Cognitive emotion regulation: a review of theory and scientific findings
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One critical developmental milestone is the ability to employ strategies that will regulate unruly emotions [1]. In childhood, and adulthood, emotions do not always need to be controlled, but in situations where regulating them is adaptive, such as educational settings, there are many strategies available for use. One commonly used and largely adaptive strategy is cognitive reappraisal, which involves changing the way we are thinking about a situation in order to change how we feel. Research indicates that this strategy is generally more adaptive than other strategies, such as expressive suppression (in Western cultures) and under certain circumstances, distraction. However, there are some situations in which using reappraisal might not be the best choice, including using reappraisal to regulate emotions which are strong, immediate, perceptually-based, or emotions that are the result of situations that are still controllable. Future work should continue to explore the contextual conditions that inform when reappraisal is effective and adaptive, and define the best alternate strategies when reappraisal cannot be effective and adaptive.

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Emotional responses can be quite adaptive and useful [2,3]. Negative emotions, though unpleasant in the moment, often organize our brains and bodies to prioritize adaptive behaviors, which handle situations quickly and efficiently [4,5]. However, sometimes emotions are not well matched for the current situation. Emotions that are the wrong magnitude, type or duration benefit from being regulated [6**]. Most typically, research on emotion regulation has focused on the strategies that adults use to decrease negative emotion. Although emotion regulation can be used to up-regulate or down-regulate positive or negative emotion, for the purpose of this review I will focus upon the ability of emotion regulation to downregulate negative emotion. Down-regulating negative emotion has clear application to clinical and educational settings, given the potential to correct overwhelming levels of negative emotion, which are present in psychopathology and may disrupt focus in an educational setting.

A great deal of the research on emotion regulation has focused upon outlining the different emotion regulation strategies that individuals commonly use [6**,7]. Then, these strategies are compared and contrasted to determine which strategies are associated with adaptive emotional outcomes. In an observational context, studies have often examined how frequently individuals habitually use different strategies [8,9]. In an experimental context, individuals are taught to use different strategies, and the success of each strategy is computed based on the degree to which each strategy reduces emotion measures [10]. These measures include self-reported affect (how emotional people say they feel), measures of peripheral psychophysiology that reflect bodily responses to emotion, and functional signals from brain regions thought to be involved in emotion, such as the amygdala. Decreases in multiple measures are taken as convergent evidence that successful emotion down-regulation has occurred. At the same time, the neural regions engaged during the regulation of emotion are documented in order to form new hypotheses about the component cognitive processes that contribute to different forms of emotion regulation. This framework for understanding emotion regulation is especially relevant to educators, because the ability to use cognition to diminish negative emotion provides one opportunity to restore balance between the early-developing limbic system, which includes the amygdala, and the later-developing prefrontal cortex [11,12].

In this review, I will first briefly outline the major categories of emotion regulation indicated by one prominent model of emotion regulation. I will then define and focus upon one type of emotion regulation that has clear clinical relevance: cognitive reappraisal. I will summarize the literature comparing the effects of using cognitive reappraisal to other types of emotion regulation. Then, I will review recent evidence that there are some contextual factors that govern whether cognitive reappraisal is an effective regulation strategy.

Emotion regulation: a brief theoretical history
The most commonly used emotion regulation strategies are frequently organized according to the point in the
emotion generation process in which they intervene. Referred to as the process model of emotion regulation [6*,7], this organizational scheme highlights five categories of emotion regulation strategies: situation selection, situation modification, attentional deployment, cognitive restructuring, and response modulation. Below, I focus upon three strategies that have been commonly compared and contrasted with one another in laboratory settings: attentional deployment (e.g., distraction), cognitive change (e.g., cognitive reappraisal), and response modification (e.g., expressive suppression). Figure 1 summarizes these strategies as part of the process model of emotion regulation.

Attentional deployment refers to both internal and external attempts to gate information from conscious attention. For example, children learn at a relatively young age to cover their eyes or ears to limit the degree to which any conscious attention can be devoted to disturbing visual or auditory stimuli. Internal direction of attention (more commonly known as distraction) might occur when someone chooses to recall pleasant memories of past school field trips instead of dwelling on his or her most recent trip, which did not go as planned.

Cognitive reappraisal refers to attempts to reconsider, reframe, or gain new perspective on an emotional situation in a way that changes its emotional meaning [13]. This is often referred to as cognitive reframing in the contexts of cognitive therapies, including cognitive behavioral therapy [14]. Reappraisal recognizes that our emotional responses are a downstream consequence of our thoughts, or appraisals [15–18]. Therefore, the same external situation can result in pleasant or unpleasant emotions based on whether it is appraised as consistent with, or inconsistent with, someone’s goals. For example, a student might reappraise a bad grade on an assignment (incompatible with the goal of being a good student) by looking at it as an opportunity to improve in the future (compatible with the goal of being someone who is able to learn and grow from mistakes).

Experimental work has consistently shown that reappraisal successfully reduces the self-reported negative emotion reported by individuals, as well as physiological measures of affect [19] and the magnitude [19–22] and duration [23] of the functional signal from the amygdala, a key brain region for processing affect. These changes are enacted by regions of the prefrontal cortex that are typically associated with cognitive control more generally [24], and accordingly, the ability to use cognitive reappraisal improves throughout adolescent development [25*], when prefrontal cortex is also going through dramatic maturation [26]. Although these experimental findings all hint that reappraisal is a generally effective strategy, it is important to keep in mind that no emotion regulation strategy is universally adaptive or maladaptive (see further discussion of this below).

There are a number of different types of appraisals [27], including those that evoke a sense that the situation will improve with the future, or is not as bad as it first seemed, or is part of the normal range of human experience [28]. Reappraisals of negative situations can also have the goal of reappraising back to a neutral point (e.g., it’s not that bad) or can have the goal of reappraising to generate positivity (e.g., I will be grateful that I went through this in the future). A few studies indicate that reappraising to generate positive emotion might be more successful and adaptive than reappraising merely to return to a neutral point [28–30]. However, positive reappraisal has a different physiological profile, indicating higher levels of physiological arousal than reappraising to diminish negative emotion [23,28,29].

The final opportunity to change one’s emotional response is referred to as response modulation. Response modulation includes all attempts to directly change the outputs of the emotional system, including facial expressions, verbal expressions of emotion, bodily responses or behaviors. Expressive suppression, as one type of response modulation, refers to attempts to inhibit, or not display, facial, verbal or bodily expression of an internally felt emotion [31]. Examples of expressive suppression might include hiding one’s face, biting one’s lip, or trying to maintain a mask of neutrality when receiving a bad test score or other critical evaluation.

Reappraisal versus distraction
Reappraisal has been frequently compared to other emotion regulation strategies, such as distraction. Behavioral
research indicates that either internally-directed distraction (telling people to think of anything else to distract themselves [32]) or externally-directed distraction (giving people a concurrent task to complete; [33]) results in successful down-regulation of self-reported negative emotion. Neurally, externally-directed distraction reduces amygdala activation to a greater extent than reappraisal [33], but there may be specific contextual differences that dictate when distraction versus reappraisal is most effective.

Research has shown that there are some contexts in which distraction may be a more adaptive strategy compared with reappraisal. Specifically, distraction might be more effective if the time available to reappraise is severely limited [32,34]. Reappraisal requires time to generate possible reappraisals, select amongst them, implement the selected reappraisal, and monitor for success [35]. In contrast, distraction may be a faster process. In addition, there is some evidence that distraction is more effective than reappraisal when the emotional stimulus is of a very high intensity [36]. In this case, an individual may feel overwhelmed by his or her initial negative response, and be unable to generate, select, or implement a good reappraisal. In this case, distraction is effective at decreasing negative emotion when reappraisal may not be. Furthermore, attempting to reappraise while emotional intensity runs high is more effortful [37], which perhaps decreases an individual’s self-efficacy beliefs regarding emotion regulation. Given that beliefs about emotion regulation success tend to predict actual success [38], it is important to try to encourage individuals to use specific strategies when they are most likely to be effective.

Despite some short-term advantages to using distraction, studies have also shown that the effects of emotion regulation are long-lasting for reappraisal [40] compared to distraction [41]. Therefore, distraction might be a good short-term strategy, but individuals who reappraise a situation might be better prepared to regulate if that situation arises again. These findings about distraction and reappraisal lead to the possibility that optimal emotion regulation sometimes involves two steps. When time is tight, or an emotion is of a high intensity, distraction may be a great short-term strategy to decrease negative emotion. Then, once the individual has more time, and more cognitive resources at his or her disposal, or the initial intensity of an experience has diminished, reappraisal might be a good choice to ensure lasting effects of successful down-regulation. Applied efforts to train emotion regulation should consider teaching individuals multiple strategies, to provide an opportunity to flexibly employ reappraisal or distraction (or both) as the situation demands.

Reappraisal versus suppression
Another emotion regulation strategy to which reappraisal is frequently compared is expressive suppression. In broad strokes, the use of this strategy is not thought to be helpful or adaptive. For example, individuals watching a disgusting film who are instructed to use expressive suppression report no decreases, or only moderate decreases, in their subjective negative emotion [21]. Furthermore, there is some evidence that suppression can backfire and actually increase the bodily responding associated with negative emotion, as measured by increases in peripheral physiology or amygdala activation [21,42,43].

In addition, there appear to be social and cognitive consequences to using expressive suppression. In Western cultures, individuals who use suppression are rated as less desirable social partners compared to those who use reappraisal or no strategy at all [44]. In contrast, there is some evidence that these effects are not true in Eastern cultural contexts [45,46]. One reason for this may be that suppression is especially sensitive to display rules, which vary by culture [47,48]. Individuals in Eastern cultures use suppression more frequently than in Western cultures [47,48]. Even within the United States, some sub-cultures encourage the expression of emotion, and therefore discourage suppression, more than others [49,50].

Contextual factors impacting the use of reappraisal
One of the most important recent developments in the emotion regulation literature is the departure from discussing emotion regulation strategies as though they are uniformly adaptive or maladaptive, helpful or harmful. Instead, in the past several years, the discussion has become more nuanced: When and for whom are certain strategies effective and adaptive? As described above, the largely maladaptive effects of using expressive suppression appear to dissolve in an Eastern cultural context. Similarly, although reappraisal is thought to be largely effective, distraction seems preferable when the intensity of the emotional stimulus is high, or the time to use reappraisal is limited. Finally, reappraisal, like other forms of self-control, is less likely to be effective whenever an individual’s ability to utilize cognitive resources is compromised, such as early or late in development [51], when deprived of high-quality sleep [52], or when distracted by additional cognitive demands [53].

To further this growing literature on the factors that predict the effectiveness of reappraisal, several recent investigations have begun to provide empirical evidence for when reappraisal is an adaptive strategy to use, and when it is not. As one example, reappraisal appears to work best when the situation causing the emotion is NOT controllable [54]. A student who feels ashamed for being on academic probation at his or her university might not want to use reappraisal to lessen that negative emotion. Instead, it might be more adaptive to use that negative emotion as motivation to improve academic performance.
However, a student who is facing an unexpected increase in college tuition, with no scholarships are available, might do best to reappraise to decrease his or her disappointment. An extension of this effect might be that reappraisal is less effective for people who have chronically low levels of control over their situations, such as individuals from low SES backgrounds, a prediction borne out by recent findings [56].

Another factor that might determine when reappraisal is helpful or harmful is the nature of the emotion to be regulated. Emotions can be generated from direct, perceptual experiences (e.g., an encounter with a threatening animal, such as a rattlesnake on a trail), but others are generated from internal, conceptual representations of an event (e.g., convincing yourself that your teacher doesn’t like you after getting one bad grade). Neuroimaging research demonstrates that negative emotions generated in these two different ways recruit generally distinct regions of the brain [57,58]. Furthermore, a great number of reappraisal studies are performed using mixed stimuli, such as a picture of a car accident, which may generate emotion both perceptually (any depictions of bodily injuries) as well as conceptually (depicting rescue vehicles and crumpled cars, which require interpretation to generate emotion). A few attempts to examine the effects of reappraisal on perceptually and conceptually generated emotions have demonstrated that reappraisal is more effective on emotions generated conceptually [57]. Furthermore, the mechanisms for this more effective regulation may be the amount of neural overlap between emotion generation and emotion regulation [59]. This may be because it is harder to use reappraisal to calm yourself down while your senses are taking in strongly threatening information, whereas it is easier to change your mindset about an emotion that was generated by a mindset to start with. In fact, there is some evidence that when used upon certain stimuli that generate emotions in perceptual ways (such as emotional faces), attempting to reappraise emotions generated perceptually might even backfire and increase some measures of emotional responding, such as amygdala activation [57,60].

Conflict of interest
Nothing declared.

References and recommended reading
Papers of particular interest, published within the period of review, have been highlighted as:

- of special interest
- - of outstanding interest

   This review is a comprehensive, birds-eye perspective on emotion regulation written by James Gross, who developed and has refined the process model of emotion regulation that is described in this review.
This empirical study demonstrates the importance of expectation in emotion regulation. The authors were able to experimentally manipulate participants’ expectations about their ability to regulate their own emotions. Participants who were led to believe that they were capable of regulating their own emotions demonstrated greater emotion regulation success.


This study demonstrates the long-lasting effects of cognitive reappraisal on the neural correlates of emotion. Researchers demonstrated when individuals use reappraisal, emotion-generative regions such as the amygdala show a lesser response one week later.


This study is one example of an empirical demonstration that reappraisal is not equally helpful in all situations. In particular, this study demonstrates that whether or not the stressful situation is controllable impacts the effectiveness of reappraisal. Reappraisal tends to only be effective when the stressful situation is not controllable.


56. Troy AS, Ford BQ, McRae K, Zarolia P, Mauss I: Change the things you can: emotion regulation is beneficial to people from lower but not higher socioeconomic status. Emotion 2016, in press.

