame	*Let's talk about something else. I'm embarrassed about my grade. I should have studied more. Stupid move going out.*
	Other		Anger	*The exam was rigged! She obviously wanted a distribution, but come on, find a better way than throwing out unfair questions.*
Activity: Concurrent	Positive	High	Enjoyment	*Learning about this stuff is pretty cool, it helps me understand what's going on right now in the world.*
	Negative	High	Anger	*Why do I have to waste time on this? Am never going to use it.*
	Positive/ Negative	Low	Frustration	*Damn it! I just can't do this!*
	None	High*/Low**	Boredom	**Ugh, too easy. How dull. Maybe I'll do it later.* ***Whatever. I give up. Don't get it and don't care.*

Note. Adapted from Pekrun (2006).

[a] CVT posits that hope and anxiety can alternate, depending on the focus of attention on success or failure, respectively.

Table 2

Families of ER Strategies and Suggested Applications in Academic Achievement Situations by Prototypical Object Focus and Time Frame

Strategy		Academic Achievement Situation	Prototypical Object Focus & Time Frame	Examples
Family	Subgroup			
Situation selection		Test-taking	Outcome (Prospective)	Skipping an exam; writing an exam in an alternative setting
			Outcome (Concurrent)	Leaving an ongoing exam
		Classroom	Outcome (Prospective)	Selecting a course that one feels will be easier to do well in than another under consideration.
			Outcome (Concurrent)	Leaving a lecture that one is intimated by the difficulty of and seeking out a more manageable course.
		Studying	Outcome (Prospective)	Choosing a reliably, non-disruptive place to study a chapter one needs to complete.
			Outcome (Concurrent)	Changing place of study in order to complete homework.
Situation modification		Test-taking	Outcome (Prospective)	Plan to use effective strategies while taking an exam.
			Activity (Concurrent)	Use strategies such as answering easy questions first and returning to difficult questions later to reduce panic over the quantity of questions.
		Classroom	Outcome (Prospective)	Plan to engage in self-regulated learning (SRL) strategies during a class one knows will be challenging and busy.
			Activity (Concurrent)	Investing effort to attend to and understand classroom instruction to enhance competence and minimize confusion. Suggesting that the group consider, as a whole, prioritizing objectives to ensure completion of core subtasks in the face of mounting time pressures (extrinsic ER).
		Studying	Outcome (Prospective)	Setting reasonable studying goals that will allot enough time for both studying and extra-curricular obligations.
			Activity (Concurrent)	Making summaries and inferences to enhance content mastery.

Attentional Deployment		Test-taking	Outcome (Prospective Retrospective)	Visualizing an exam where one was successful.
			Activity (Concurrent)	Ignoring how other test-takers are reacting to questions and/or how quickly they are completing items.
		Classroom	Outcome (Prospective Retrospective)	Visualizing a previous lecture from the same course that one understood after a studying session with peers to offset the dread of needing to understand a series of complicated concepts in a recently completed or upcoming lecture alone.
			Activity (Concurrent)	Keeping one's eyes on the speaker (e.g., teacher, student question/comment) rather than other students' screens/doodles or conversations that may be distracting.
				Suggesting that the group start by focusing on establishing what they do know, rather than dwelling on what they don't know about a task (extrinsic ER).
		Studying	Outcome (Prospective Retrospective)	Visualizing a studying session where one was productive rather than imagining a repeat of last night's failed attempt to focus.
			Activity (Concurrent)	Listening to music to focus attention on work and drown out other conversations.
Cognitive Change	Value Appraisal	Test-taking	Outcome (Prospective)	Re-appraising an upcoming final exam as a non-life and death situation (decrease value).
			Activity (Concurrent)	Re-appraising a current test as important to do well on to motivate oneself to double-check answers (increase value).
			Outcome (Retrospective)	Re-appraising a failed final exam as not the end of one's chances of getting into graduate school (decrease value).
		Classroom	Outcome (Prospective)	Reminding oneself of the importance of attending a required, but dull course in order to complete a program of studies and pursue a dream career (increase value).
			Activity (Concurrent)	Re-appraising a boring ongoing lecture as necessary to pay attention to in order to understand a unit (increase value).
				Reminding group members that the work they are doing might not be graded but provides them with a chance to apply course concepts that can be hard to fully grasp otherwise (increase value; extrinsic ER).
			Outcome (Retrospective)	Re-appraising a lecture one couldn't understand as less important than the supplemental reading one plans on doing on the topic (decrease value).
		Studying	Outcome (Prospective)	Reminding oneself that the reading material assigned for that night covers content the lecture didn't and therefore can't be skipped for an online gaming session a friend proposes (increase value).

		Activity (Concurrent)	Making connections between the content one is studying and real-life applications to underscore its importance, relevance, and interest (increase value).
		Outcome (Retrospective)	Re-appraising one's lack of understanding of a reading from a recent studying session as low in importance, perhaps because it will be reviewed in-class (decrease value).
Control Appraisal	Test-taking	Outcome (Prospective)	Raising one's expectancies of success for an upcoming exam, potentially by reminding oneself of how much studying one did for it (increase control).
		Activity (Concurrent)	Bolstering one's self-efficacy that one can identify the right answer for a tricky multiple-choice question (increase control).
		Outcome (Retrospective)	Blaming the instructor for an unfair exam rather than oneself to feel better about failing (Other: attribution of failure)
	Classroom	Outcome (Prospective)	Raising one's expectancies of success for understanding the next class, potentially by reminding oneself that the teacher said the recently completed one was the most difficult (increase control).
		Activity (Concurrent)	Bolstering one's self-efficacy that one can meaningfully contribute to the classroom discussion because of relevant personal experience or background (increase control). Suggesting to group members that they might be able to succeed on a challenging task by leveraging their respective strengths (increase control; extrinsic ER).
		Outcome (Retrospective)	Reminding oneself of one's important contributions to the winning-side of a class debate when one is not highlighted in a post-debate overview discussion (self: attribution of success).
	Studying	Outcome (Prospective)	Raising one's expectancies of success for understanding the reading, potentially by reminding oneself that the textbook is easier to follow than the teacher (increase control).
		Activity (Concurrent)	Bolstering one's self-efficacy that one can finish the reading, perhaps noting that one is halfway through.
		Outcome (Retrospective)	Reminding oneself of the loud guests one's roommate had over and the role they likely had in making finishing a chapter impossible (Other: attribution of failure).
Response Modulation	Test-taking/ Classroom/ Studying	Outcome (Prospective/ Retrospective) /Activity (Concurrent)	Deep or pursed lip breathing Substance abuse (e.g., drinking alcohol, pills) Forcing oneself to smile or laugh rather than cry or shout (intrinsic ER, and extrinsic ER if aiming to regulate others' emotions).

Note. Object focus and time frames are referred to as prototypical because these are the most common pairings of object focus with these time frames (Pekrun, 2006; Pekrun & Perry, 2014). Studying, classroom, and test-taking represent prototypical examples of individual low-evaluative, social low-evaluative, and individual high-evaluative academic situations. Intrinsic ER involves a goal to regulate one's own emotions. Extrinsic ER involves a goal to regulate another person's (or people's) emotions.
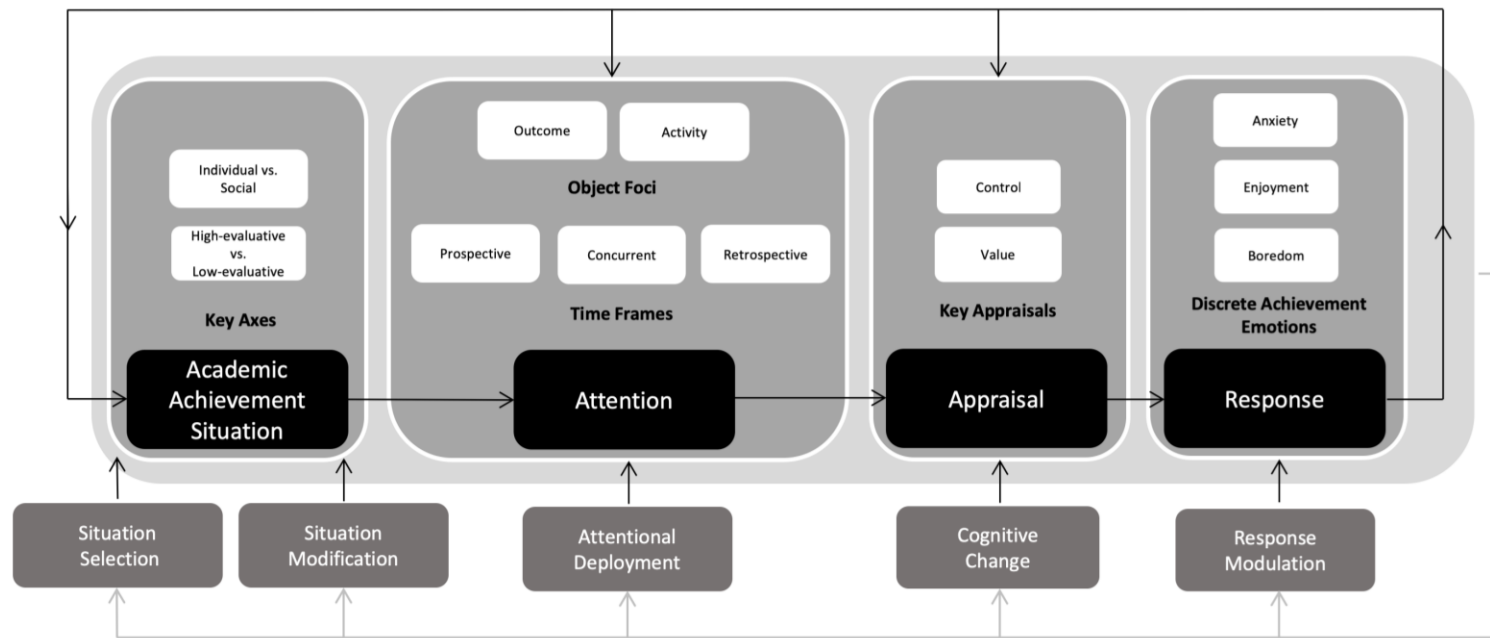
Figure 1. The integrated model of emotion regulation in achievement situations (ERAS).