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Toward a Personalized Science of Emotion Regulation

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Abstract

The ability to successfully regulate emotion plays a key role in healthy development and the maintenance of psychological well-being. Although great strides have been made in understanding the nature of regulatory processes and the consequences of deploying them, a comprehensive understanding of emotion regulation that can specify what strategies are most beneficial for a given person in a given situation is still a far-off goal. In this review, we argue that moving toward this goal represents a central challenge for the future of the field. As an initial step, we propose a concrete framework that (i) explicitly considers emotion regulation as an interaction of person, situation, and strategy, (ii) assumes that regulatory effects vary according to these factors, and (iii) sets as a primary scientific goal the identification of person-, situation-, and strategy-based contingencies for successful emotion regulation. Guided by this framework, we review current questions facing the field, discuss examples of contextual variation in emotion regulation success, and offer practical suggestions for continued progress in this area.

Emotion regulation is central to emotional well-being and physical health. In the past 15 years, the literature exploring this ability has flourished, yielding a diverse body of research approaching the topic from multiple levels of analysis (Gross, 2015; Ochsner, Silvers, & Buhle, 2012). However, a key question for the science of emotion regulation has so far been little addressed: can we predict for particular people, in particular situations, which emotion regulation strategies will be most beneficial? Addressing this question is important both for constructing basic science models that accurately reflect the complexity of the natural world and for translational research, which by its nature is deeply concerned with identifying appropriate interventions for individuals who suffer emotion dysregulation in specific situations or in response to particular cues (Silvers, Buhle, & Ochsner, 2013).

To date, work on emotion regulation has been constrained in scope such that it cannot fully address this question. Existing research has built a model of emotion regulation predominantly by studying a particular population (e.g., healthy young adults) and a particular situation (e.g., normatively aversive films or images), via the use of particular strategies (e.g., reinterpreting the meaning of a film in order to feel less negative) (see Aldao, 2013; Gross, 2015). Limiting the variables at play when studying a phenomenon within the laboratory provides experimental control that is crucial for drawing inferences about whether it is possible for a variable to exert a causal effect. That said, the basic model that guides much contemporary emotion regulation research has now received strong support (Gross, 2015; Ochsner et al., 2012; Webb, Miles, & Sheeran, 2012), and researchers are beginning to move beyond it to formulate the next iteration of emotion regulation research.

As we see it, the most pressing goal for the future of this field will be to extend and test the boundaries of the basic model by estimating variation in core emotional and regulatory processes, with an eye toward identifying the conditions that support successful regulation of emotion. In this article, we consider how the field can move toward addressing these issues. In doing so, our aim is not to identify precisely which studies need to be conducted in the short term, but

rather to sketch out the form that such studies may take in the medium and long term. As detailed below, we argue for a theoretical approach that prioritizes the estimation of person-, situation-, and strategy-based variation in emotion regulation success and leverages novel methods for data collection and analysis in service of this overarching goal.

Emotion Regulation as a Person × Situation × Strategy Interaction

Theories in social psychology have long emphasized the interaction of persons and their social context, beginning with Kurt Lewin's field theory (1951), which posited that person and situation factors interact to produce behavior. One person by situation framework that has been a particularly influential framework is Mischel and Shoda's cognitive–affective processing system (CAPS) model (1995). According to the CAPS model, situations in the world elicit patterns of cognitive–affective processing units, and these units combine to generate behavior. Another influential framework, regulatory fit theory, focuses on the interaction between person and strategy, proposing that people can self-regulate most effectively when they pursue goals in a manner that fits (i.e., is consistent) with their chronic ways of regulating (Higgins, 2005).

Although emotion regulation is inherently an interaction of person, situation, and strategy factors, past research has focused more on main effects of each of these influences (e.g., benefits of a particular strategy as compared with others), and dominant models of emotion regulation have not foregrounded such interactions (see Aldao, 2013; Koole & Veenstra, 2015). Here, we argue that explicitly modeling emotion regulation as a person by situation by strategy interaction can provide direction for the growth of this field. A long-term goal of such an approach is the development of a family of models that can be applied to describe and explain the tremendous variability seen in instances of emotion regulation across different people, evocative situations, and regulatory strategies.

Emotion generation as a person × situation interaction

Before discussing regulation, it is useful to consider models of emotion generation and how they set the stage for our approach to emotion regulation. Fundamentally, an emotion represents the interaction of a person (or another organism) with an emotionally evocative situation. Consequently, an emotion is more than the sum of its parts: that is, person and situation factors exert both additive (i.e., main effect) and interactive influences on emotion generation.

In terms of main effects, people may vary in emotional reactivity (the intensity of their initial emotional reactions to the world) on a continuum from unreactive to hyper-reactive. Likewise, situations might vary in their potential to evoke intense responses, from mildly evocative (a shoelace becomes untied while walking) to extremely intense (you trip on the shoelace into oncoming traffic).

However, in contemporary theory, emotion generation is driven by an appraisal of the relevance of a situation to goals, and variability in emotional responding is driven by the interaction of situational features and appraisal tendencies (Barrett, Mesquita, Ochsner, & Gross, 2007; Ellsworth & Scherer, 2003; Lazarus, 1993). Simply put, where certain people are emotionally sensitive to particular situational dimensions, others are moved less, differently, or not at all (consider how an expert antique appraiser versus layperson approaches an estate sale). Thus, the emotion generation process reflects a particular form of person by situation interaction brought about via the operation of appraisal systems that are driven by past experiences as well as current and chronic goals and knowledge.

Emotion regulation as a person × situation × strategy interaction

Following this logic, if emotion generation is a person–situation interaction, then emotion regulation brings a third component into play – the regulation strategy. Emotion regulation entails encountering an evocative situation and regulating one's response to it using a particular strategy. An instance of regulation is successful, in the short term, if it brings about a desired emotional outcome and, more broadly, if it brings about longer-term well-being (McRae, 2013; Tamir, 2009). In addition to person and situation variables, whether an attempt to regulate succeeds depends on the characteristics of the strategy, which may have additive impact or may interact with person and situation influences. A commonly cited example of a regulatory main effect concerns the difference between *reappraisal*, a regulation strategy that involves reframing the meaning of an emotional stimulus, and *expressive suppression*, a regulation strategy that involves limiting behavioral displays of emotion. Reappraisal is often seen as the preferred strategy because (when used to down-regulate emotion) it can diminish behavioral, experiential, and autonomic measures of emotional response (Gross & Levenson, 1997). By contrast, expressive suppression impacts behavior and can also impact experience (albeit to lesser extent than reappraisal) but does so at the cost of increasing autonomic arousal and impairing memory (Davis, Senghas, Brandt, & Ochsner, 2010; Davis, Senghas, & Ochsner, 2009; Richards & Gross, 2000).

This is where the importance of examining interactive as opposed to additive (i.e., main) effects in the domain of emotion regulation becomes clear. For example, the benefits of reappraisal may be attenuated or reversed for particular people, or in particular situations. Specifically, when a distressing situation is controllable, it may be wise to change objective features of the situation (i.e., use a situation modification strategy) rather than use reappraisal to change the way the situation is interpreted. Supporting this idea, a recent study found that higher reappraisal ability predicted lower depressive symptoms for participants experiencing uncontrollable stressors, but, strikingly, actually predicted greater depressive symptoms for participants experiencing controllable stressors (Troy, Shallcross, & Mauss 2013). This pattern suggests that whether reappraisal is adaptive depends on the controllability of the situation it is being leveraged against, and raises the possibility that having high capacity to use reappraisal may lead people to apply it imprudently. Moreover, several studies suggest that the costs of expressive suppression are diminished or reversed for people whose cultural background values emotional restraint (Butler, Lee, & Gross, 2009; Soto, Perez, Kim, Lee, & Minnick, 2011).

In another example, a seminal line of research in self-regulation found that children's ability to delay gratification (i.e., to forgo a small immediate reward and wait for a larger one) at about four years of age prospectively predicted important outcomes later in life, like body mass in childhood (Francis & Sussman, 2009), SAT scores in adolescence (Shoda, Mischel, & Peake, 1990), and drug use in adulthood (Ayduk et al., 2000). Although the results of these studies are sometimes thought of as evidence for main effects of stable self-control ability, careful assessment of the relevant data shows that the predictive value of delay behavior is attenuated by a host of other factors, including gender (Francis & Sussman, 2009; Shoda et al., 1990), age (Francis & Sussman, 2009), tendency to anxiously expect rejection (Ayduk et al., 2000), and whether, in the delay task, a cognitive strategy for waiting was supplied or not (Shoda et al., 1990). Though little research has examined this possibility, there must also be cases in which self-control capacities are leveraged toward goals that are detrimental to overall well-being, like using drugs or committing crime in order to gain a social reward (see Rawn & Vohs, 2011) or avoiding the consumption of food in eating disorders (Steinglass et al., 2012).

Overall, this line of theorizing prompts the hypothesis that failure or success in emotion regulation may be characterized as emerging not from a context-free continuum of person-level regulatory ability but from a set of person by situation by strategy interactions (e.g., Person A tends to succeed with strategy A in situation A but fail with strategy A in situation B or strategy B in situation A).

The Person by Situation by Strategy Model

Given the breadth of work in emotion regulation, it is crucial to organize findings within an overarching framework. Nearly two decades ago, James Gross developed a process model of emotion regulation that has been tremendously influential for the growth of this field (Gross, 1998a). Primarily, the process model of emotion regulation is a description of categories or groups of emotion regulation strategies – situation selection, situation modification, attentional deployment, cognitive change, and response suppression – that are organized by the temporal stage of the emotion generation process that they target.

More recently, Ochsner and Gross (2014) and Gross (2015) have proposed an extension to this model that delineates the role of nested valuation cycles in the generation and regulation of emotion. From this perspective, emotion regulation unfolds iteratively over time but can be broken up into discrete temporal stages, including *identification* (of an opportunity to regulate emotion), *selection* (of a particular regulation strategy), and *implementation* (of a selected strategy) (see Gross, 2015). Here, we build on these ideas by situating them within an overarching framework delineating (i) the factors (i.e., sources of variability) that compose the person by situation by strategy context in which emotion regulation is embedded and (ii) the manner in which these contextual factors influence discrete temporal stages of the emotion regulation process.

1. **Sources of variability in emotion regulation.** According to our model, the effects of the regulation strategies identified by Gross (1998a) depend on measurable characteristics of the persons leveraging them and the situation(s) they are being leveraged against. That is, sources

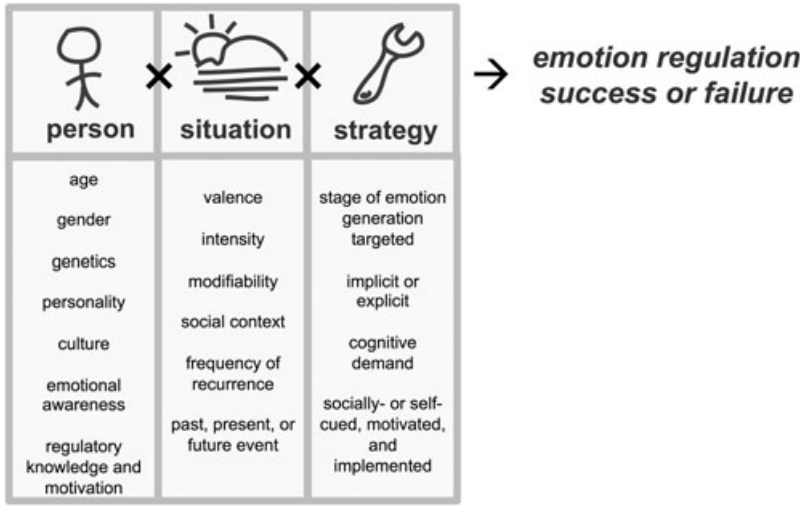

Figure 1 Model of sources of variability in emotion regulation success, including main effects of person, situation, and strategy factors as well as their interactions (listed factors are meant to be illustrative rather than exhaustive). Whether a particular strategy (e.g., distraction, reappraisal, or expressive suppression) leads to successful regulation depends on the characteristics of the person leveraging it and the situation it is leveraged against.

of variability in emotion regulation success consist of main effects of person, situation, and strategy, as well as their interactions.

In Figure 1, we provide examples of person, situation, and strategy factors that are likely to have additive and interactive influences on emotion regulation success, meant to be illustrative rather than comprehensive. Our current understanding suggests that the impact of a given variable, like age (a person variable), on emotion response channels will depend on the other variables (in this case, situation and strategy). Because our ultimate goal is to generalize our models to all people, across all emotional situations and all regulatory strategies, it is important to assess these variables comprehensively as a field, even though such an ambition is impossible for any particular study.

An example of a person by situation interaction is apparent in comparing reappraisal of aversive and appetitive stimuli in children. Recent work from our laboratory has revealed that children are more successful when reappraising appetitive food stimuli than when reappraising aversive social stimuli (Silvers, Shu, Hubbard, Weber, & Ochsner, 2015; Silvers, Wager, Weber, & Ochsner, 2014; Silvers et al., 2012). These findings have at least two possible explanations. One explanation is that developing neurobiology allows for prefrontal regulation of subcortical structures involved in generating appetitive responses before regulation of regions involved in generating aversive responses (see Fareri et al., in press; Gabard-Durnam et al., 2014). Another possible explanation is that children have more experience interpreting food cues than they do with negative social situations and this experience facilitates better regulation (i.e., children eat food every day of their lives but encounter negative social situations less frequently). These possibilities could be tested by examining whether repeated practice with reappraising aversive social cues improves children's reappraisal ability. If practice makes children look more "adultlike" in their ability to reappraise, this would suggest that a lack of familiarity with regulating negative emotions underlies age effects rather than an absolute biological constraint.

2. **Dynamics of person, situation, and strategy influences**. Building from the extended process model (Gross, 2015), we represent three distinct temporal stages where person, situation, and strategy variables may exert additive and interactive influence (Table 1): first, when *identifying* an opportunity to regulate; second, when *selecting* a particular regulation

Table 1. Descriptions of person, situation, and strategy main effects and two-way interactions manifest within identification, selection, and implementation stages of emotion regulation.

	identification →	selection →	implementation
person *some people…*	are more motivated or able to identify regulation opportunities	are more likely to choose to regulate	are capable of more effective implementation
situation *some situations…*	are more readily recognized as regulation opportunities	encourage the choice to regulate	lead to more effective implementation
strategy *some strategies…*	enhance identification of regulation opportunities	are preferred over others	are more effective than others
person×situation *for some people, certain situations…*	are more readily recognized as regulation opportunities	encourage the choice to regulate	lead to more effective implementation
person×strategy *for some people, certain strategies…*	enhance identification of regulation opportunities	are preferred over others	are more effective than others
situation×strategy *for some situations, certain strategies…*	enhance identification of regulation opportunities	are preferred over others	are more effective than others

strategy; and, third, when *implementing* a selected strategy. These three stages of emotion regulation form the columns of Table 1, and the rows specify the kinds of person, situation, and strategy factors that can influence these stages. The first three rows consist of person, situation, and strategy main effects that influence emotion regulation via the identification, selection, or implementation, collapsing across other variables. The next three rows consist of two-way interactions of these factors, including person by situation interactions (which specify situations that lend themselves to successful regulation for particular people), person by strategy interactions (which specify the strategies that "fit", or work best for particular people), and situation by strategy interactions (which specify the strategies that "fit", or work best for particular situations). Although most existing studies have focused on main effects, in Table 2, we provide illustrative examples of studies that have looked at main effects and interactions of person, situation, and strategy factors (in black), as well as hypotheses for future research (in grey italics).

Measuring person, situation, and strategy-based variation

In Table 3, we illustrate the design of three characteristic investigations of emotion regulation that illustrate the impact of design choices on outcomes and inference. In the first, Gross (1998b) held person and situation variables constant in order to reveal a main effect difference between reappraisal and expressive suppression (reappraisal evoked greater decrease in emotional response to a disgusting film). In the second, Troy et al. (2013) held

Table 2. Recent findings (in black) and hypotheses for future work (in grey italics) that illustrate person by situation, person by strategy, and situation by strategy interactions in emotion regulation.

	identification →	selection →	implementation
person×situation *Which situations "fit" for particular people?*	people high in agreeableness perceive hostile contexts as an opportunity to diminish anger (Meier, Wilkowksi & Robinson, 2006)	*people who believe positive emotions are malleable may choose to regulate them more*	young children show less ability to regulate responses to aversive, but not appetitive stimuli (Silvers et al., 2012; Silvers et al., 2014)
person×strategy *Which strategies "fit" for particular people?*	*people trained in a particular strategy may show enhanced recognition of opportunities to apply it*	people low in reappraisal ability may rely on non-reappraisal strategies where they are appropriate (Troy, Shallcross, & Mauss, 2013)	people whose cultural background values emotional restraint show fewer costs of expressive suppression (Butler, Lee, & Gross, 2009; Soto et al., 2011)
situation×strategy *Which strategies "fit" for particular situations?*	social regulation: other people can help identify opportunities to use reappraisal (Morris, Schueller, & Picard, 2015)	distraction is preferred over reappraisal for highly aversive stimuli (Sheppes, Scheibe, & Gross, 2011) *situation modification may be preferred for controllable situations*	reappraisal may be impaired in highly stressful situations (Raio et al., 2013) reappraisal leads to more long-lasting change than distraction (Kross & Ayduk, 2008; Denny et al., in press)

Table 3. Characteristic studies of emotion regulation that have applied one-way and two-way factorial designs.

	person	situation	strategy	
Gross, 1998	young adults	disgust-inducing	reappraisal vs expressive suppression	***2 factors constant, 1 factor varies***
Troy, Shallcross, & Mauss, 2013	adults high in reappraisal ability vs adults low in reappraisal ability	modifiable life stressors vs unmodifiable life stressors	reappraisal	***1 factor constant, 2 factors vary***
Silvers et al., 2012 & 2014	children vs adolescents vs young adults	aversive images vs appetitive images	reappraisal	

strategy constant and measured variability in person and situation factors to reveal a two-way interaction effect (high reappraisal ability was helpful for uncontrollable stressors but harmful for controllable stressors). In the third, across two studies, Silvers and colleagues (2012, 2014) held strategy constant and asked people of different ages to reappraise both aversive or appetitive stimuli, revealing an interaction-like pattern (relative to adults, children were impaired at reappraising aversive but not appetitive stimuli). Studies that incorporate two-way interactions of person and situation may inform whether it is advisable to recommend a strategy (like reappraisal) for particular people in particular situations. Moreover, studies that simultaneously model all three sources of variability can reveal three-way interactions informing which strategies are particularly advisable (relative to other strategies) for certain people in certain situations.

The value of an interactionist approach to emotion regulation

In considering and estimating the kinds of interactions in Table 1, we move from a science focused on describing population averages (i.e., behaviors and processes that are apparent when averaging across studied people and situations) to one focused on describing and understanding person-specific processes whose operation varies as a function of context. Just as approaches to *personalized medicine* focus on tailoring medical treatment to the characteristics, goals, and abilities of individuals by drawing on a knowledge base that is grounded in contextual dependencies (e.g., Hamburg & Collins, 2010), a *personalized science of emotion regulation* may be able to make better contact with regulatory attempts in real-world contexts, for both healthy and clinical populations.

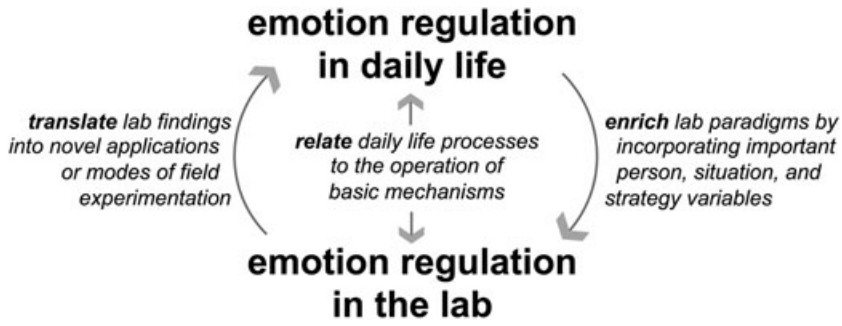

Figure 2 Model of the knowledge generation process in emotion regulation research. Scientists generate knowledge by enriching lab paradigms, translating lab findings, and relating daily life processes to underlying mechanisms.

Along with its potential value, this approach brings new compromises. In its extreme form, the interactionist approach entails shelving questions like, "Which regulation strategy is best?" in favor of a theoretical stance that assumes context-varying regulatory effects as a basic tenet and holds as a primary scientific goal the identification of the person, situation, and strategy contingencies for this variation (see Gross, 2015). In doing so, contributors to this field may avoid what Bonanno and Burton (2013) call "the fallacy of uniform efficacy" or what Gelman (2014) more generally refers to as "the presumption of constant effects" that can be implicit in traditional approaches to research design and analysis.

Building a Knowledge Base That is Grounded in Interactive Processes

Our overarching question for the remainder of this article is as such: how do we build a knowledge base that can shed light on the person by situation by strategy interactions that constitute emotion regulation? To address this question, we reflect on how the field generates knowledge about emotion regulation, review prior research that demonstrates or suggests important interaction effects, and offer suggestions for future progress.

Practical directions

Scientific knowledge about emotion regulation comes from two sources – observation of emotion regulation in daily life and observation of emotion regulation in lab studies in which we manipulate and measure particular variables. In Figure 2, we schematize this knowledge generation process, highlighting reciprocal influences between these two sources of information and identifying sub-processes instantiated in particular kinds of empirical studies. With these reciprocal influences in mind, an interactionist approach to emotion regulation suggests three kinds of directions for future research.

1. **Enrich lab paradigms by incorporating important person, situation, and strategy variables.** Important advances will come from modifications to lab paradigms that seek to incorporate variables that are inherent to emotion regulation but are not modeled in current lab tasks and paradigms. There are at least three kinds of variables that may be important but are currently understudied.

Person-level variables. A crucial direction for future work will be to quantify variability in emotion regulation *capacity* (i.e., strategy implementation) and *tendency* (i.e., identification and strategy selection) from person to person and ask how much of this variability can be understood with reference to person-level variables like age, personality, and psychopathology. Capacity refers to what people are capable of doing to regulate their emotions, which has been studied by

instructing participants how and when to use specific regulatory strategies (see Buhle et al., 2014; Webb et al., 2012). Tendency refers to what people *tend* to do when allowed to choose whether and how to regulate, which has been studied by observing regulatory behaviors or asking participants to report on them (all in the absence of explicit instructions to regulate; see Aldao, Nolen-Hoeksema, & Schweizer, 2010; Gross & John, 2003; Moore, Zoellner, & Mollenholt, 2008). The theoretical distinction between regulatory capacities and tendencies is inherently linked to the idea of person by situation interactions, in that regulatory tendencies are governed by situational contingencies that specify when particular strategic capacities are deployed.

The capacity versus tendency issue may be particularly relevant to questions about emotion regulation across the lifespan. For example, when children display less regulated emotional behavior than adults, this could be due to them being less inclined to less regulate, less capable of regulating, or both. Questionnaire and behavioral measures have revealed that individuals exhibit greater meta-cognitive awareness of regulatory strategies (Mischel & Mischel, 1987), greater tendency to use cognitive strategies (Garnefski, Legerstee, Kraaij, van den Kommer, & Teerds, 2002; Williams & McGillicuddy-De Lisi, 1999), and greater emotion regulatory capacity on lab-based cognitive regulation paradigms (Silvers et al., 2012) from childhood to adolescence and adulthood. While little work has tested whether regulatory capacity and tendency co-develop or whether one informs the other, there is some evidence to suggest capacity can precede tendency. For example, the work by Mischel and colleagues has revealed that children as young as 4 years can cognitively transform a tempting treat when instructed to do so and can wait longer for the said treat when it is out of sight, yet children do not endorse such strategies as being useful until years later (Mischel & Mischel, 1987; Moore, Mischel, & Zeiss, 1976; Yates & Mischel, 1979).

From young to older adulthood, a paradox has been noted: although there is decline in prefrontal regions and the cognitive abilities associated with them, older age is associated with reliable increases in positive emotion and well-being (Carstensen et al., 2011; Mather, 2012). A key question here is to what extent the 'rosy glow' of older age reflects changes in the changes in the capacity for particular regulatory strategies (i.e., strategy implementation), changes in the tendency to deploy them (i.e., identification and selection), or some combination of the two. Studies have begun to address this issue by examining two strategies in particular – attentional control and reappraisal. On the attention side, it appears that older adults have both spared capacity to redirect and/or control the focus of their attention to regulate their emotion and may tend to spontaneously use this strategy to look away from unpleasant and toward pleasant stimuli (Isaacowitz, Wadlinger, Goren, & Wilson, 2006; Mather, 2012; Tucker, Feuerstein, Mende-Siedlecki, Ochsner, & Stern, 2012). On the reappraisal side, older adults might be more likely to reappraise, but their capacity to do so effectively may depend on the specific goals they have when reappraising. Older adults show lesser ability to down-regulate negative emotion (e.g., Shiota & Levenson, 2009; Winecoff, LaBar, Madden, Cabeza, & Huettel, 2011) but spared ability to enhance positive emotion via reappraisal (Shiota & Levenson, 2009). Together, these data suggest that whether older adults are successful or struggle when attempting to regulate may depend upon the strategy they deploy and their goals for regulation.

Beyond age, many other person-level variables may influence the success or failure of particular instances of emotion regulation, including gender (e.g., McRae, Ochsner, Mauss, Gabrieli, & Gross, 2008), personality (e.g., Widiger, 2011; Wilkowski & Robinson, 2010), cultural background (e.g., Soto et al., 2011), and emotional awareness (e.g., Hill & Updegraff, 2012). Though less studied, people may also vary appreciably in their knowledge of, motivation for, and skill with emotion regulation.

Situation-level variables. In addition to person-level variability, it's important to identify variability along situational dimensions and to ask what consequences this variability has for our general understanding of regulatory processes. While ecological momentary assessment (EMA) methods are well-suited to tracking people as they navigate different situations, many important situational variables can also be profitably modeled in lab paradigms, enabling identification of basic brain mechanisms that track situational change.

One situational variable that may be particularly important is stress level at the time of an emotional encounter. Acute exposure to stress is known to impact prefrontal cortex function and to disrupt performance in cognitive control tasks (Alexander, Hillier, Smith, Tivarus, & Beversdorf, 2007; Arnsten, 2009), and a recent investigation showed a pattern of results consistent with the idea that acute stress impairs participants' ability to deploy cognitive resources to reappraise aversive stimuli (Raio et al., 2013). While this result fits with those of an imaging study showing that social stress impairs prefrontal function and a measure of cognitive control (van Ast et al., 2014) that may depend upon some of the same mechanisms as reappraisal (Ochsner et al., 2012), it didn't make clear whether stress increased the strength of emotional reactions, impaired regulatory ability, or some combination of both. Disentangling these possibilities will be a key direction for future research.

Another important but understudied situational factor is whether the evocative stimulus will be encountered only once or if it will be re-encountered in the future. This variable is relevant for understanding whether a given regulation strategy can have durable effects (e.g., Denny, Inhoff, Zerubavel, Davachi, & Ochsner, 2015) and whether the ability to deploy a given regulation strategy effectively can be trained via practice (e.g., Denny & Ochsner, 2014). Though only a handful of studies have examined these questions, the existing literature indicates that reappraisal can lead to decreases in brain measures of emotional responding across both short-term (e.g., 30 minutes) and longer-term (e.g., one week) delays (Denny et al., 2015; Erk et al., 2010; Silvers et al., 2014). Because strategies like distraction and expressive suppression are unlikely to cause long-term change in affective representations, this suggests that reappraisal is preferable for situations where lasting change is desired (see Denny et al., 2015; Kross & Ayduk, 2008; Sheppes et al., 2014).

Among other fundamental situational differences that could prove important are the valence (e.g., Quoidbach, Berry, Hansenne, & Mikolajczak, 2010), intensity (e.g., Sheppes, Catran, & Meiran, 2009), and category of emotion elicited (e.g., Rivers, Brackett, Katulak, & Salovey, 2007), as well as the social content (e.g., Silvers et al., 2012), controllability (e.g., Troy et al., 2013), and time and distance from the evocative event (e.g., Doré, Ort, Braverman, & Ochsner, 2015).

Strategy-level variables. A third crucial source of variability is the regulation strategy that is applied to regulate the emotional response. As noted earlier, one well-developed body of work has contrasted expressive suppression, which targets the behavioral display of emotion, to reappraisal, which targets evaluations of the meaning of negative stimuli. Although between-strategy differences are clearly important, it may be just as important to consider within-strategy differences in the *tactics* that are used in the service of a given strategy. For example, within the context of reappraising negative experiences, we can distinguish *positive reappraisal* tactics, used to enhance positive feelings by finding positive aspects or implications of negative situations, and *neutralizing reappraisal* tactics, used to dampen negative feelings by focusing on neutral aspects or implications of negative situations (McRae, Ciesielski, & Gross, 2012; Mauss & McRae, in press).

Recent work in our lab has contrasted positive and neutralizing tactics in terms of their immediate and long-term effects on the informational content and emotional impact of

negative autobiographical memories (Doré & Ochsner, under review). In this article, we found that positive and neutralizing reappraisal evoke long-term change in fundamentally different ways – positive reappraisal entails imbuing memories with a "silver lining" via the sustained addition of new positively valenced information, whereas neutralizing reappraisal entails taking a more distant psychological perspective on the events of a memory in order to decouple one's emotional response from the (comparatively) unchanged emotional memory content. This pattern of results suggests that these two strategies operate via distinct mechanisms and have distinct effects, raising the possibility that they may be more effectively leveraged for particular classes of evocative situations (e.g., those that contain some degree of positively valenced content or implication), a hypothesis that could be tested in future work.

Many theoretically meaningful strategy-related differences have received little empirical attention, including whether application of a strategy is intrinsically or extrinsically motivated, whether it is cued and implemented by the self or by another person (see Reeck, Ames, & Ochsner, 2016; Zaki & Williams, 2013), and whether it is motivated, cued, and/or implemented in a relatively explicit or implicit manner (see Gyurak, Gross, & Etkin, 2011; Mauss, Bunge, & Gross, 2007).

4. **Translate lab findings into novel applications and modes of field experimentation.** As the experimental study of emotion regulation becomes increasingly mature, we will be able to move toward careful translation of findings, ideas, and techniques into real-world contexts, including novel applications and novel modes of field research. In field studies of emotion regulation, we can apply observational methods to better characterize spontaneous regulatory tendencies and apply experimental manipulations in the field in order to identify capacities that are sustained over time and evoked in a natural context.

A recent project from Morris and Picard (2014) combined translation and field experimentation to develop and evaluate of a novel online intervention – the *Panoply* application – which administers emotion regulation training and social support by crowdsourcing reappraisals and empathic responses from other trained users of the application. Relative to a control platform that facilitated expressive writing, Panoply led to larger increases in reappraisal use for people who were higher in depression at baseline, indicating an interaction such that socially oriented forms of emotion regulation training may be particularly beneficial for people with higher levels of depression (Morris, Schueller, & Picard, 2015).

Relate daily life processes to the operation of basic mechanisms. Although most studies focus exclusively on either lab-based or daily life processes, empirical connections between naturalistic and lab instances of emotion regulation can be made in a single article, and even within the same subjects. The importance of this kind of work has been pointed out by other theorists (Aldao, Sheppes, & Gross, 2014; Berkman & Falk, 2013), and empirical study has increasingly attended to testing lab-life associations. In principle, any article relating lab-based behavioral or brain results to retrospective questionnaires enhances our knowledge of such associations, but the combination of lab measures with EMA methods or other ambulatory assessments show particular promise in this regard. By collapsing across measurements collected for particular persons, EMA can be used to ask individual difference questions, adding to and validating the extant questionnaire-based literature, and by considering each person's deflection from baseline across different situations, these methods can also be used to ask situation-focused questions more directly than questionnaire or lab studies (see Bolger, Davis, & Rafaeli, 2003; Brans, Koval, Verduyn, Lim, & Kuppens, 2013; Nezlek & Kuppens, 2008).

In a recent example from our lab, we used a Twitter dataset to identify patterns of emotional word use in response to a national tragedy (the Sandy Hook Elementary School shooting) over space and time. Although sadness words decreased with time and spatial distance, anxiety words showed the opposite pattern, associated with increases in words reflecting causal thinking. Moreover, increased feelings of anxiety were driven by perceptions that the causes of this event are unresolved (Doré et al., 2015). This pattern suggests that the modulation of emotion that occurs over time and space can be attributed in part to top-down cognitive processes (i.e. abstract causal thinking) that diminish sadness while simultaneously increasing other emotions, like anxiety.

Methodological and analytic considerations

A person-centered science of emotion regulation, even more so than the group-average centered approach dominant in the past, will benefit from the application of modern tools for data collection and analysis. Below, we highlight two important considerations: greater diversity in the kinds of data leveraged and a shift in statistical focus toward the estimation of effect sizes with uncertainty and variation.

Expanding the psychology lab. Practical considerations inherent in conducting a psychology study have changed dramatically in the past ten years, and we expect that they will continue to do so (see Yarkoni, 2012). For example, the emergence of Internet-based sampling has facilitated efficient access to large and diverse samples of participants. Moreover, as people's interactions with the world become increasingly intertwined with their use of the Internet, new opportunities will emerge for the collection of psychologically relevant records of actual behavior across life contexts (Gosling & Mason, 2015).

Embracing the "new statistics": estimation with variation. An interactive approach to person, situation, and strategy sources of variability in emotion regulation aligns well with recent examinations of and recommendations for statistical practice in psychology (Cumming, 2013; Gelman & Carlin, 2014; Simmons, Nelson, & Simonsohn, 2011). In particular, we expect that the future of emotion regulation will move gradually away from statistical approaches that seek to categorically accept or reject hypotheses about the existence of a particular regulatory effect and toward approaches that seek to estimate the magnitude of theoretically motivated interactions. Because detecting context-varying effects (i.e., interactions) typically requires more statistical power than detecting main effects, we also expect that studies will move gradually to include larger samples of people and more measurements per person.

Multilevel approaches to data analysis are particularly well-suited to the estimation of context-varying effects, because they can incorporate random effect terms allowing effects of interest to vary from person to person (Bolger & Laurenceau, 2013; Gelman & Hill, 2006). With these models, we can ask which documented emotion regulation effects are true for nearly everyone and which are characterized by more variability, even before we have identified the factors that generate this variability. A recent investigation used a multilevel technique (latent class analysis) to characterize person-specific patterns of strategy use, finding that elevated use of regulation strategies overall, and elevated use of avoidance and rumination strategies in particular, was associated with psychopathology symptoms (Dixon-Gordon, Aldao, & De Los Reyes, 2014).

Another strength of multilevel modeling is that it can reveal that relationships of interest are different at between- and within-person levels. In a recent example from our lab (Silvers, Wager, Weber, & Ochsner, 2015), we sought to examine the neural mechanisms that underlie spontaneous variation in negative affect felt in response to aversive images. In a between-person

analysis, we found that people with lower average levels of negative affect more strongly recruited ventromedial prefrontal cortex (vmPFC), a region known to support contextual updating of affective value (Roy, Shohamy, & Wager, 2012), including signaling a state of safety and extinguishing conditioned fear (Schiller & Delgado, 2010). In a within-person analysis, we found that lower levels of negative affect on a given trial were associated with lateral and medial prefrontal activity, whereas higher negative affect ratings were associated with amygdala activity. These within-person effects closely resemble the brain activity associated with instructed reappraisal – suggesting that phasic changes in these regions may reflect spontaneous engagement of resources for cognitive emotion regulation (Buhle et al., 2014). In this and other cases, parceling out within- and between-person sources of variability can lead to new scientific insights, avoid the erroneous assumption that variation from person to person follows the same rules as variation from situation to situation, and serve theoretical movement toward person-centered paradigms in the neuroscience and psychology of emotion regulation.

Conclusion

As emotion regulation research continues to mature, it is becoming clear that the utility of any given regulation strategy will depend on the characteristics of the person leveraging it and the evocative situation it is being leveraged against. Here, we provide a model of the person, situation, and strategy influences on discrete temporal stages of the emotion regulation process. We suggest that an overarching scientific framework in which these contextual dependencies are foregrounded can serve to integrate basic and translational approaches to studying emotion regulation. We hope that such a framework can usefully guide observational and experimental approaches to field and lab research, aid in the development of a comprehensive model of emotion regulation with transportable relevance, and eventually give rise to a nuanced understanding of the factors that set the stage for emotion regulation success or failure.

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Short Biographies

Bruce Doré is a PhD candidate in psychology at Columbia University. In his research, he uses behavioral, neuroimaging, and large-scale observational methods to ask questions about the motivational, cognitive, and brain processes that determine how we respond to and recover from emotional events. Bruce graduated with the highest honors with a BSc in Psychology from University of Guelph, where he completed his undergraduate thesis on rodent models of conditioned discussed with Dr Linda Parker. His PhD research investigates the psychological and brain mechanisms that underlie our ability to find positive meaning in negative life experiences, the motivational factors that influence when and how we choose to regulate our emotions, and how these mechanisms and motivations change from young to older adulthood.

Using a combination of behavioral and neuroimaging approaches, Jennifer Silvers' research focuses on how cognitive strategies and social influences regulate emotion across the lifespan. Dr Silvers graduated receiving a BA in Psychology and Cognitive Science from University of Virginia, where she conducted her undergraduate thesis with Dr Jonathan Haidt. Dr Silvers received a PhD in Psychology from Columbia University, where she worked with Dr Kevin Ochsner and collaborated with Dr Walter Mischel and Dr B. J. Casey studying the neural bases

of emotion regulation across child and adolescent development. Dr Silvers subsequently completed postdoctoral research examining caregiving influences on emotional development with Dr Nim Tottenham at Columbia University. Dr Silvers is currently an assistant professor in the Department of Psychology at University of California-Los Angeles.

Kevin Ochsner is a professor and director of Graduate Studies in the Department of Psychology at Columbia University. Dr Ochsner graduated summa cum laude with a BA in Psychology from University of Illinois. He then received an MA and PhD in psychology from Harvard University working in the laboratory of Dr Daniel Schacter, where he studied emotion and memory. Also at Harvard, he began his postdoctoral training in the lab of Dr Daniel Gilbert, where he first began integrating social cognitive and neuroscience approaches to emotion-cognition interactions, and along with Matthew Lieberman published the first articles on the emerging field of Social Cognitive Neuroscience. Dr Ochsner later completed his postdoctoral training at Stanford University in the lab of Dr John Gabrieli, where he conducted some of the first in functional neuroimaging studies examining the brain systems supporting cognitive forms of regulation. He is now the director of the Social Cognitive and Affective Neuroscience Laboratory at Columbia University, whose goal is to understand the inter-relationships of emotion, social behavior, and self-control and their contributions to mental health and mental illness across the lifespan. Current work uses a combination of behavioral and biological methods to ask questions about emotion regulation and empathy, how they develop during adolescence and change as we age, and how they might be problematic in clinical populations. Dr Ochsner has received various awards for his research and teaching, including the American Psychological Association's New Investigator Award, the Cognitive Neuroscience Society's Young Investigator Award, and Columbia University's Lenfest Distinguished Faculty Award.

Note

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References

Aldao, A. (2013). The future of emotion regulation research capturing context. *Perspectives on Psychological Science*, **8**(2), 155–172.

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

Aldao, A., Sheppes, G., & Gross, J. J. (2014). Emotion regulation flexibility. *Cognitive Therapy and Research*, **38**(6), 263–278.

Alexander, J. K., Hillier, A., Smith, R. M., Tivarus, M. E., & Beversdorf, D. Q. (2007). Beta-adrenergic modulation of cognitive flexibility during stress. *Journal of Cognitive Neuroscience*, **19**(3), 468–478.

Arnsten, A. F. (2009). Stress signalling pathways that impair prefrontal cortex structure and function. *Nature Reviews Neuroscience*, **10**(6), 410–422.

Ayduk, O., Mendoza-Denton, R., Mischel, W., Downey, G., Peake, P. K., & Rodriguez, M. (2000). Regulating the interpersonal self: Strategic self-regulation for coping with rejection sensitivity. *Journal of Personality and Social Psychology*, **79**(5), 776–792.

Barrett, L. F., Mesquita, B., Ochsner, K. N., & Gross, J. J. (2007). The experience of emotion. *Annual Review of Psychology*, **58**, 373–403.

Berkman, E. T., & Falk, E. B. (2013). Beyond brain mapping using neural measures to predict real-world outcomes. *Current Directions in Psychological Science*, **22**(1), 45–50.

Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology*, **54**(1), 579–616.

Bolger, N., & Laurenceau, J. P. (2013). *Intensive longitudinal methods: An introduction to diary and experience sampling research.* New York: Guilford.

Bonanno, G. A., & Burton, C. L. (2013). Regulatory flexibility an individual differences perspective on coping and emotion regulation. *Perspectives on Psychological Science*, **8**(6), 591–612.

Brans, K., Koval, P., Verduyn, P., Lim, Y. L., & Kuppens, P. (2013). The regulation of negative and positive affect in daily life. *Emotion*, **13**(5), 926–939.

Buhle, J. T., Silvers, J. A., Wager, T. D., Lopez, R., Onyemekwu, C., Kober, H., … & Ochsner, K. N. (2014). Cognitive reappraisal of emotion: A meta-analysis of human neuroimaging studies. *Cerebral Cortex*, **24**(11), 2981–2990.

Butler, E. A., Lee, T. L., & Gross, J. J. (2009). Does expressing your emotions raise or lower your blood pressure? The answer depends on cultural context. *Journal of Cross-Cultural Psychology*, **40**(3), 510–517.

Carstensen, L. L., Turan, B., Scheibe, S., Ram, N., Ersner-Hershfield, H., Samanez-Larkin, G. R., … & Nesselroade, J. R. (2011). Emotional experience improves with age: Evidence based on over 10 years of experience sampling. *Psychology and Aging*, **26**(1), 21–33.

Cumming, G. (2013). The new statistics: Why and how. *Psychological Science*, **25**(1): 7–29.

Davis, J. I., Senghas, A., Brandt, F., & Ochsner, K. N. (2010). The effects of BOTOX injections on emotional experience. *Emotion*, **10**(3), 433–440.

Davis, J. I., Senghas, A., & Ochsner, K. N. (2009). How does facial feedback modulate emotional experience? *Journal of Research in Personality*, **43**(5), 822–829.

Denny, B. T., Inhoff, M. C., Zerubavel, N., Davachi, L., & Ochsner, K. N. (2015). Getting over it: Long-lasting effects of emotion regulation on amygdala response. *Psychological Science*, **26**(9), 1377–1388.

Denny, B. T., & Ochsner, K. N. (2014). Behavioral effects of longitudinal training in cognitive reappraisal. *Emotion*, **14**(2), 425–433.

Dixon-Gordon, K. L., Aldao, A., & De Los Reyes, A. (2014). Repertoires of emotion regulation: A person-centered approach to assessing emotion regulation strategies and links to psychopathology. *Cognition & Emotion*, **29**(7), 1314–1325.

Doré, B. P. & Ochsner, K. N. (under review). Reappraisal evokes lasting change in the content and emotional impact of negative autobiographical memories.

Doré, B. P., Ort, L. O., Braverman, O. B., & Ochsner, K. N. (2015). Sadness shifts to anxiety with time and distance from national tragedy in Newtown CT. *Psychological Science*, **26**(4), 363–373.

Ellsworth, P. C., & Scherer, K. R. (2003). Appraisal processes in emotion. In R. J. Davidson, H. Goldsmith, & K. R. Scherer (Eds.), *Handbook of Affective Sciences*. New York and Oxford: Oxford University Press.

Erk, S., Mikschl, A., Stier, S., Ciaramidaro, A., Gapp, V., Weber, B., & Walter, H. (2010). Acute and sustained effects of cognitive emotion regulation in major depression. *The Journal of Neuroscience*, **30**(47), 15726–15734.

Fareri, D. S., Gabard-Durnam, L., Goff, B., Flannery, J., Gee, D. G., Lumian, D. S., Caldera, C., Tottenham, N. (in press). Normative development of ventral striatal resting state connectivity in humans. *NeuroImage*, **118**(2015), 422–437.

Francis, L. A., & Sussman, E. J. (2009). Self-regulation and rapid weight gain in children from age 3 to 12 years. *Archives of Pediatrics & Adolescent Medicine*, **163**(4), 297–302.

Gabard-Durnam, L. J., Flannery, J., Goff, B., Gee, D. G., Humphreys, K. L., Telzer, E., … & Tottenham, N. (2014). The development of human amygdala functional connectivity at rest from 4 to 23 years: A cross-sectional study. *NeuroImage*, **95**, 193–207.

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.

Gelman, A. (2014). The connection between varying treatment effects and the crisis of unreplicable research a Bayesian perspective. *Journal of Management*, **41**(2), 632–643.

Gelman, A., & Carlin, J. (2014). Beyond power calculations assessing type S (sign) and type M (magnitude) errors. *Perspectives on Psychological Science*, **9**(6), 641–651.

Gelman, A., & Hill, J. (2006). *Data Analysis Using Regression and Multilevel/Hierarchical Models*. New York: Cambridge University Press.

Gosling, S. D., & Mason, W. (2015). Internet research in psychology. *Annual Review of Psychology*, **66**, 877–902.

Gross, J. J. (1998a). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, **2**(3), 271–299.

Gross, J. J. (1998b). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, **74**(1), 224–237.

Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, **26**, 1–26.

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**(2), 348–362.

Gross, J. J., & Levenson, R. W. (1997). Hiding feelings: The acute effects of inhibiting negative and positive emotion. *Journal of Abnormal Psychology*, **106**(1), 95–103.

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

Hamburg, M. A., & Collins, F. S. (2010). The path to personalized medicine. *New England Journal of Medicine*, **363**(4), 301–304.

Higgins, E. T. (2005). Value from regulatory fit. *Current Directions in Psychological Science*, **14**(4), 209–213.

Hill, C. L., & Updegraff, J. A. (2012). Mindfulness and its relationship to emotional regulation. *Emotion*, **12**(1), 81–90.
Isaacowitz, D. M., Wadlinger, H. A., Goren, D., & Wilson, H. R. (2006). Is there an age-related positivity effect in visual attention? A comparison of two methodologies. *Emotion*, **6**(3), 511–516.
Koole, S. L., & Veenstra, L. (2015). Does emotion regulation occur only inside people's heads? Toward a situated cognition analysis of emotion-regulatory dynamics. *Psychological Inquiry*, **26**(1), 61–68.
Kross, E., & Ayduk, O. (2008). Facilitating adaptive emotional analysis: Distinguishing distanced-analysis of depressive experiences from immersed-analysis and distraction. *Personality and Social Psychology Bulletin*, **34**(7), 924–938.
Lazarus, R. S. (1993). From psychological stress to the emotions: A history of changing outlooks. *Annual Review of Psychology*, **44**(1), 1–22.
Lewin, K. (1951). *Field Theory in Social Science*. Oxford, England: Harpers.
Mather, M. (2012). The emotion paradox in the aging brain. *Annals of the New York Academy of Sciences*, **1251**(1), 33–49.
Mauss, I. B., Bunge, S. A., & Gross, J. J. (2007). Automatic emotion regulation. *Social and Personality Psychology Compass*, **1**(1), 146–167.
Mauss, I. B., & McRae, K. (in press). Increasing positive emotion in negative contexts: Emotional consequences, neural correlates, and implications for resilience. In J. Greene, I. Morrison & M. Seligman (Eds.), *Positive neuroscience*, Oxford: Oxford University Press.
McRae, K. (2013). Emotion regulation frequency and success: Separating constructs from methods and time scale. *Social and Personality Psychology Compass*, **7**(5), 289–302.
McRae, K., Ciesielski, B., & Gross, J. J. (2012). Unpacking cognitive reappraisal: Goals, tactics, and outcomes. *Emotion*, **12**(2), 250–255.
McRae, K., Ochsner, K. N., Mauss, I. B., Gabrieli, J. J., & Gross, J. J. (2008). Gender differences in emotion regulation: An fMRI study of cognitive reappraisal. *Group Processes & Intergroup Relations*, **11**(2), 143–162.
Mischel, H. N., & Mischel, W. (1987). The development of children's knowledge of self-control strategies. In F. Halisch & J Kuhl (Eds.), *Motivation, Intention, and Volition* (pp. 321–336). Berlin Heidelberg: Springer.
Mischel, W., & Shoda, Y. (1995). A cognitive–affective system theory of personality: Reconceptualizing situations, dispositions, dynamics, and invariance in personality structure. *Psychological Review*, **102**(2), 246–268.
Moore, B., Mischel, W., & Zeiss, A. (1976). Comparative effects of the reward stimulus and its cognitive representation in voluntary delay. *Journal of Personality and Social Psychology*, **34**(3), 419–428.
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.
Morris, R. R., & Picard, R. (2014). Crowd-powered positive psychological interventions. *The Journal of Positive Psychology*, **9**(6), 509–516.
Morris, R. R., Schueller, S. M., & Picard, R. W. (2015). Efficacy of a web-based, crowdsourced peer-to-peer cognitive reappraisal platform for depression: Randomized controlled trial. *Journal of Medical Internet Research*, **17**(3), e72.
Nezlek, J. B., & Kuppens, P. (2008). Regulating positive and negative emotions in daily life. *Journal of Personality*, **76**(3), 561–580.
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**(1), E1–E24.
Ochsner, K. N., & Gross, J. J. (2014). The neural bases of emotion and emotion regulation: A valuation perspective. J. J Gross & R. Thompson (Eds.), *Handbook of Emotional Regulation* (2nd edn) (pp. 23–42). New York: Guilford.
Quoidbach, J., Berry, E. V., Hansenne, M., & Mikolajczak, M. (2010). Positive emotion regulation and well-being: Comparing the impact of eight savoring and dampening strategies. *Personality and Individual Differences*, **49**(5), 368–373.
Raio, C. M., Orederu, T. A., Palazzolo, L., Shurick, A. A., & Phelps, E. A. (2013). Cognitive emotion regulation fails the stress test. *Proceedings of the National Academy of Sciences*, **110**(37), 151139–15144.
Rawn, C. D., & Vohs, K. D. (2011). People use self-control to risk personal harm: An intra-interpersonal dilemma. *Personality and Social Psychology Review*, **15**(3), 267–289.
Reeck, C., Ames, D. R., & Ochsner, K. N. (2016). The social regulation of emotion: An integrative, cross-disciplinary model. *Trends in Cognitive Sciences*, **20**(1), 47–63.
Richards, J. M., & Gross, J. J. (2000). Emotion regulation and memory: The cognitive costs of keeping one's cool. *Journal of Personality and Social Psychology*, **79**(3), 410–422.
Rivers, S. E., Brackett, M. A., Katulak, N. A., & Salovey, P. (2007). Regulating anger and sadness: An exploration of discrete emotions in emotion regulation. *Journal of Happiness Studies*, **8**(3), 393–427.
Roy, M., Shohamy, D., & Wager, T. D. (2012). Ventromedial prefrontal-subcortical systems and the generation of affective meaning. *Trends in Cognitive Sciences*, **16**(3), 147–156.
Schiller, D., & Delgado, M.R. (2010). Overlapping neural systems mediating extinction, reversal and regulation of fear. *Trends in Cognitive Sciences*, **14**(6): 268-75.

Sheppes, G., Catran, E., & Meiran, N. (2009). Reappraisal (but not distraction) is going to make you sweat: Physiological evidence for self-control effort. *International Journal of Psychophysiology*, **71**(2), 91–96.

Sheppes, G., Scheibe, S., Suri, G., Radu, P., Blechert, J., & Gross, J. J. (2014). Emotion regulation choice: A conceptual framework and supporting evidence. *Journal of Experimental Psychology: General*, **143**(1), 163–181.

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.

Shoda, Y., Mischel, W., & Peake, P. K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. *Developmental Psychology*, **26**(6), 978–986.

Silvers, J. A., Buhle,J. T., & Ochsner, K. N. (2013). The neuroscience of emotion regulation: Basic mechanisms and their role in development, aging, and psychopathology. *The Handbook of Cognitive Neuroscience*, **1**, 52–78.

Silvers, J. A., McRae, K., Gabrieli, J. D., Gross, J. J., Remy, K. A., & Ochsner, K. N. (2012). Age-related differences in emotional reactivity, regulation, and rejection sensitivity in adolescence. *Emotion*, **12**(6), 1235–1247.

Silvers, J. A., Shu, J., Hubbard, A. D., Weber, J., & Ochsner, K. N. (2015). Concurrent and lasting effects of emotion regulation on amygdala response in adolescence and young adulthood. *Developmental Science*, **18**(5), 771–784.

Silvers, J. A., Wager, T. D., Weber, J., & Ochsner, K. N. (2014). The neural bases of uninstructed negative emotion modulation. *Social Cognitive and Affective Neuroscience*, **10**(1), 10–18.

Silvers, J. A., Wager, T. D., Weber, J., & Ochsner, K. N. (2015). The neural bases of uninstructed negative emotion modulation. *Social Cognitive and Affective Neuroscience*, **10**, 10–18.

Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science*, **22**(11):1359–1366.

Soto, J. A., Perez, C. R., Kim, Y. H., Lee, E. A., & Minnick, M. R. (2011). Is expressive suppression always associated with poorer psychological functioning? A cross-cultural comparison between European Americans and Hong Kong Chinese. *Emotion*, **11**(6), 1450–1455.

Steinglass, J. E., Figner, B., Berkowitz, S., Simpson, H. B., Weber, E. U., & Walsh, B. T. (2012). Increased capacity to delay reward in anorexia nervosa. *Journal of the International Neuropsychological Society*, **18**(04), 773–780.

Tamir, M. (2009). What do people want to feel and why? Pleasure and utility in emotion regulation. *Current Directions in Psychological Science*, **18**(2), 101–105.

Troy, A. S., Shallcross, A. J., & Mauss, I. B. (2013). A person-by-situation approach to emotion regulation cognitive reappraisal can either help or hurt, depending on the context. *Psychological Science*, **24**(12), 2505–2514.

Tucker, A. M., Feuerstein, R., Mende-Siedlecki, P., Ochsner, K. N., & Stern, Y. (2012). Double dissociation: circadian off-peak times increase emotional reactivity; aging impairs emotion regulation via reappraisal. *Emotion*, **12**(5), 869–874.

van Ast, V. A., Schmer-Galunder, S., Liberzon, I., Abelson, J. L., & Wager, T. D. (2014). Brain mechanisms of social threat effects on working memory. *Cerebral Cortex*, bhu206.

Webb, T. L., Miles, E., & Sheeran, P. (2012). Dealing with feeling: a meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychological Bulletin*, **138**(4), 775–808.

Widiger, T. A. (2011). Integrating normal and abnormal personality structure: A proposal for DSM-V. *Journal of Personality Disorders*, **25**(3), 338–363.

Wilkowski, B. M., & Robinson, M. D. (2010). The anatomy of anger: An integrative cognitive model of trait anger and reactive aggression. *Journal of Personality*, **78**, 9–38.

Williams, K., & McGillicuddy-De Lisi, A. (1999). Coping strategies in adolescents. *Journal of Applied Developmental Psychology*, **20**(4), 537–549.

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.

Yarkoni, T. (2012). Psychoinformatics: New horizons at the interface of the psychological and computing sciences. *Current Directions in Psychological Science*, **21**(6), 391–397.

Yates, B. T., & Mischel, W. (1979). Young children's preferred attentional strategies for delaying gratification. *Journal of Personality and Social Psychology*, **37**(2), 286–292.

Zaki, J., & Williams, W. C. (2013). Interpersonal emotion regulation. *Emotion*, **13**(5), 803–810.