Social and Personality Psychology Compass 7/5 (2013): 289–302, 10.1111/spc3.12027

Emotion Regulation Frequency and Success: Separating Constructs from Methods and Time Scale

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Abstract

Research on emotion regulation (ER) has largely focused upon two related lines of inquiry: ER frequency and ER success. First, research on ER frequency has focused upon the relationship between how often individuals attempt to use ER strategies in everyday life which is typically measured by subjective reports on questionnaires and interpreted as trait ER. Second, research on ER success has focused on the degree to which experimentally instructed use of different strategies results in change of one or more measures of affect as measured by relatively objective measures. Therefore, distinctions between ER frequency and success are very often confounded by time scale (ER frequency measured in the long-term, ER success measured in the short-term) and methods (ER frequency measured with subjective questionnaires, ER success measured with more objective affective variables). I offer examples from the literature on ER and offer suggestions for ways to uncouple ER frequency and success from the methods that are currently being used to measure them. Clarity on the distinction between these constructs should lead to the most appropriate interpretation of results from current studies and more precisely inform clinical interventions that target one or more ER process.

Although research in human emotions has been popular for several decades, research on how we are able to control our emotions, or emotion regulation (ER), has received a steep increase in attention over the past 15 years (Gross, in press). Research on ER refers to the fact that we are not merely passive conduits of emotional responses and specifically outlines processes by which we influence the onset, offset, magnitude, duration, intensity, or quality of an emotional experience (Gross & Thompson, 2007). The widespread interest in ER may be due to the fact that ER seems to be of interest to many subfields of psychology. More specifically, ER can be described as poised between two psychological research traditions – those that describe stable traits and those that characterize the effects of dynamic processes. On one hand, researchers interested in ER as a stable trait have focused upon measuring individual differences in the use of different ER strategies and describing how these individual differences are associated with important outcomes. Other researchers have made it a priority to describe the effects of ER processes in terms of measurable affective changes when ER processes are used, and the set of circumstances under which those processes are optimized. Although these two traditions have had a few points of contact, much research on ER has largely addressed either ER as a long-term trait variable or ER as a relatively brief cognitive process.[1]

However, categorizing these literatures as investigating ER traits and ER states may not be the best way to organize the existing data and move forward. One core characteristic of trait variables is that they are quite stable over time. There is some evidence that both ER frequency (Gross & John, 2003) and ER success (Lee, Shackman, Jackson, & Davidson, 2009) have adequate test/re-test reliability and therefore are at least somewhat stable. However, due to the large emphasis on the utility of improving ER for the purpose of clinical

intervention, both are hypothesized to be at least somewhat malleable over one's lifetime. In addition, somewhat separate research traditions have used different methods to study ER in these two ways, resulting in the common characterization of how often someone uses ER (ER *frequency*) as a stable trait measured using questionnaires over days, weeks, and months, and how well someone achieves his or her ER goal (ER *success*) as a dynamic cognitive process measured as change in affective variables over seconds, minutes, and hours. I propose that once ER is studied with comparable methods and over similar time scales, the distinction that will remain most critical is that between ER frequency and ER success. Furthermore, I argue that distinguishing between ER frequency and success will help ER researchers draw more precise conclusions from studies of ER. Below, I outline the main findings of these two literatures and propose ways to liberate the study of ER frequency and ER success from the current methodological confounds.

Uncoupling emotion regulation frequency and success from methodology, time scale, and one another

Emotion regulation frequency refers to how often an individual habitually uses a particular ER strategy. By contrast, ER success refers to how well an individual is able to achieve his or her emotional goals while using a particular ER strategy. Figure 1 outlines a 2 × 2 diagram representing fully crossed dimensions of ER success and frequency with time scale. The majority of established research either measures ER success over a short time scale (circled in the figure) or ER frequency over a long time scale (squared with dashes in the figure). I argue that future research should investigate the currently under-developed areas of this figure. Ensuring that results are combined or compared only when measuring the same core construct, not confounded by methodology, will lead to clearer synthesis of the growing literature on ER. Furthermore, this clarity will allow for exploration of the relationship between frequency and success as well as any circumstances under which this relationship changes.

Methods. Each cell is also divided further to represent *relatively* subjective (white) and objective (gray) measures of that construct. The majority of studies that examine ER frequency use subjective reports typically via questionnaires, and the adaptive value of each

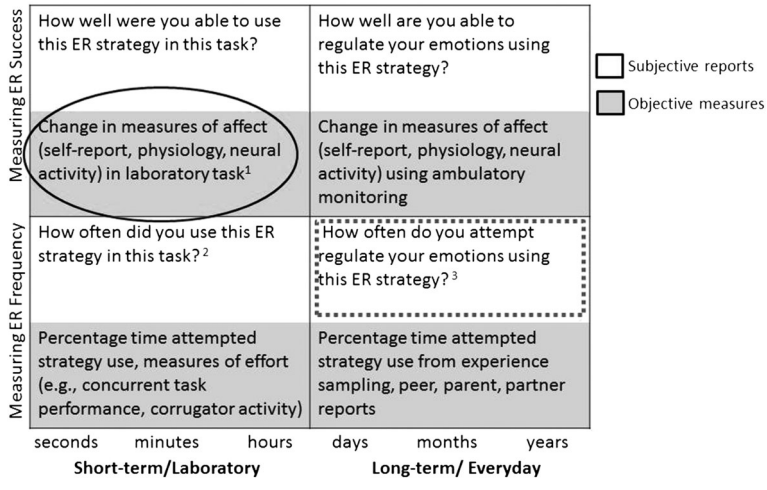

Figure 1. Dimensions of emotion regulation (ER) success and frequency with time scale.

strategy is derived from cross-sectional correlations with well-validated outcome measures (e.g., positive relationships with well-being and negative relationships with depressive symptoms). By contrast, the majority of studies describing ER success primarily report changes in relatively objective measures during regulation including momentary experience reports and psychophysiology. In theory, these different types of information (subjective and objective) should converge to reveal truths about the nature of ER. However, in practice, different measures have different sources of bias and error, so the most appropriate comparisons are those that are done with similar measures.

Time scale. The most prominent confound observed in studies of ER frequency and success is the time scale over which these constructs are measured. Studies of ER frequency typically ask participants to summarize their use of ER strategies in general or over the last several weeks, whereas studies of ER success are often measuring changes in affect variables over seconds, minutes, or hours. However, this confound is due to custom, not necessity. Collecting data over multiple time scales will help answer whether someone who habitually uses a particular ER strategy is any more likely to use it during a single emotional episode, or whether someone who can use ER very successfully at one point in time is more likely to use it successfully in general.

Frequency and success. It is tempting to combine the outcomes that are known to be associated with ER frequency with known properties of processes leading to ER success. However, few studies have actually reported both ER frequency and ER success (McRae, Jacobs, Ray, John, & Gross, 2012; Troy, Wilhelm, Shallcross, & Mauss, 2010). These studies used common questionnaire methods (Gross & John, 2003) to evaluate long-term use of an ER strategy called cognitive reappraisal, which involves rethinking emotional material from a different perspective, to measure ER frequency. In addition, researchers used decreases in self-reported affect and physiology in response to a reappraisal instruction applied to negative stimuli as a measure of ER success. These studies report a modest relationship between reappraisal frequency and success. Furthermore, these studies demonstrate specific relationships between ER success and important variables such as cognitive control ability (positive relationship; McRae, Jacobs, et al., 2012) and depressive symptoms (negative relationship; Troy et al., 2010) that are not true of ER frequency. This is an important step in the literature, because after all, frequency does not always indicate success – just think of the famous quote from Mark Twain (1835–1910): "To cease smoking is the easiest thing in the world. I ought to know because I've done it a thousand times". In other domains, such as thought suppression, it has been shown that the attempt to control a thought can actually increase its occurrence (Wegner, Schneider, Carter, & White, 1987), a phenomenon that is paralleled in the ER literature in the case of paradoxical effects of a strategy called expressive suppression on negative emotion (Goldin, McRae, Ramel, & Gross, 2008; Gross, 1998a).

One reason that it is tempting to combine these literatures because at points they seem to be consistent with one another, and it makes sense that those who use an ER strategy frequently do so because they use it successfully, and those that are unsuccessful in using a particular ER strategy would not use it frequently. However, it is easy to imagine someone who uses an ER strategy very successfully and therefore does not need to use it very frequently. Different ER profiles, or various combinations of ER frequency and success, might lead to different types of ER difficulties and therefore call for different interventions. For example, it is possible that some individuals have a very inefficient ER profile, one in which an ER strategy is used quite frequently but not very successfully. This individual might be a good candidate for an intervention that teaches her to use a different strategy successfully or gives her tips that

would improve the use of the strategy that is already in frequent use. By contrast, someone who is very skilled at using a strategy but does not use it frequently might need only a better way to cue himself to use the strategy more often. Therefore, the separation of these constructs might have important consequences for the precise characterization of ER deficits and subsequent interventions.

Established research: Long-term emotion regulation frequency

Measurement. Research on ER was born of the literature on stress and coping. The coping literature emphasizes that a person's well-being might not be entirely dependent on the properties of her environment and the stimuli he encounters but also the strategies that a person might employ while responding to the environment (Lazarus, 1966). The majority of research that has been done on coping has asked individuals to report the frequency with which they use different types of coping strategies and examined the relationship between the frequency of strategy use and a number of important psychological health outcomes (Carver, Scheier, & Weintraub, 1989; Folkman & Lazarus, 1980). It is not surprising, then, that much of the field of ER has focused upon the adaptive correlates of different ER strategies and studies utilizing subjective questionnaire methods of how often these strategies are used. These studies largely converge upon the conclusion that frequent use of an ER strategy like reappraisal is positively associated with adaptive outcomes and negatively associated with maladaptive outcomes. Conversely, the frequent use of an ER strategy like expressive suppression, which involves the inhibition of the outward expression of a felt emotion, is negatively associated adaptive outcomes and positively associated with maladaptive outcomes (Garnefski, Kraaij, & Spinhoven, 2001; Gratz & Roemer, 2004; Gross & John, 2003; John & Gross, 2004; Moore, Zoellner, & Mollenholt, 2008; Nezlek & Kuppens, 2008).

One potential change in measurement is to use other methods to validate these subjective reports. ER frequency could be measured using experience sampling or daily diaries to avoid the potential retrospective biases that come with asking someone to summarize how often they do something in general. This has been done in adolescent (Silk et al., 2003) and adult (Pe & Kuppens, 2012) populations but not compared and contrasted to the subjective questionnaire measures that are more frequently used (Silk, Steinberg, & Morris, 2003). In addition, having other individuals (parents, peers, spouses, or friends) rate how often individuals use different ER strategies would help confirm the validity of subjective ER frequency.

Manipulation. Research on ER as a trait has primarily focused upon the frequency with which individuals use different ER strategies over relatively long periods of time. However, it is possible that there are intervening events that can change the frequency of an individual's use of any particular strategy. For example, one would hope that therapeutic interventions that teach ER skills increase the frequency of the use of those skills over time (Beck & Dozois, 2011). Recent evidence even indicates that interventions that are theoretically geared toward emotional reactivity might result in significant changes in ER frequency (McRae, Rekshen, Williams, Cooper, & Gross, forthcoming). It is also possible to imagine more direct manipulations of frequency – for example, using a mobile application to send a notification multiple times a day to remind an individual to engage in regulation when needed. Identifying the types of interventions that specifically change frequency of different ER strategies could lead to more targeted interventions for those who do not use an ER strategy with an adaptive frequency.

Important factors in long-term emotion regulation frequency. Interesting cultural differences in ER frequency have been observed. This literature has focused mostly on the ER strategy of expressive suppression, and posits that cultural differences in display rules (Matsumoto, 1990) lead to increased use of suppression in eastern (compared to western) cultures (Haga, Kraft, & Corby, 2009; Matsumoto, 2006). Because culture is seen as relatively static, long-term ER frequency is a good fit with these studies. However, even ER frequency can also change with more subtle changes in sociocultural context, such as the transition to college (Srivastava, Tamir, McGonigal, John, & Gross, 2009) or participation in a temporary, alternative culture (McRae, Heller, John, & Gross, 2011; Snyder, Heller, Lumian, & McRae, submitted).

In addition, consistent individual differences in ER frequency have been found by gender, age, and other types of group membership such as those with mood and anxiety disorders (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Blanchard-Fields, Stein, & Watson, 2004; Garnefski, Legerstee, Kraaij, Van Den Kommer, & Teerds, 2002; John & Gross, 2004). These differences are distinct when considering particular ER strategies. For example, there are few reported gender differences in reappraisal frequency, but adults report using reappraisal more frequently than adolescents (Blanchard-Fields et al., 2004; Garnefski et al., 2002), and those with mood and anxiety disorders use reappraisal less frequently than those without these disorders (Aldao et al., 2010; Gross & John, 2003). For expressive suppression, by contrast, women regularly use suppression less frequently than men (Gross & John, 2003; Snyder et al., submitted), older adults tend to use it less frequently than younger adults (John & Gross 2004), and those with mood and anxiety disorders use suppression more frequently than those without (Aldao et al., 2010; Gross & John, 2003). However, it is not yet clear whether all of these differences are true of short-term ER frequency or any type of ER success.

Under-developed research: Short-term emotion regulation frequency

Measurement. Because any estimate of the frequency of an event is more reliable to estimate over a longer time frame, the historical focus on long-term frequency is somewhat understandable. However, it is also possible to measure how frequently people engage in different types of ER over shorter time periods. A small number of studies have used a creative design to allow participants to view a negative film and then asked them immediately following the film to rate the degree to which they used different types of ER (Campbell-Sills, Barlow, Brown, & Hofmann, 2006; Ehring, Tuschen-Caffier, Schnulle, Fischer, & Gross, 2010). In these studies, the variable of interest is not a change in affect (which would be ER success) but rather a more acute measurement of ER frequency in a laboratory setting. This self-report measure would be a great supplement to the subjective questionnaire measures of long-term ER frequency, as it is unknown whether individuals who use ER more frequently in everyday life are more likely to use it spontaneously during a distinct emotional episode.

It may not be possible to measure short-term ER frequency without some of the challenges of using self-report. It would be difficult to devise an objective measure that is a gold standard for detecting whether or not someone has attempted to use ER over a given time period. However, because most ER strategies discussed here require at least some effort (but see the discussion of implicit ER in the "future directions" section below), indirect measures of effort such as performance on a concurrent task, corrugator activity, skin conductance, or pupil dilation might support the conclusion that the person was trying to change how they were feeling. These measures are challenging to use, however, because they are often also associated with emotional responding (Blair et al., 2007; Bradley, Miccoli, Escrig, &

Lang, 2008; Ray, McRae, Ochsner, & Gross, 2010; Siegle, Steinhauer, Stenger, Konecky, & Carter, 2003).

It is also crucial that changes in measures of affective responding alone (commonly used to measure ER success) are not taken as evidence that ER has taken place (short-term ER frequency). For example, Drabant et al. (2009) observed that amygdala activation, while viewing emotional (compared with neutral) faces, was negatively correlated with long-term reappraisal frequency. It is tempting to conclude that those who tend to use reappraisal more frequently actually engaged in spontaneous reappraisal during the experimental task. It is appropriate to *speculate* that those who use reappraisal more frequently in everyday life may be more likely to use reappraisal in the current experimental context. However, the data do not definitively show that these individuals are engaging in reappraisal during the scanner task. Without a short-term measure of reappraisal frequency (described above), it is very difficult to conclude that ER processes were in use.

Additionally, functional neuroimaging has allowed us to make more specific speculations about the cognitive processes involved in different ER strategies. More than a decade of fMRI studies have shown that broadly, ER strategies can be considered a special type of cognitive control, engaging dorsolateral and ventrolateral prefrontal cortex (PFC) as well as parietal areas involved in cognitive control (Kalisch, 2009; Kim & Hamann, 2007; Ochsner & Gross, 2005; Urry et al., 2006, Ochsner et al., 2012). In Drabant et al. 2009, prefrontal regions previously associated with the engagement of reappraisal in an experimental context were also activated to a greater extent in those who used reappraisal more frequently, strengthening the speculation about which processes might be occurring to a greater degree in these individuals.

Even more specifically, the comparison of different types of ER strategies has led to conclusions about strategies that engage more medial than lateral PFC or those that recruit PFC activation earlier or later in the regulation process (Goldin et al., 2008; McRae, Hughes, et al., 2010; Ochsner et al., 2004). Eventually, a very specific pattern of prefrontal activation might serve as corroborating evidence that someone has engaged in a very specific type of ER.

Manipulation. In one sense, every study of ER success is also a manipulation of ER frequency in the short term. Instead of measuring natural continuous variation in ER frequency, these manipulations artificially create only two levels (experimental conditions in which participants are instructed to use an ER strategy or not). Measuring ER frequency itself as a dependent variable in response to these instructions is an excellent manipulation check but can also serve as another important outcome. A certain ER instruction might lead to similar ER success but might be easier, or more inviting than another, leading to differences in ER frequency. Asking individuals whether they used one strategy more frequently than another, even when they have been instructed to use them equally, may shed light on which strategy may lead to the most spontaneous ER outside the laboratory.

Important factors in short-term emotion regulation frequency. The small number of studies that have measured short-term ER frequency have also reported differences in groups defined by clinical status (Campbell-Sills et al., 2006; Ehring et al., 2010). In these studies, individuals with mood or anxiety disorders use reappraisal less frequently in the short-term and use expressive suppression more frequently in the short-term than healthy controls, which in this case is consistent with studies of long-term frequency. However, as of yet it is unclear whether there are differences in short-term ER frequency by gender, age, or other individual or contextual factors.

Established research: Short-term emotion regulation success

Measurement. Experimental studies of ER success typically measure the degree to which different ER strategies can change measures of emotional responding such as self-reported affect (Gross, 1998a; Jackson, Malmstadt, Larson, & Davidson, 2000; Ochsner, Bunge, Gross, & Gabrieli, 2002), peripheral psychophysiology (Jackson et al., 2000; Ray et al., 2010), and central physiology (Hajcak & Nieuwenhuis, 2006; Kalisch, 2009; Moser, Krompinger, Dietz, & Simons, 2009; Ochsner & Gross, 2005; Thiruchselvam, Blechert, Sheppes, Rydstrom, & Gross, 2011; Ochsner et al., 2012). Generally, strategies that are effective at achieving their emotional goal, without also resulting in harmful cognitive or social side effects, such as those on memory, attention, and social processes (Butler, Lee, & Gross, 2007; Dillon, Ritchey, Johnson, & LaBar, 2007; Hayes et al., 2010; Richards, 2001) are considered relatively more adaptive (Gross, 1998b; McRae, Ochsner, & Gross, 2010). Some studies have asked participants to directly report their own success at reaching their ER goal (Eippert et al., 2007). This has the disadvantage of relying on a participant's emotional insight and awareness, and so the accuracy of this estimate might vary with individual differences in emotional intelligence, awareness, or clarity (Brackett & Mayer, 2003; Lane et al., 1990) and may not relate to actual changes in more objective measures of affect when regulating.

Manipulation. As noted above, experimental tasks that measure ER success usually manipulate ER frequency, and many of them compare the success of different ER strategies by comparing changes in affect, most commonly using specific examples of cognitive reappraisal and expressive suppression (Gross, 1998b; Gross & Thompson, 2007). Despite consistent effects of these strategies, recent work has also begun to examine differential ER success within variations of single regulation strategies. For example, multiple subtypes of reappraisal have been identified, including distancing versus situational reinterpretation (Ochsner et al., 2004), and reappraisal with the goal of increasing positive versus decreasing negative affect (McRae, Ciesielski, & Gross, 2012; Shiota & Levenson, 2009, 2012). Some of these reappraisal tactics (e.g., increasing positive affect) are associated with relatively more ER success. As more information about different variants of ER strategies emerge, it is important to ensure that studies of ER success reinform the studies of ER frequency. Studies examining ER success to decrease positive emotion should measure ER frequency for decreasing positive emotion, for example.

Another variable that impacts short-term ER success may be the degree to which participants are trained on ER tasks. Most studies have provided relatively detailed training (taking anywhere from 10 to 45 minutes) instructing participants to use the regulation strategies of interest (McRae, Ciesielski, et al., 2012; Wager, Davidson, Hughes, Lindquist, & Ochsner, 2008). This extensive training and prompting may result in an inflated estimate of each participant's ER typical success in a nonlaboratory environment. However, the same uninstructed paradigms used to study short-term ER frequency objectively might also provide an opportunity to study uninstructed ER success, which may be closer to everyday ER success. In addition, the study of short-term ER success has identified a number of cognitive consequences of different types of ER (Dillon et al., 2007; Richards, 2001). It would be interesting to examine whether these same cognitive consequences occur when ER occurs successfully, but more spontaneously, without extensive instruction.

Important factors in short-term emotion regulation success. Research on ER success has begun to catalog the different environments in which different ER strategies result in the most prominent changes of affective variables in accordance with the ER goal. For example, early studies showed that reappraisal can decrease negative responding to stimuli such as pictures or

films (Goldin et al., 2008; Gross, 1998a; Jackson et al., 2000; Koriat, Melkman, Averill, & Lazarus, 1972). This work has been extended by examining differential reappraisal success when emotions are induced in different ways (McRae, Misra, Prasad, Pereira, & Gross, 2011). In addition, more recent work has broadened the contexts in which reappraisal can also successfully influence responding to include neuroeconomic tasks (Grecucci, Giorgetta, van't Wout, Bonini, & Sanfey, 2012; Sokol-Hessner et al., 2009; Staudinger, Erk, Abler, & Walter, 2009). Other work has demonstrated that the most successful ER strategy, in this case distraction or reappraisal, depends on context (Sheppes & Gross, 2011; Sheppes & Meiran, 2008; Thiruchselvam et al., 2011).

In addition, neuroimaging studies indicate that there are important differences in ER success when participants are grouped by age (McRae, Gross, et al., 2012; Opitz, Rauch, Terry, & Urry, 2012; Silvers et al., 2012; Winecoff, LaBar, Madden, Cabeza, & Huettel, 2011) or gender (McRae, Ochsner, Mauss, Gabrieli, & Gross, 2008).

Under-developed research: Long-term emotion regulation success

Measurement. Although those who conduct studies of short-term ER success would like to conclude that the ER success exhibited in the laboratory reflects typical ER success in everyday life, relatively little work has been done on measures of long-term ER. Despite the cautions outlined above about using self-report to directly measure success, it may be prudent to ask participants about typical ER success whenever they are also asked about typical ER frequency to be sure that participants understand the distinction. Most crucial, however, is the need for studies that examine real-world sampling of ER success over a longer time-course obtaining multiple measurements of emotional responding at several points in time. Although ambulatory monitoring of a measure like BOLD signal is not likely to be an option, ambulatory monitoring of peripheral physiology or endocrine levels is possible, and asking participants to report their affect before and after attempts to change how they are feeling in everyday life, rather than in a laboratory, is a crucial and necessary addition to the literature.

Important factors in long-term emotion regulation success. To my knowledge, no studies have attempted to manipulate long-term ER success, measure it in different contexts, or characterize individual and group differences in it.

Implicit Emotion Regulation

One popular and fruitful direction of ER research is to make a distinction between explicit and implicit ER (Mauss, Bunge, & Gross, 2007). The research summarized above largely involves explicit ER, wherein participants have the conscious, well-defined goal of changing one or more aspects of their emotional response. However, there are at least three other manipulations that might impact ER without the pursuit of an explicitly stated ER goal. The first has been demonstrated when participants are primed with information that makes them more likely to engage in ER (Williams, Bargh, Nocera, & Gray, 2009) or by the implicit measurement of individual differences in ER attitudes (Hopp, Troy, & Mauss, 2011; Mauss, Evers, Wilhelm, & Gross, 2006). A thorough discussion of how to distinguish between implicit or nonconscious ER and changes in emotional reactivity is beyond the scope of the present paper. However, if ER is the proposed mechanism in these studies, the most conservative support for this conclusion would include at least one measure indicative of ER frequency listed above. The second type of implicit ER is the automatic engagement of cognitive control

during an emotional stimulus due to the recent engagement of control on another stimulus (Etkin, Egner, Peraza, Kandel, & Hirsch, 2006; Gyurak, Gross, & Etkin, 2011; Joormann & Gotlib, 2009). This is typically measured as decreased emotional interference as evidenced by reaction time, decreased activation in emotionally responsive regions, and increased activation in control regions of the brain (Gyurak et al., 2011). Finally, experimental studies have used explicit instructions, such as verbal labeling, that do not mention an ER goal but have a measurable impact on emotional responding (Hariri, Bookheimer, & Mazziotta, 2000; Lieberman et al., 2007; McRae, Taitano, & Lane, 2010; Tabibnia, Lieberman, & Craske, 2008). These studies have demonstrated changes in emotional responding, but it is unclear whether they influence ER frequency or ER success, over only the short or also the long term. It is also possible that processes that impact emotion need not be distinctly engaged such as the clear efforts to change emotion that are outlined here. In fact, there is increasing interest in processes such as mindfulness and acceptance, which may ultimately alter emotion but without the engagement of an explicit emotion regulatory goal. In these cases, it is very difficult to measure ER frequency because these types of processes, which impact emotion, may not be characterized by clear bouts of regulatory effort.

Conclusion and Future Directions

The literatures on ER frequency and success have several points of convergence. For example, both reappraisal frequency (short and long term) and reappraisal success are inversely related to depressive symptoms (Aldao et al., 2010; Blanchard-Fields et al., 2004; Ehring et al., 2010 Garnefski et al., 2002; John & Gross, 2004; Troy et al., 2010), although there is at least one report that reappraisal success is related to depressive symptoms after controlling for frequency (Troy et al., 2010). Developmentally, adolescents appear to use reappraisal less frequently Garnefski et al. (2002) and less successfully (McRae, Gross, et al., 2012; Silvers et al., 2012) than young adults. However, there are also several points of discrepancy between the two literatures. Men appear to demonstrate greater reappraisal success than women (McRae et al., 2008), although they tend to use reappraisal equally frequently as women (John & Gross, 2004). Even more of the literature is asymmetrical, having only measured ER frequency or ER success. For example, it is unknown whether the changes in suppression frequency observed in Eastern cultures (Matsumoto, 1990, 2006), during the transition to college (Srivastava et al., 2009) and during participation in alternative cultures (McRae, Misra, et al., 2011; Snyder et al., submitted), are also true of suppression success. Conversely, the literature on ER success has demonstrated that the success of reappraisal (McRae, Misra, et al., 2011) and distraction (Sheppes and Meiran 2008) depends on properties of the emotion to be regulated. It is not yet clear whether these same factors influence ER frequency.

I have outlined several ways in which new studies could eliminate confounds between both time scale and methods in order to make stronger conclusions about the constructs of ER frequency and ER success. Three specific opportunities for future research seem particularly promising. First, studies of long-term ER frequency should employ measures that do not require retrospection and summarization, such as daily diaries or experience sampling. Second, many existing paradigms can add a measure of short-term ER frequency by asking participants to report on their use of ER strategies (when instructed to use them or not). Finally, more studies of long-term ER success can be initiated, using a variety of measures of affective responding, over a longer time-course than is possible

in the laboratory. This could start with relatively simple long-term measures such as experience sampling and then grow to include more complex measures such as ambulatory physiological monitoring. Whenever possible, researchers should look for convergent evidence from both subjective and objective measures as well as measure both frequency and success. This will allow researchers to better understand when ER frequency and success converge and when they have distinct causes, correlates, and consequences.

A better understanding of the relationship between ER frequency and success, and when it changes, might be an important step toward the identification of ER profiles that help determine the best interventions for different individuals or groups. Fortunately, it has become clear that ER is at least somewhat malleable over time, which is heartening for the increasingly popular work done on interventions designed to improve ER frequency, ER success, or both. These interventions include traditional clinical interventions such as cognitive behavioral therapy or mindfulness based stress reduction, which commonly include modules targeted at ER (Beck & Dozois, 2011; Berking et al., 2008; Kumar, Feldman, & Hayes, 2008). Other interventions for clinical and nonclinical populations also target ER processes (Cameron, Booth, Schlatter, Ziginskas, & Harman, 2007; Cameron & Jago, 2008; Giese-Davis et al., 2002; Gratz & Gunderson, 2006; Kovacs et al., 2006). Examining the effect of these interventions on ER frequency and ER success, measured over multiple time scales, would be an exciting way to further the understanding of the precise way that interventions impact ER.

[1]It should be noted that ER can be used to increase, decrease, or change several types of emotion. However, because elevated negative affect may play an important role in affect and mood disorders, the use of ER to decrease negative affect has been of particular interest. To extrapolate to other types of ER goals, it is only necessary to ensure that ER success is measured by the degree to which affect is changed in accordance with one's ER goals.

Acknowledgment

My sincere thanks to Pareezad Zarolia and Erik Wing, who provided helpful comments on a draft of this manuscript.

Short Biography

Kateri McRae studies the interaction between emotion and cognition, with a particular focus on comparing different emotion regulation strategies, as well as the cognitive generation of emotion and emotional awareness. McRae uses an interdisciplinary, multi-measure approach to characterize emotional responding and cognitive processing using experimental approaches and correlational studies. McRae presently teaches and directs the laboratory for the study of automaticity, affect, control and thought (the AACT Lab) at the University of Denver. She holds a BA in Human Biology and Drama from Stanford University and a PhD in Psychology with an emphasis in Cognitive Neuroscience from the University of Arizona.

Endnote

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References

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, **30**(2), 217–237. doi: 10.1016/j.cpr.2009.11.004.

Beck, A. T., & Dozois, D. J. (2011). Cognitive therapy: Current status and future directions. *Annual Review of Medicine*, **62**, 397–409. doi: 10.1146/annurev-med-052209-100032.

Berking, M., Wupperman, P., Reichardt, A., Pejic, T., Dippel, A., & Znoj, H. (2008). Emotion-regulation skills as a treatment target in psychotherapy. *Behaviour Research and Therapy*, **46**(11), 1230–1237. doi: 10.1016/j.brat.2008.08.005.

Blair, K. S., Smith, B. W., Mitchell, D. G. V., Morton, J., Vythilingam, M., Pessoa, L., & Blair, R. J. R. (2007). Modulation of emotion by cognition and cognition by emotion. *NeuroImage*, **35**(1), 430–440. doi: 10.1016/j.neuroimage.2006.11.048.

Blanchard-Fields, F., Stein, R., & Watson, T. L. (2004). Age differences in emotion-regulation strategies in handling everyday problems. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, **59**(6), 261–269. doi: 10.1093/geronb/59.6.P261.

Brackett, M. A., & Mayer, J. D. (2003). Convergent, discriminant, and incremental validity of competing measures of emotional intelligence. *Personality and Social Psychology Bulletin*, **29**(9), 1147–1158. doi: 10.1177/0146167203254596.

Bradley, M. M., Miccoli, L., Escrig, M. A., & Lang, P. J. (2008). The pupil as a measure of emotional arousal and autonomic activation. *Psychophysiology*, **45**(4), 602–607. doi: 10.1016/j.neuroimage.2006.11.048.

Butler, E. A., Lee, T. L., & Gross, J. J. (2007). Emotion regulation and culture: Are the social consequences of emotion suppression culture-specific? *Emotion*, **7**(1), 30–48. doi: 10.1111/j.1469-8986.2008.00654.x.

Cameron, L. D., & Jago, L. (2008). Emotion regulation interventions: A common-sense model approach. *British Journal of Health Psychology*, **13**(2), 215–221. doi: 10.1348/135910708x288800.

Cameron, L. D., Booth, R. J., Schlatter, M., Ziginskas, D., & Harman, J. E. (2007). Changes in emotion regulation and psychological adjustment following use of a group psychosocial support program for women recently diagnosed with breast cancer. *Psycho-Oncology*, **16**(3), 171–180. doi: 10.1002/pon.1050.

Campbell-Sills, L., Barlow, D. H., Brown, T. A., & Hofmann, S. G. (2006). Acceptability and suppression of negative emotion in anxiety and mood disorders. *Emotion*, **6**(4), 587–595. doi: 10.1037/1528-3542.6.4.587.

Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, **56**, 267–283. doi: 10.1037/0022-3514.56.2.267.

Dillon, D. G., Ritchey, M., Johnson, B. D., & LaBar, K. S. (2007). Dissociable effects of conscious emotion regulation strategies on explicit and implicit memory. *Emotion*, **7**(2), 354–365. doi: 10.1037/1528-3542.7.2.354.

Drabant, E., McRae, K., Manuck, S., Hariri, A., & Gross, J. J. (2009). Individual differences in typical reappraisal use predict amygdala and prefrontal responses. *Biological Psychiatry*, **65**, 367–373.

Ehring, T., Tuschen-Caffier, B., Schnulle, J., Fischer, S., & Gross, J. J. (2010). Emotion regulation and vulnerability to depression: Spontaneous versus instructed use of emotion suppression and reappraisal. *Emotion*, **10**(4), 563–572. doi: 10.1037/a0019010.

Eippert, F., Veit, R., Weiskopf, N., Erb, M., Birbaumer, N., & Anders, S. (2007). Regulation of emotional responses elicited by threat-related stimuli. *Human Brain Mapping*, **28**(5), 409–423. doi: 10.1002/hbm.20291.

Etkin, A., Egner, T., Peraza, D. M., Kandel, E. R., & Hirsch, J. (2006). Resolving emotional conflict: A role for the rostral anterior cingulate cortex in modulating activity in the amygdala. *Neuron*, **51**(6), 871–882. doi: 10.1016/j.neuron.2006.07.029.

Folkman, S., & Lazarus, R. S. (1980). An analysis of coping in a middle-aged community sample. *Journal of Health and Social Behavior*, **21**(3), 219–239. doi: 10.2307/2136617.

Garnefski, N., Kraaij, V., & Spinhoven, P. (2001). Negative life events, cognitive emotion regulation and emotional problems. *Personality and Individual Differences*, **30**(8), 1311–1327. doi: 10.1016/s0191-8869(00)00113-6.

Garnefski, N., Legerstee, J., Kraaij, V., Van Den Kommer, T., & Teerds, J. A. N. (2002). Cognitive coping strategies and symptoms of depression and anxiety: A comparison between adolescents and adults. *Journal of Adolescence*, **25**(6), 603–611. doi: 10.1006/jado.2002.0507.

Giese-Davis, J., Koopman, C., Butler, L. D., Classen, C., Cordova, M., Fobair, P., & Spiegel, D. (2002). Change in emotion-regulation strategy for women with metastatic breast cancer following supportive-expressive group therapy. *Journal of Consulting and Clinical Psychology*, **70**(4), 916–925. doi: 10.1037/0022-006x.70.4.916.

Goldin, P. R., McRae, K., Ramel, W., & Gross, J. J. (2008). The neural bases of emotion regulation: Reappraisal and suppression of negative emotion. *Biological Psychiatry*, **63**(6), 577–586. doi: 10.1016/j.biopsych.2007.05.031.

Gratz, K. L., & Gunderson, J. G. (2006). Preliminary data on an acceptance-based emotion regulation group intervention for deliberate self-harm among women with borderline personality disorder. *Behavior Therapy*, **37**(1), 25–35. doi: 10.1016/j.biopsych.2007.05.031.

Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, (26), 41–54. doi: 10.1023/B:JOBA.0000007455.08539.94.

Grecucci, A., Giorgetta, C., van't Wout, M., Bonini, N., & Sanfey, A. G. (2012). Reappraising the ultimatum: An fMRI study of emotion regulation and decision making. *Cerebral Cortex*, doi: 10.1093/cercor/bhs028.

Gross, J. J. (1998a). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, **74**, 224–237. doi: 10.1037/0022-3514.74.1.224.

Gross, J. J. (1998b). The emerging field of emotion regulation: An integrative review. *Review of General Psychological*, **2**, 271–299. doi: 10.1037/1089-2680.2.3.271.

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, **85**, 348–362. doi: 10.1037/0022-3514.85.2.348.

Gross, J. J., & Thompson, R. A. (2007). Emotion regulation: Conceptual foundations. In J. J. Gross (Ed.), *Handbook of Emotion Regulation* (pp. 3–24). New York: Guilford Press.

Gross, J. J. (in press). Emotion regulation: Taking stock and moving forward. *Social Emotion*. doi: 10.1037/a0032135.

Gyurak, A., Gross, J. J., & Etkin, A. (2011). Explicit and implicit emotion regulation: A dual-process framework. *Cognition & Emotion*, **25**(3), 400–412. doi: 10.1080/02699931.2010.544160.

Haga, S., Kraft, P., & Corby, E.-K. (2009). Emotion regulation: Antecedents and well-being outcomes of cognitive reappraisal and expressive suppression in cross-cultural samples. *Journal of Happiness Studies*, **10**(3), 271–291. doi: 10.1007/s10902-007-9080-3.

Hajcak, G., & Nieuwenhuis, S. (2006). Reappraisal modulates the electrocortical response to unpleasant pictures. *Cognitive, Affective, & Behavioral Neuroscience*, **6**(4), 291–297. doi: 10.3758/cabn.6.4.291.

Hariri, A. R., Bookheimer, S. Y., & Mazziotta, J. C. (2000). Modulating emotional responses: Effects of a neocortical network on the limbic system. *NeuroReport*, **11**(1), 43–48. doi: 10.1097/00001756-200001170-00009.

Hayes, J. P., Morey, R. A., Petty, C. M., Seth, S., Smoski, M. J., Mccarthy, G., & LaBar, K. S. (2010). Staying cool when things get hot: Emotion regulation modulates neural mechanisms of memory encoding. [Original research]. *Frontiers in Human Neuroscience*, 4. doi: 10.3389/fnhum.2010.00230.

Hopp, H., Troy, A. S., & Mauss, I. B. (2011). The unconscious pursuit of emotion regulation: Implications for psychological health. *Cognition & Emotion*, **25**(3), 532–545. doi: 10.1080/02699931.2010.532606.

Jackson, D. C., Malmstadt, J. R., Larson, C. L., & Davidson, R. J. (2000). Suppression and enhancement of emotional responses to unpleasant pictures. *Psychophysiology*, **37**(4), 515–522. doi: 10.1017/S0048577200990401.

John, O. P., & Gross, J. J. (2004). Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. *Journal of Personality*, **72**(6), 1301–1334. doi: 10.1111/j.1467-6494.2004.00298.x.

Joormann, J., & Gotlib, I. H. (2009). Emotion regulation in depression: Relation to cognitive inhibition. *Cognition & Emotion*, **24**(2), 281–298. doi: 10.1080/02699930903407948.

Kalisch, R. (2009). The functional neuroanatomy of reappraisal: Time matters. *Neuroscience and Biobehavioral Reviews*, **33**(8), 1215–1226. doi: 10.1016/j.neubiorev.2009.06.003.

Kim, S. H., & Hamann, S. (2007). Neural correlates of positive and negative emotion regulation. *Journal of Cognitive Neuroscience*, **19**(5), 776–798. doi: 10.1162/jocn.2007.19.5.776.

Koriat, A., Melkman, R., Averill, J. R., & Lazarus, R. S. (1972). The self-control of emotional reactions to a stressful film. *Journal of Personality*, **40**, 601–619. doi: 10.1111/j.1467-6494.1972.tb00083.x.

Kovacs, M., Sherrill, J., George, C. J., Pollock, M., Tumuluru, R. V., & Ho, V. (2006). Contextual emotion-regulation therapy for childhood depression: Description and pilot testing of a new intervention. *Journal of the American Academy of Child & Adolescent Psychiatry*, **45**(8), 892–903. doi: 10.1097/01.chi.0000222878.74162.5a.

Kumar, S., Feldman, G., & Hayes, A. (2008). Changes in mindfulness and emotion regulation in an exposure-based cognitive therapy for depression. *Cognitive Therapy and Research*, **32**(6), 734–744. doi: 10.1007/s10608-008-9190-1.

Lane, R., Quinlan, D., Schwartz, G., Walker, P., & Zeitlin, S. (1990). The levels of emotional awareness scale: A cognitive-developmental measure of emotion. *Journal of Personality Assessment*, **55**(1–2): 124–134. doi: 10.1207/s15327752jpa5501&2_12.

Lazarus, R. S. (1966). *Psychological Stress and the Coping Process*. New York, NY: McGraw-Hill.

Lee, H., Shackman, A. J., Jackson, D. C., & Davidson, R. J. (2009). Test-retest reliability of voluntary emotion regulation. *Psychophysiology*, **46**(4), 874–879. doi: 10.1111/j.1469-8986.2009.00830.x.

Lieberman, M. D., Eisenberger, N. I., Crockett, M. J., Tom, S. M., Pfeifer, J. H., & Way, B. M. (2007). Putting feelings into words: Affect labeling disrupts amygdala activity in response to affective stimuli. *Psychological Science*, **18**(5), 421–428. doi: 10.1111/j.1467-9280.2007.01916.x.

Matsumoto, D. (1990). Cultural similarities and differences in display rules. *Motivation and Emotion*, **14**(3), 195–214. doi: 10.1007/BF00995569.

Matsumoto, D. (2006). Are cultural differences in emotion regulation mediated by personality traits? *Journal of Cross-Cultural Psychology*, **37**(4), 421–437. doi: 10.1177/0022022106288478.

Mauss, I. B., Bunge, S. A., & Gross, J. J. (2007). Automatic emotion regulation. *Social and Personality Psychology Compass*, **1**, 146–167. doi: 10.1111/j.1751-9004.2007.00005.x.

Mauss, I. B., Evers, C., Wilhelm, F. H., & Gross, J. J. (2006). How to bite your tongue without blowing your top: Implicit evaluation of emotion regulation predicts affective responding to anger provocation. *Personality and Social Psychology Bulletin*, **32**(5), 589–602. doi: 10.1177/0146167205283841.

McRae, K., Ochsner, K. N., & Gross, J. J. (2011). The reason in passion: A social cognitive neuroscience approach to emotion regulation. In K. Vohs & R. F. Baumeister (Eds). *Handbook of self regulation: Research, theory, and applications* 2nd ed., (pp. 186–203). New York, NY: Guilford Press.

McRae, K., Ciesielski, B. G., & Gross, J. J. (2012). Unpacking cognitive reappraisal: Goals, tactics, and outcomes. *Emotion*, **12**, 250–255. doi: 10.1037/a002635.

McRae, K., Gross, J. J., Weber, J., Robertson, E. R., Sokol-Hessner, P., Ray, R. D., & Ochsner, K. N. (2012). The development of emotion regulation: An fMRI study of cognitive reappraisal in children, adolescents and young adults. *Social Cognitive and Affective Neuroscience*, **7**(1), 11–22. doi: 10.1093/scan/nsr093.

McRae, K., Heller, S. M., John, O. P., & Gross, J. J. (2011). Context-dependent emotion regulation: Suppression and reappraisal at the Burning Man festival. *Basic and Applied Social Psychology*, **33**(4), 346–350. doi: 10.1080/01973533.2011.614170.

McRae, K., Hughes, B., Chopra, S., Gabrieli, J. D. E., Gross, J. J., & Ochsner, K. N. (2010). The neural bases of distraction and reappraisal. *Journal of Cognitive Neuroscience*, **22**(2), 248–262. doi: 10.1162/jocn.2009.21243.

McRae, K., Jacobs, S. E., Ray, R. D., John, O. P., & Gross, J. J. (2012). Individual differences in reappraisal ability: Links to reappraisal frequency, well-being, and cognitive control. *Journal of Research in Personality*, (46), 2–7. doi: 10.1016/j.jrp.2011.10.003.

McRae, K., Misra, S., Prasad, A. K., Pereira, S. C., & Gross, J. J. (2011). Bottom-up and top-down emotion generation: Implications for emotion regulation. *Social Cognitive and Affective Neuroscience*, doi: 10.1093/scan/nsq103.

McRae, K., Ochsner, K. N., & Gross, J. J. (forthcoming). The reason in passion: A social cognitive neuroscience approach to emotion regulation. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of Self-Regulation: Research, Theory and Applications*(2nd ed.). New York, NY: Guilford Press.

McRae, K., Ochsner, K. N., Mauss, I. B., Gabrieli, J. D. E., & Gross, J. J. (2008). Gender differences in emotion regulation: An fMRI study of cognitive reappraisal. *Group Processes and Intergroup Relations.*, **11**(2), 143–162. doi: 10.1177/1368430207088035.

McRae, K., Rekshen, W., Williams, L. E., Cooper, N. J., & Gross, J. J. (forthcoming). Effects of antidepressant medication on emotion regulation in depressed patients: An iSPOT-D report.

McRae, K., Taitano, E. K., & Lane, R. D. (2010). The effects of verbal labeling on psychophysiology: Objective but not subjective labeling reduces skin conductance responses to briefly presented pictures. *Cognition & Emotion.*, **5**, 829–839. doi: 10.1080/02699930902797141.

Moore, S. A., Zoellner, L. A., & Mollenholt, N. (2008). Are expressive suppression and cognitive reappraisal associated with stress-related symptoms? *Behaviour Research and Therapy*, **46**(9), 993–1000. doi: 10.1016/j.brat.2008.05.001.

Moser, J. S., Krompinger, J. W., Dietz, J., & Simons, R. F. (2009). Electrophysiological correlates of decreasing and increasing emotional responses to unpleasant pictures. *Psychophysiology*, **46**, 17–27. doi: 10.1111/j.1469-8986.2008.00721.x.

Nezlek, J. B., & Kuppens, P. (2008). Regulating positive and negative emotions in daily life. *Journal of Personality*, **76**(3), 561–580. doi: 10.1111/j.1467-6494.2008.00496.x.

Ochsner, K. N., & Gross, J. J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences*, **9**(5), 242–249. doi: 10.1016/j.tics.2005.03.010.

Ochsner, K. N., Bunge, S. A., Gross, J. J., & Gabrieli, J. D. E. (2002). Rethinking feelings: An fMRI study of the cognitive regulation of emotion. *Journal of Cognitive Neuroscience*, **14**, 1215–1229. doi: 10.1162/089892902760807212.

Ochsner, K. N., Ray, R. D., Cooper, J. C., Robertson, E. R., Chopra, S., Gabrieli, J. D. E., & Gross, J. J. (2004). For better or for worse: Neural systems supporting the cognitive down- and up-regulation of negative emotion. *NeuroImage*, **23**, 483–499. doi: 10.1016/j.neuroimage.2004.06.030.

Ochsner, K. N., Ray, R. R., Hughes, B., McRae, K., Cooper, J. C., Weber, J., & Gross, J. J. (2009). Bottom-up and top-down processes in emotion generation: Common and distinct neural mechanisms. *Psychological Science*, **20**(11), 1322–1331. doi: 10.1111/j.1467-9280.2009.02459.x.

Ochsner, K. N., Silvers, J. A., & Buhle, J. T. (2012). Functional imaging studies of emotion regulation: A synthetic review and evolving model of the cognitive control of emotion. *Annals of the New York Academy of Sciences*, **1251**, E1–E24.

Opitz, P. C., Rauch, L. C., Terry, D. P., & Urry, H. L. (2012). Prefrontal mediation of age differences in cognitive reappraisal. *Neurobiology of Aging*, **33**(4), 645–655. doi: 10.1016/j.neurobiolaging.2010.06.004.

Pe, M. L., & Kuppens, P. (2012). The dynamic interplay between emotions in daily life: Emotion augmentation, emotion blunting, and the role of appraisal overlap. *Emotion*, **12**, 1320–1328. doi: 10.1037/a0028262

Ray, R. D., McRae, K., Ochsner, K. N., & Gross, J. J. (2010). Cognitive reappraisal of negative affect: Converging evidence from EMG and self-report. *Emotion*, **10**(4), 587–592. doi: 10.1037/a0019015.

Richards, J. M. (2001). Emotion regulation and memory. *Dissertation Abstracts International: Section B: The Sciences & Engineering*, **61**(9-B), 5059.

Sheppes, G., & Gross, J. J. (2011). Is timing everything? Temporal considerations in emotion regulation. *Personality and Social Psychology Review*, doi: 10.1177/1088868310395778.

Sheppes, G., & Meiran, N. (2008). Divergent cognitive costs for online forms of reappraisal and distraction. *Emotion*, **8**(6), 870–874. doi: 2008-17541-014 [pii]10.1037/a0013711.

Shiota, M. N., & Levenson, R. W. (2009). Effects of aging on experimentally instructed detached reappraisal, positive reappraisal, and emotional behavior suppression. *Psychology and Aging*, **24**(4), 890–900. doi: 10.1037/a0017896.

Shiota, M. N., & Levenson, R. W. (2012). Turn down the volume or change the channel? Emotional effects of detached versus positive reappraisal. *Journal of Personality and Social Psychology*, **103**(3), 416.

Siegle, G. J., Steinhauer, S. R., Stenger, V. A., Konecky, R., & Carter, C. S. (2003). Use of concurrent pupil dilation assessment to inform interpretation and analysis of fMRI data. *NeuroImage*, **20**(1), 114–124. doi: 10.1016/s1053-8119(03)00298-2.

Silk, J. S., Steinberg, L., & Morris, A. S. (2003). Adolescents' emotion regulation in daily life: Links to depressive symptoms and problem behavior. *Child Development*, **74**(6), 1869–1880. doi: 10.1046/j.1467-8624.2003.00643.x.

Silvers, J. A., McRae, K., Gabrieli, J. D. E., Gross, J. J., Remy, K. A., & Ochsner, K. N. (2012). Age-related differences in emotional reactivity, regulation, and rejection sensitivity in adolescence. *Emotion*, 1235–1247. doi: 10.1037/a0028297.

Snyder, S. A., Heller, S. M., Lumian, D. S., & McRae, K. (submitted). Regulation of positive and negative emotion: Effects of sociocultural context. *Frontiers in Emotion Science*.

Sokol-Hessner, P., Hsu, M., Curley, N. G., Delgado, M. R., Camerer, C. F., & Phelps, E. A. (2009). Thinking like a trader selectively reduces individuals' loss aversion. *Proceedings of the National Academy of Sciences*, **106**(13), 5035–5040. doi: 10.1073/pnas.0806761106.

Srivastava, S., Tamir, M., McGonigal, K. M., John, O. P., & Gross, J. J. (2009). The social costs of emotional suppression: A prospective study of the transition to college. *Journal of Personality and Social Psychology*, **96**(4), 883–897. doi: 10.1037/a0014755.

Staudinger, M. R., Erk, S., Abler, B., & Walter, H. (2009). Cognitive reappraisal modulates expected value and prediction error encoding in the ventral striatum. *NeuroImage*, **47**(2), 713–721. doi: 10.1016/j.neuroimage.2009.04.095.

Tabibnia, G., Lieberman, M. D., & Craske, M. G. (2008). The lasting effect of words on feelings: Words may facilitate exposure effects to threatening images. *Emotion*, **8**, 307–317. doi: 10.1037/1528-3542.8.3.307.

Thiruchselvam, R., Blechert, J., Sheppes, G., Rydstrom, A., & Gross, J. J. (2011). The temporal dynamics of emotion regulation: An EEG study of distraction and reappraisal. *Biological Psychology*, **87**, 2. doi: 10.1016/j.biopsycho.2011.02.009.

Troy, A. S., Wilhelm, F. H., Shallcross, A. J., & Mauss, I. B. (2010). Seeing the silver lining: Cognitive reappraisal ability moderates the relationship between stress and depressive symptoms. *Emotion*, **10**, 783–795. doi: 10.1037/a0020262.

Urry, H. L., van Reekum, C. M., Johnstone, T., Kalin, N. H., Thurow, M. E., Schaefer, H. S., & Davidson, R. J. (2006). Amygdala and ventromedial prefrontal cortex are inversely coupled during regulation of negative affect and predict the diurnal pattern of cortisol secretion among older adults. *Jounal of Neuroscience*, **26**(16), 4415–4425. doi: 10.1523/jneurosci.3215-05.2006.

Wager, T. D., Davidson, M. L., Hughes, B. L., Lindquist, M. A., & Ochsner, K. N. (2008). Prefrontal-subcortical pathways mediating successful emotion regulation. *Neuron*, **59**(6), 1037–1050. doi: 10.1016/j.neuron.2008.09.006.

Wegner, D. M., Schneider, D. J., Carter, S., & White, T. (1987). Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology*, (53), 5–13. doi: 10.1037/0022-3514.53.1.5.

Williams, L. E., Bargh, J. A., Nocera, C. C., & Gray, J. R. (2009). The unconscious regulation of emotion: Nonconscious reappraisal goals modulate emotional reactivity. *Emotion*, **9**(6), 847–854. doi: 10.1037/a0017745.

Winecoff, A., LaBar, K. S., Madden, D. J., Cabeza, R., & Huettel, S. A. (2011). Cognitive and neural contributors to emotion regulation in aging. *Social Cognitive and Affective Neuroscience*, **6**(2), 165–176. doi: 10.1093/scan/nsq030.

