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Unlocking creative potential: Reappraising emotional events facilitates creativity for conventional thinkers

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<https://escholarship.org/uc/item/0506z46b>

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### Publication Date

2023

### DOI

10.1016/j.obhdp.2022.104209

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Peer reviewed

## Unlocking Creative Potential:

### Reappraising Emotional Events Facilitates Creativity for Conventional Thinkers

#### Abstract

We examine the cognitive processes that underpin emotion regulation strategies and their associations with creativity. Building on theories of emotion regulation and creative cognition, we theorize that cognitive reappraisal of emotion-eliciting events is positively associated with creativity because both involve considering new approaches or perspectives. We also predict that reappraisal experience boosts creativity for people prone to thinking conventionally. Three studies support our theory by demonstrating that reappraisal improves cognitive flexibility and enhances creativity for individuals low in openness to experience, independent from the effects of emotions on creativity. Therefore, reappraisal is an effective tool to foster creativity among conventional thinkers. More broadly, the results indicate that emotion regulation processes have downstream consequences on behavior, above and beyond their effects on emotions.

*Keywords:* emotion regulation, reappraisal, creativity, openness to experience, cognitive flexibility

## Unlocking Creative Potential:

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Emotions are a ubiquitous part of organizational life that have a wide range of important consequences for both employees and the companies for which they work (Ashkanasy & Dorris, 2017; Barsade & Gibson, 2007; Elfenbein, 2007). The link between emotions and creativity, in particular, has received considerable scholarly attention (e.g., Amabile, Barsade, Mueller, & Staw, 2005; Davis, 2009; De Dreu, Baas, & Nijstad, 2012; Isen, Daubman, & Nowicki, 1987). Creativity is a crucial capability that allows firms to adapt to challenges and gain a competitive advantage in today's knowledge-based society (Amabile et al., 2005; Anderson, Potočník, & Zhou, 2014; Sarooghi, Libaersa, & Burkemper, 2015; Shalley, Zhou, & Oldham, 2004). More than 1,500 CEOs from 60 countries and across 33 industries ranked creativity as the most important quality for managers, over rigor, integrity, and vision (IBM, 2010). Increasingly complex business environments raise many challenges to contemporary organizations, such as evolving customer preferences, emerging technology, big data, and the volatile global economic environment (IBM, 2010). Creativity can help managers and employees address these challenges (Amabile, 1988; Brandenburger, 2019; George, 2007).

Although people are more creative under some emotional states than others (e.g., Davis, 2009; De Dreu, Baas, & Nijstad, 2008; González-Gómez & Richter, 2015; Staw, Sandelands, & Dutton, 1981), individuals also play an active role in shaping their emotional experiences. Emotion regulation refers to processes individuals use to monitor and control their emotional experiences and can take several forms (Grandey, 2000; Gross, 1998). For example, managers going through stressful organizational change report that they need to “psych” themselves up, “blank out” negative emotions, and adopt a “positive frame in mind” (Huy, 2002, p. 41). Many

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try to avoid thinking about upsetting information (Vuori & Huy, 2022). Customer service professionals routinely manage their emotions during interactions with customers and actively encode situations in ways that mitigate negative emotions (Bailey & McCollough, 2000). Negotiators try to project calmness during frustrating conversations (Brooks, 2015). In sum, employees are often motivated and sometimes encouraged to reduce unwanted emotions to enhance their performance (Coté, 2005; Scott, Awasty, Johnson, Matta, & Hollenbeck, 2020), including performance on creative tasks (Ivcevic & Brackett, 2015; Parke, Seo, & Sherf, 2015), and they may use a variety of different strategies to do so.

A limited amount of prior research suggests that emotion regulation and creativity are linked. Individuals' capacity to manage their emotions—a component of emotional intelligence—appears to help them maintain desirable emotional states that facilitate creativity (Ivcevic & Brackett, 2015; Parke et al., 2015; Sánchez-Ruiz, Hernández-Torrano, Pérez-González, Batey, & Petrides, 2011; cf. Ivcevic, Brackett, & Mayer, 2007). In other words, stable individual differences in how people regulate their emotions shape the emotions people regularly experience, and these emotional experiences directly influence creativity (Da Costa, Zhou & Ferreira, 2018). This approach includes two implicit assumptions. First, it assumes that affect is the only mechanism that links emotion regulation and creativity. Second, it assumes that the various emotion regulation strategies people use should have the same effects on creativity, provided that they have equivalent effects on emotional experiences.

We propose that emotion regulation strategies have different effects on creativity because they involve different cognitive processes; that is, our approach is novel because it focuses on the cognitive underpinnings of emotion regulation strategies rather than their consequences for emotions. Because priming different mindsets influences performance in creative tasks

(Gołowska, Crisp, & Labuschagne, 2013; Huang, 2020; Markman, Lindberg, Kray, & Galinsky, 2007; Miron-Spektor, Gino, & Argote, 2011), cognitive differences in emotion regulation strategies may also affect creativity. We propose that one emotion regulation strategy, *cognitive reappraisal*, is uniquely suited to boost creativity for people who are not predisposed to flexible thinking. Cognitive reappraisal involves reframing the meaning of emotional events (Gross, 1998, 2015; from here on, *reappraisal*). We theorize that engaging in reappraisal activates a flexible cognitive processing style that facilitates creativity, above and beyond the effect of changing emotional experience. In contrast, other emotion regulation strategies do not involve reinterpreting emotional events as reappraisal does, and thus do not have the same potential to benefit creative thinking.

However, reappraisal may not help all people equally. We theorize that practice with reappraisal can tap the potential of those who face cognitive barriers to creativity that stem from their dispositional tendencies. Drawing from the five-factor model of personality, we use openness to experience (from here on, *openness*) to identify which individuals are more or less prone to flexible thinking. Openness involves intellectual curiosity, sensitivity to aesthetics, and amenability to new ideas, experiences, and perspectives (Costa & McCrae, 1992). High-openness individuals are equipped with a flexible thinking style that predisposes them to creativity, whereas low-openness individuals' thinking styles are not (McCrae, 1987; Raja & Johns, 2010). Research that takes an interactionist approach to creativity tends to find situational factors that further realize the creative potential of high-openness individuals without benefiting low-openness individuals (e.g., Baer, 2010; Baer & Oldham, 2006; but see Madjar, 2008). Some research even frames low-openness individuals' thinking style as a barrier to creativity that cannot be overcome (Ivcevic & Brackett, 2015). However, we suggest that directly engaging the

cognitive processes that drive creativity can help low-openness individuals overcome the creative limitations of their default thinking style.

Building on the creative cognition approach, which posits that cognitive processes that underpin creativity are mundane parts of everyday cognition (Finke, Ward, & Smith, 1992; Leung, Maddux, Galinsky, & Chiu, 2008), we theorize that reappraisal experiences can unlock the creative potential of low-openness individuals. We propose that reappraisal experience can foster cognitive flexibility, which facilitates creativity by compensating for low-openness individuals' natural tendency to rely on conventional perspectives. However, reappraisal may not help high-openness individuals because cognitive flexibility is already an active part of their default thinking style. In short, we derive our theory from the core assumption of the creative cognition approach—that everyone has the capacity to be creative—and identifies a cognitive trigger that can catalyze low-openness individuals' creative potential.

We make three main contributions to theory. First, we identify a new avenue for research by establishing that emotion regulation has broader downstream consequences than their effects on emotions. Prior research on emotion regulation focuses on emotion-laden outcomes, including emotional experiences, mental health, memory of emotional events, and emotion-imbued decisions (e.g., Ehring, Tuschen-Caffier, Schnülle, Fischer, & Gross, 2010; Fabiansson & Denson, 2012; Feinberg, Ford, & Flynn, 2020; Wang et al., 2011). This prior work assumes that emotion regulation strategies have the same consequences if they result in the same emotional states and does not consider whether or how using different emotion regulation strategies may activate different cognitive processes. There is evidence that dissonance between emotional displays and emotional experiences can prime cognitive processes that affect the way people approach creative tasks (Huang, 2020; Huang & Galinsky, 2011). However, the emotional

displays in these studies involved surface acting induced by physical props. Little is known about how commonly used emotion regulation strategies affect creativity. Our work is the first to systematically examine the direct effects of specific emotion regulation strategies on outcomes outside of the affective domain. By focusing on the cognitive underpinnings of emotion regulation strategies, our approach identifies a path by which emotion regulation can influence a wide range of subsequent judgments and behaviors.

Second, we identify a novel facet of the relationship between emotional experiences and creativity. Previous work on emotional experiences and creativity focuses on features of emotions, such as valence (e.g., Amabile et al., 2005; Davis, 2009; George & Zhou, 2002; Ivcevic & Brackett, 2015; Parke et al., 2015), activation level (e.g., Baas, De Dreu, & Nijstad, 2008; To, Fisher, Ashkanasy, & Rowe, 2012), and discrete types of emotions (e.g., González-Gómez & Richter, 2015; Mann & Cadman, 2014; Park, Lim, & Oh, 2019). We extend these prior findings on emotion experiences and creativity in a new direction by documenting that people's strategies to regulate their emotions—a common part of the broader emotional experience process (Elfenbein, 2007)—can also influence creativity, above and beyond the influence of emotions themselves. We advance theory in this area by identifying cognitive processes that underpin both reappraisal and creativity.

Third, the current research bridges two theoretically distinct research traditions—the creative cognition approach and the interactionist perspective on creativity—and offers novel insights about how to tap the creative potential of low-openness individuals. Prior research rooted in the interactionist approach to creativity offers little advice about how to tap the creative potential of low-openness individuals, whose tendency is to rely on conventional perspectives (Madjar, 2008; see also Woodman & Schoenfeldt, 1989). However, based on the creative

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cognition approach, we show that reappraisal experiences can situationally induce cognitive flexibility in low-openness individuals, which endures and enhances creativity in subsequent situations. Thus, we show that situational triggers can tap the creative potential of those who may not excel at creativity when left to their own devices. In other words, our theory complements prior approaches by explaining how those not naturally oriented toward creativity nonetheless can produce creative ideas under the right conditions.

In terms of practice, emotion regulation is a skill that employees need to cope with the emotions they routinely experience at work (e.g., Seppälä & Bradley, 2019), and identifying an additional benefit of using reappraisal may enhance employee training programs. Unlocking the creative potential of low-openness individuals in particular is important because they often work in technical and analytical roles (Barrick, Mount, & Gupta, 2003; Costa, McCrae, & Holland, 1984), and their domain knowledge may serve as the basis for creative solutions to organizational problems (Amabile, 1983, 1988). Even organizational tasks that usually are viewed as conventional, such as accounting, can benefit from inventive strategies that improve efficiency (Amabile, 1998). Our research identifies a way to tap the creative potential of a set of employees who are not naturally oriented toward flexible thinking but may possess important expertise and skills to generate creative solutions to organizational problems.

### **Emotion Regulation Strategies in the Workplace**

To maintain standards of professionalism, facilitate performance and wellbeing, and promote social relationships, professionals often regulate unwanted emotions in the workplace, such as anxiety when making risky decisions, frustration when projects fail, and anger or sadness when resources are deployed elsewhere (Coté, 2005; Hochschild, 1983; Seppälä & Bradley, 2019). Three emotion regulation strategies have received the vast majority of researchers'



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attention: reappraisal, distraction, and suppression (Elfenbein, 2007; Gross, 1998, 2015). As mentioned above, reappraisal involves reframing the meaning of emotional events (Gross, 1998). For example, during a frustrating meeting, someone using reappraisal could seek to alleviate the frustration by reconceptualizing the meeting as an opportunity to identify and allay others' concerns. Distraction is a different emotion regulation strategy that involves directing attention away from the undesirable stimuli or events (Gross & Thompson, 2007). Someone using distraction could shift their attention away from the frustrating meeting and think about a recent vacation to relieve the frustration. Alternatively, suppression is a regulation strategy that involves inhibiting verbal or nonverbal cues that others use to interpret their emotional state (Gross, 1998, 2015). Someone using suppression would attempt to eliminate outward expressions of their feelings about the meeting.

Given that people often need to modify their emotional experiences one way or another in the workplace, and that there are multiple strategies that people can deploy to manage their emotions, it is useful to examine how the use of different strategies may influence work-related outcomes differently. Specifically, we focus on the distinct cognitive processes associated with different emotion regulation strategies and argue that they have divergent effects on creativity.

### **Reappraisal and Creativity Depend on Similar Cognitive Processes**

Creativity is the generation of ideas or insights that are novel and useful; that is, creative thoughts are original and unexpected but also feasible and adaptive to task constraints (Amabile, 1983, 1988). Creativity usually involves breaking existing assumptions and constructing new perceptual frames (Amabile, 1988; Smith, Ward, & Schumacher, 1993). People often need to view the problem from a different angle or combine multiple perspectives to generate creative

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ideas (Smith & Blankenship, 1991; Wan & Chiu, 2002). Thus, according to the creative cognition approach, creativity depends on mundane rather than specialized cognitive processes, such as those that allow people to combine non-overlapping concepts or search long-term memory for less immediately accessible information (for a review, see Ward, Smith, & Finke, 1999). However, the typical way of doing things often inhibits novel insights (Maier, 1931; Smith et al., 1993).

We theorize that, unlike other emotion regulation strategies, reappraisal is uniquely associated with creativity because the same cognitive processes underpin both reappraisal and creativity. Similar to creativity, reappraisal involves recasting a situation by viewing it in a new way rather than interpreting it from a default perspective (McRae, Ciesielski, & Gross, 2012). Therefore, both reappraisal and creativity require cognitive flexibility, or the ability to consider new approaches or adopt different perspectives (Nijstad, De Dreu, Rietzschel, & Baas, 2010).

People can reinterpret undesirable events—initially perceived as threatening to one’s goal achievement or wellbeing—as insignificant, benign, or beneficial (Shiota & Levenson, 2012). For example, to cope with anger arising from a colleague’s actions, people may reappraise the situation and come to view the behavior as driven by circumstances rather than malicious. To cope with frustration, people may reappraise a business plan failure as merely one of many stumbling blocks on the path to success rather than as a sign that they lack talent. To cope with anxiety, people may reappraise an important presentation as an opportunity to share ideas rather than as a high-stakes evaluation (Zhu & Young, 2020). In each of these cases, reappraisal requires the cognitive flexibility to shift the way the situation is initially encoded. Thus, as with creative thinking, reappraisal involves breaking free from dominant assumptions and considering new perspectives. Consistent with this view, neurological evidence indicates that reappraisal is

associated with a brain activation pattern similar to that observed during creative ideation (Fink et al., 2017).

In sum, people accustomed to flexible thinking should tend to use reappraisal and tend to be creative. Empirically, sharing the same underlying process should lead to a positive association between the use of reappraisal and creativity.

*Hypothesis 1. Individuals' chronic tendency to use reappraisal to regulate their emotions will be positively associated with creativity.*

### **An Interactionist Perspective on Reappraisal, Openness, and Creativity**

Building on the idea that reappraisal and creativity share the same cognitive processes, it may be possible to design interventions that boost creativity by prompting people to practice reappraising emotional events. Creativity is a joint function of cognitive factors—cognitive styles conducive to creative thinking—and motivational factors such as incentives, social support, and task constraints (Amabile, 1983). Because high-openness individuals are equipped with the cognitive style to explore and integrate diverse perspectives, many studies focus on the conditions that boost their motivation to be creative (e.g., Baer, 2010; Baer & Oldham, 2006; George & Zhou, 2001). For example, a combination of positive feedback and open-ended instructions or goals maximizes creativity for high-openness individuals (George & Zhou, 2001). Similarly, high-openness individuals are most creative when motivated by moderate time pressure and social support (Baer & Oldham, 2006). However, low-openness individuals tend not to respond to these motivational factors because their barrier to creativity lies in their tendency to be conventional thinkers (i.e., cognitively inflexible). Prior research offers little guidance about how to optimize creativity for low-openness individuals, which is problematic because they, by definition, compose half of the workforce and undoubtedly have critical domain

knowledge that can fuel creative problem solving (Amabile, 1983, 1988; Costa et al., 1984).

Our approach builds on the notion that creativity is not only a function of personality but also varies by situation, experience, and training (Amabile, 1983, 2013). As noted above, the creative cognition approach maintains that everyone has the potential to be creative because creativity is a product of basic cognitive processes that people use every day for different purposes (Ward et al., 1999). It further asserts that creative thinking skills are malleable rather than fixed (Finke et al., 1992; Leung et al., 2008; Weisberg, 1993). For example, “novel conceptual combination” training can build people’s tendency to seek similarities in non-overlapping concepts and combine them in new ways, which enhances creativity in subsequent tasks (Wan & Chiu, 2002).

In addition to dedicated training, everyday experiences that involve applying new perspectives to understand a situation also can enhance flexible thinking because they prompt people to think across conceptual boundaries and apply new perspectives to problems (Leung et al., 2008). More broadly, a host of research shows that information processing styles activated in one context often persist and shape thinking in subsequent tasks. Cognitive experiences can influence information retrieval, encoding, and thought production (Gollwitzer, Heckhausen, & Steller, 1990) and improve performance on subsequent tasks that involve the same procedures (Smith & Branscombe, 1987). Specific to the current context, several studies show that cognitive experiences can carry over and influence creativity (e.g., Gocłowska et al., 2013; Jung & Lee, 2015; Markman et al., 2007; Miron-Spektor et al., 2011).

Although stable individual differences exist in people’s tendency to think flexibly, it is also possible to situationally induce cognitive flexibility (e.g., Althuisen & Reichel, 2016; De Dreu et al., 2008; De Dreu, Nijstad, & Baas, 2011; Intasao & Hao, 2018; Mayer & Mussweiler,

2011; Miron-Spektor & Beenen, 2015). For example, presenting information in unstructured rather than in hierarchical ways increases cognitive flexibility (Kim & Zhong, 2017). Also, multicultural experiences can promote flexible thinking by challenging familiar perspectives and by providing access to alternative values, norms, and assumptions (Leung & Chiu, 2010; Leung et al., 2008). In this way, multicultural experiences promote cognitive flexibility, which in turn enhances creativity (Benet-Martinez, Lee, & Leu, 2006; Godart, Maddux, Shipilov, & Galinsky, 2015; Lu, Hafenbrack, et al., 2017; Tadmor & Tetlock, 2006). Similarly, unusual and unexpected experiences can promote cognitive flexibility by disrupting conventional thinking and prompting people to make novel associations between concepts (Huang, 2020; Huang & Galinsky, 2011; Ritter et al., 2012). For example, thinking about counter-stereotypes inhibits habitually accessible stereotypes and facilitates cognitive flexibility (Gołowska et al., 2013). In short, experiences that promote cognitive flexibility produce carry-over effects on subsequent tasks that require creativity (Leung et al., 2008; Wan & Chiu, 2002).

We propose that low-openness individuals should benefit from experience with reappraisal because reappraisal should induce flexible thinking that compensates for their natural propensity to stick with familiar perspectives. In turn, this situationally induced cognitive flexibility should boost their creativity. Other common emotion regulation strategies, including distraction and suppression, do not involve shifting cognitive representations of the emotional events and therefore should not facilitate cognitive flexibility or boost creativity. That is, distraction and suppression rely on different cognitive processes than reappraisal and should not influence creativity independent of how they affect emotional experience.

In contrast, high-openness individuals may not benefit from experience with reappraisal. Several studies show that some factors that enhance creativity for people with less flexible

cognitive styles are ineffective for those with more flexible cognitive styles (e.g., Madjar, 2008; Madjar, Oldham, & Pratt, 2002; Tierney, Farmer, & Graen, 1999; Zhou, 2003). For example, Zhou (2003) finds that having creative coworkers and supervisors who do not closely monitor activities boosts creativity for individuals who score low on a measure of creative personality but do not help those who score high on creative personality. Asymmetrical effects like these can occur because situational factors may compensate for the cognitive tendencies of people not predisposed to creativity, but these same factors may be redundant with the cognitive tendencies of those with creative dispositions. As an analogy, putting gas in a car with an empty tank will improve acceleration, but putting gas in a car that already has gas in the tank will not make it accelerate faster. In the current context, reappraisal experience may not boost creativity in high-openness individuals because they are already predisposed to cognitive flexibility (McCrae, 1987). Taken together, we expect reappraisal interventions to boost creativity for low-openness individuals, but they may not help high-openness individuals.

*Hypothesis 2. The effect of reappraisal experiences on creativity will be positive for people who score low on openness and absent for those who score high on openness.*

*Hypothesis 3. The interaction of reappraisal experiences and openness on creativity will be mediated by changes in cognitive flexibility.*

We test our hypotheses in three studies. Study 1 examines the association between people's chronic tendency to use reappraisal and their creativity (Hypothesis 1). Studies 2 and 3 test the effects of reappraisal interventions on creativity as a function of openness (Hypothesis 2) by either measuring trait openness (Study 2) or manipulating state openness (Study 3). Studies 2 and 3 also examine whether changes in cognitive flexibility account for the effect of reappraisal interventions on creativity (Hypothesis 3). All of the data and syntax are available at:

[https://osf.io/6cy32/?view\\_only=3d02565eacf74428810f5c67d6369bbd](https://osf.io/6cy32/?view_only=3d02565eacf74428810f5c67d6369bbd). We also report all of the study materials in supplemental materials.

### **Study 1**

Study 1 tests Hypothesis 1 by examining the association between creativity and the chronic tendency to regulate emotions by using reappraisal. As a point of comparison, Study 1 also assesses people's tendency to regulate their emotions by using suppression. As mentioned above, suppression is a useful comparison to reappraisal because both are emotion regulation strategies, but they involve different cognitive processes. Measuring suppression allows us to evaluate the strength of the association between reappraisal and creativity relative to the strength of the association between another emotion regulation strategy and creativity, which addresses the potential concern that common method variance is responsible for any effects we observe (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

#### **Participants**

Undergraduate business students from a large, public university in the western United States ( $N = 279$ ) completed a survey in exchange for extra credit in a course. A priori, we determined that we would recruit as many participants as possible during an academic term and analyze the data afterward. A post hoc power analysis indicated that we achieved statistical power of 0.99. The sample was 61.3% female and ranged in age from 18 to 35 years ( $M = 20.45$ ,  $SD = 2.17$ ); 68.5% identified as Asian, 15.1% as Hispanic or Latino, 11.5% as White, 3.7% as mixed race or ethnicity, and 1.1% as African American.

#### **Procedures and Measures**

Participants completed all measures in a single session. The order of the reappraisal and

suppression scales was randomized across participants. The creativity measure was always presented last. Scale items were averaged and then centered for analyses (Aiken & West, 1991).

**Reappraisal.** The six-item reappraisal scale (Gross & John, 2003) assessed participants' tendency to use reappraisal to regulate their emotions ( $\alpha = 0.81$ ). For example, participants indicated how much they agreed or disagreed with the following statement: "I control my emotions by changing the way I think about the situation I'm in." Participants responded on seven-point scales with point labels that ranged from 1 = *strongly disagree* to 7 = *strongly agree*.

**Suppression.** The four-item suppression scale (Gross & John, 2003) assessed the extent to which people tend to use suppression to regulate their emotions ( $\alpha = 0.70$ ). For example, participants indicated how much they agreed or disagreed with the following statement: "I control my emotions by not expressing them." Participants responded on a seven-point scale with scale point labels that ranged from 1 = *strongly disagree* to 7 = *strongly agree*.

**Creativity.** The 23-item Runco Ideational Behavior Scale assessed creativity ( $\alpha = 0.93$ ; Runco, Plucker, & Lim, 2001). This scale measures how often people behave in ways that involve generation and use of creative ideas. Higher scores indicate that the individuals are more flexible and fluent with ideas. Two sample items are: "I have ideas about new inventions or about how to improve things," and "I often get excited by my own new ideas." This scale has been frequently used in prior work as a self-report measure for creativity (e.g., Benedek & Neubauer, 2013; Cohen & Ferrari, 2010). This scale reduces social desirability bias by asking respondents to report their behaviors instead of asking them to rate their creativity as a trait (Kaufman & Baer, 2004).

## Results and Discussion



Table 1 presents zero-order correlations among the use of reappraisal, the use of suppression, creativity, and demographic variables. Hypothesis 1 predicted that the use of reappraisal should be positively associated with creativity. OLS regression with reappraisal and suppression as predictors and creativity as the criterion found a significant effect of reappraisal,  $\beta = 0.29$ ,  $t(276) = 4.97$ ,  $p < 0.001$ , 95% CI [0.17, 0.41]. Therefore, the results supported Hypothesis 1.

In comparison, the effect of suppression on creativity was not significant,  $\beta < 0.001$ ,  $t(276) = -0.007$ ,  $p = 0.995$ , 95% CI [-0.13, 0.13]. Notably, the confidence interval of the coefficient associated with reappraisal did not overlap with the confidence interval for suppression, indicating that the positive association between reappraisal and creativity was significantly greater than the association between suppression and creativity. The results remain the same after controlling for age, gender, and ethnicity in the analysis.

In sum, Study 1 found that the chronic tendency to use reappraisal was positively associated with creativity (Hypothesis 1), whereas the tendency to use suppression was not. These results indicate that reappraisal has a distinct, positive association with creativity that is not shared by other emotion regulation strategies. Thus, the pattern is consistent with our theory, which suggests that the link between reappraisal and creativity stems from shared cognitive underpinnings and not something about emotion regulation more broadly.

## Study 2

Study 2 tests the causal effect of reappraisal experience on creativity as a function of openness. It also examines the role of cognitive flexibility as the mechanism responsible for the effect. Specifically, Study 2 tests whether using reappraisal to regulate emotions will help people low in openness be more creative on a subsequent task, whereas people high in openness will not

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reap similar benefits (Hypothesis 2) and whether the interactive effect of reappraisal and openness on creativity is mediated by cognitive flexibility (Hypothesis 3).

Study 2 compares reappraisal with the two most frequently used emotion regulation strategies: distraction and suppression (Gross, 1998, 2015). It also includes a control condition in which participants do not regulate their emotions. According to our theory, experience with reappraisal should enhance creativity because it induces cognitive flexibility. In contrast, experience with distraction and suppression should not enhance creativity because distraction and suppression do not involve cognitive flexibility. Therefore, Study 2 compares the effects of reappraisal, distraction, and suppression on creativity, which allows us to disentangle the unique effect of reappraisal relative to other emotion regulation strategies that have similar effects on emotional experience but involve different cognitive processes.

Creativity research commonly uses a behavioral indicator of cognitive flexibility that reflects how many categories a participant's responses spans (e.g., De Dreu et al., 2008, 2011; Kim & Zhong, 2017; Miron-Spektor & Beenen, 2015; see Nijstad et al., 2010 for a review). This behavioral measure of cognitive flexibility is conceptually and empirically distinct from other important constructs in the creativity literature. In particular, fluency represents the total number of non-redundant ideas produced (De Dreu et al., 2008). Cognitive flexibility may correlate positively with fluency, but not necessarily so. A person could achieve high fluency by producing many ideas within a given category (i.e., high fluency and low cognitive flexibility) or a few ideas within several categories (i.e., low fluency and high cognitive flexibility). Similarly, cognitive flexibility may correlate positively with novelty, but not necessarily so. A person could persist when working within a given category and generate ideas not mentioned by others (i.e., high novelty and low cognitive flexibility) or generate ideas that span several categories but

represent only commonly mentioned exemplars (i.e., low novelty and high cognitive flexibility).

In sum, cognitive flexibility is “a precursor of the production of many (fluency) and original responses” (De Dreu et al., 2008, p. 740), and we use the behavioral operationalization commonly used in creativity research as our primary measure of the mechanism specified by our theory.

We pre-registered the study details, including the sample size, exclusion criteria, design, measures, and analyses (see [https://aspredicted.org/BJJ\\_5F7](https://aspredicted.org/BJJ_5F7)).

### **Participants**

To identify an appropriate sample size to test Hypothesis 2, we used G\*power to conduct a power analysis for the interaction of reappraisal and openness on creativity (Faul, Erdfelder, Lang, & Buchner, 2007). We assumed  $f^2 = 0.02$ , which is widely accepted as the standard to differentiate trivial versus nontrivial effects (e.g., Cashen & Geiger, 2004; Li, Lee, Mitchell, Hom, & Griffeth, 2016). Given that a sample of 395 would be adequate to obtain 80% power at  $\alpha = 0.05$ , we recruited 400 participants from the online survey platform Prolific Academic. To avoid participant fatigue and eliminate any psychological dependencies between the measures and participants' behavior on the focal tasks, the study was divided into two sessions that were one week apart. Out of the 400 participants who completed the first session, 335 (83.75%) completed the second session and were paid \$4.77. Post hoc power analysis indicated that we achieved statistical power of 0.82.

Prior to collecting data, we established and pre-registered two exclusion criteria. First, we decided to exclude participants who did not provide a valid answer to the creativity task (i.e., provided responses that were completely irrelevant to the prompt;  $n = 5$ ). Second, we decided to

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exclude participants who clearly did not follow the emotion regulation instructions (e.g., discussed why the clip made them angry;  $n = 7$ ). The resultant sample ( $N = 323$ ) was 78.3% female and ranged in age from 18 to 76 ( $M = 37.45$ ,  $SD = 12.86$ ); 88.9% identified as White, 4.3% as Asian, 2.5% as Black, 0.3% as Hispanic or Latino, and 3.3% as mixed race or ethnicity. The pattern and statistical significance of the results is the same when data from all of the participants are included in analyses.

### **Design and Procedure**

In the first session, participants completed the Big Five Inventory, which includes a measure of openness, as well as measures of conscientiousness, extraversion, agreeableness, and neuroticism (John & Srivastava, 1999). Our theory posits that experience with reappraisal will influence individuals differently as a function of their level of openness because level of openness reflects the extent to which individuals are naturally oriented toward new perspectives and flexible thinking. In contrast, other personality traits should not moderate the effect of reappraisal on creativity because they are more distally related to our theorized mechanism.

In the second session, one week later, participants completed two ostensibly unrelated tasks. Participants were randomly assigned to one of four experimental conditions before watching a film clip: reappraisal, distraction, suppression, and no regulation. In the reappraisal condition, participants were instructed to think about the situation in the film clip from a different perspective (Troy, Wilhelm, Shallcross, & Mauss, 2010). Specifically, they were asked to reinterpret the event in a way that would help them experience the situation differently. In line with research on the diverse forms of reappraisal (McRae et al., 2012; Shiota & Levenson, 2012), our empirical manipulation of reappraisal is not exclusively about reframing the events in either a positive or neutralized way but broadly encompasses both (Bebko, Franconeri, Ochsner,

& Chiao, 2014; Denson, Moulds, & Grisham, 2012; Lange, van de Ven, & Schrieken, 2003; Lieberman, Inagaki, Tabibnia, & Crockett, 2011; Ochsner, Bunge, Gross, & Gabrieli, 2002; Wang et al., 2011). In the distraction condition, participants were instructed to think about something unrelated to the film content while watching the clip (Sheppes & Meiran, 2007). In the suppression condition, participants were asked to inhibit their facial expressions and keep their facial muscles still while watching the clip (Gross & Levenson, 1995; Richards & Gross, 2000). In the no regulation condition, participants did not receive emotion regulation instructions.

A one-sentence subtitle at the bottom of the screen throughout the clip reminded participants of the emotion regulation instructions (Sheppes & Meiran, 2007). Specifically, the reappraisal subtitle read, “Try your best to think about the situation from a different perspective.” The distraction subtitle read, “Try your best to think about something that is emotionally neutral. For example: a flock of birds migrating in autumn.” The suppression subtitle read, “Try your best to keep your facial muscles still so that you don’t make any expressions.” The no regulation subtitle read, “Try your best to keep viewing what is presented to you, in the same manner as you did so far.” After watching the film, participants were asked to describe what they thought about while watching the film (Feinberg et al., 2020).

All participants watched the same, four-minute film clip that has been validated by prior research and used to induce anger (Gross & Levenson, 1995). We used anger as the focal emotion to avoid the confound of emotional experiences as an alternative explanation of the results. The effect of anger on creativity ranges from positive to null, depending on the situation (Davis, 2009; De Dreu et al., 2008). Therefore, if emotional experience were the only influence on creativity across conditions, then, counter to Hypothesis 2, reappraisal should reduce the

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amount of anger participants experience, making the effect of reappraisal on creativity either negative or absent. However, if we observed that reappraisal enhanced creativity, the difference would be attributable to the emotion regulation strategy, not the emotion itself. In short, inducing anger provided a conservative test of our hypotheses.

Next, ostensibly unrelated to the film task, participants completed a creativity task. They were told to imagine that a cafeteria in their company's building had gone bankrupt after years of mismanagement and poor food quality and asked to generate creative ideas for a new business that could go into the empty space left by the cafeteria (Goncalo, Chatman, Duguid, & Kennedy, 2015; Goncalo & Duguid, 2012; Goncalo & Staw, 2006). Participants could work on the creativity task for as long as they wanted. Finally, participants completed measures of their emotional state and a manipulation check. All measures included in the study are reported below.

**Measures**

**Creativity.** Participants provided answers to the creativity task in a large text box. Two independent coders who were blind to the experimental conditions rated the novelty and usefulness of each response on a seven-point scale. In line with past research (Amabile, 1982; Goncalo & Duguid, 2012; Madjar & Shalley, 2008), both coders were considered appropriate judges for the creativity task because they had knowledge and expertise about the general problem domain (i.e., management) and were familiar with the problem setting.

The coders were provided with definitions of novelty and usefulness and were asked to read all the responses before rating them. Specifically, we operationalized novel ideas as those that appear infrequently in the sample, do not resemble something commonly known, and are not the most obvious (Duguid & Goncalo, 2015; Goncalo & Staw, 2006; Van Kleef,

Anastasopoulou, & Nijstad, 2010). We operationalized usefulness as practical ideas that could be readily implemented (Lu, Akinola, & Mason, 2017; Pillay, Park, Kim, & Lee, 2020). The coders were told to evaluate each response relative to other responses in the sample.

Inter-rater reliability was satisfactory for both novelty ( $ICC = 0.91, p < 0.001$ ) and usefulness ( $ICC = 0.85, p < 0.001$ ). Therefore, the coders' scores were averaged to form novelty and usefulness ratings for each participant's response. We then multiplied the novelty and usefulness scores to obtain an overall creativity score for each participant (see Ellis, Mai, & Christian, 2013; Hoever, van Knippenberg, Van Ginkel, & Barkema, 2012; Zhou & Oldham, 2001 for similar procedures). Some of the ideas that were rated most creative included relaxation services (e.g., napping pods) and a daycare center. Some of the ideas that were rated least creative included a cafeteria similar as before with cheaper prices and a dining franchise (e.g., Subway). See the coding scheme in supplemental materials.

**Cognitive flexibility.**<sup>1</sup> We operationalized cognitive flexibility as the number of categories of ideas each participant generated (Nijstad et al., 2010). We first categorized all the ideas generated in the entire sample by their semantic similarity (Goncalo & Staw, 2006).

Examples of categories include “food-related business or facilities such as a coffee shop or an

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<sup>1</sup> We also included a self-report measure of cognitive flexibility based on a scale used in mental health research to track the effectiveness of interventions that help patients consciously alter the way they perceive situations that are difficult for them (Dennis & Vander Wal, 2010). In retrospect, we believe this self-report measure was a poor indicator of state-level cognitive flexibility for multiple reasons (see the supplemental materials for additional discussion and analyses). For example, self-perceptions of abilities are based on subjective assessments of one's past behaviors and performance (Dang, King, Inzlicht, 2020), and participants in our study had little information they could use to form an accurate assessment of their state level of cognitive flexibility. Consistent with our interpretation, self-reported cognitive flexibility correlated positively with openness ( $r = 0.22, p < 0.001$ ) but did not correlate with the behavioral indicator of cognitive flexibility commonly used in creativity research ( $r = 0.06, p = 0.31$ ). That is, self-perceptions of cognitive flexibility were more strongly associated with participants' self-perceptions of their personality (i.e., past behaviors and tendencies) than an objective measure of their state-level of cognitive flexibility. Therefore, we deviated from our pre-registered plan and report analyses that used the behavioral operationalization of cognitive flexibility commonly used in creativity research (e.g., De Dreu et al., 2008; Kim & Zhong, 2017; Nijstad et al., 2010).

employee kitchen” “workspaces such as breakout rooms and conference rooms” and “entertainment facilities such as TV and games.” Next, two independent coders who were blind to the experimental conditions assigned each idea to one of the eleven categories.

We counted the number of categories of ideas each participant generated as the measure of cognitive flexibility ( $ICC = 0.95, p < 0.001$ ). On average, participants used 1.93 categories ( $SD = 1.10$ ). The coding scheme is provided in the supplemental materials.

**Openness.** The 10-item openness scale from the Big Five Inventory assessed openness ( $\alpha = 0.85$ ; John & Srivastava, 1999). For example, participants indicated how much they agreed or disagreed with the following statement: “I am curious about many different things.” Participants responded on a seven-point scale with scale point labels that ranged from 1 = *strongly disagree* to 7 = *strongly agree*. Responses were averaged and centered (Aiken & West, 1991).

**Other personality traits.** We also measured conscientiousness ( $\alpha = 0.88$ ), extraversion ( $\alpha = 0.90$ ), agreeableness ( $\alpha = 0.82$ ), and neuroticism ( $\alpha = 0.90$ ) using the Big Five Inventory (John & Srivastava, 1999). Responses were averaged and centered (Aiken & West, 1991).

**Emotional state.** Our theory of the effect of emotion regulation on creativity involves the cognitive processes that underpin both, not participants’ emotional experience. However, it is possible that emotional experience could also influence creativity. Therefore, we asked participants to report how they felt on 5-point scales with point labels that ranged from 1 = *not at all* to 5 = *very much*. To assess anger, we averaged responses for the extent to which participants felt *anger* and *rage* ( $\alpha = 0.88$ ). To assess happiness, we averaged responses for the extent to which they felt *happiness* and *enjoyment* ( $\alpha = 0.82$ ). The anger and happiness indices were unassociated with each other ( $r = -0.09, p = 0.12$ ).



**Manipulation check.** To assess whether the emotion regulation manipulation was successful, participants indicated the extent to which they used each regulation strategy on a seven-point scale with scale point labels that ranged from 1 = *strongly disagree* to 7 = *strongly agree*: (1) “To feel better, I changed the way I was thinking about the film.” (reappraisal); (2) “I thought about something else that is not related to the film.” (distraction); (3) “I tried not to let my feelings show.” (suppression; adapted from Ehring et al., 2010).

## Results

Table 2 displays descriptive statistics and bivariate correlations of key variables. Table 3 reports means and standard deviations by condition for the manipulation checks, moderator, mediator, and dependent variable.

**Manipulation check.** We used effects coding (Cohen, Cohen, West, & Aiken, 2003; Hayes, 2013) to create variables representing the four emotion regulation conditions. Reappraisal, distraction, and suppression were each represented by one effects-coding variable, and the no regulation condition served as the base group. The effects coding scheme enables the regression coefficients to represent the deviation of outcome variable in each condition from the overall mean (Cohen et al., 2003).

To test whether the reappraisal manipulation was successful, we conducted OLS regression with experimental condition, openness, and their interaction as predictors and the reappraisal manipulation check as the criterion. Participants were more likely to use reappraisal in the reappraisal condition than in other conditions,  $B = 1.05$ ,  $t(315) = 6.18$ ,  $p < 0.001$  (see Table 3). There was no effect of openness,  $B = 0.13$ ,  $t(315) = 1.16$ ,  $p = 0.24$ . None of the interaction terms between emotion regulation conditions and openness were significant,  $Bs < 0.13$ , *ns*. In

short, the reappraisal manipulation was successful.

To test whether the distraction manipulation was successful, we conducted OLS regression with experimental condition, openness, and their interaction as predictors and the distraction manipulation check as the criterion. Participants were more likely to use distraction in the distraction condition than in the other conditions,  $B = 2.69$ ,  $t(315) = 17.84$ ,  $p < 0.001$ . There was no effect of openness or any interaction between emotion regulation conditions and openness,  $Bs < 0.19$ , *ns*.

Similarly, as a suppression manipulation check, participants were more likely to use suppression in the suppression condition than the other conditions,  $B = 1.64$ ,  $t(315) = 12.26$ ,  $p < 0.001$ . There was no effect of openness or any interaction between emotion regulation conditions and openness,  $Bs < 0.17$ , *ns*. In sum, all manipulations were successful.

**Hypothesis testing.** OLS regression with experimental condition, openness, and their interaction as predictors and creativity as the criterion tested Hypothesis 2, which predicted that the positive effect of reappraisal on creativity would be stronger for low- than high-openness individuals. Results indicated a marginal effect of the reappraisal condition relative to other emotion regulation conditions,  $B = 1.76$ ,  $t(315) = 1.75$ ,  $p = 0.08$ , and a significant positive effect of openness on creativity,  $B = 1.73$ ,  $t(315) = 2.68$ ,  $p = 0.008$ . Similar to prior research on openness that did not involve emotions or emotion regulation, the simple slope of openness on creativity was positive in the no regulation condition,  $B = 3.48$ ,  $t(80) = 2.52$ ,  $p = 0.01$ .

More important to our theory, the interaction of reappraisal and openness on creativity was significant,  $B = -3.15$ ,  $t(315) = -2.84$ ,  $p = 0.005$ ,  $f^2 = 0.03^2$  (see Figure 1). As predicted, simple slope analyses revealed that for people with low openness (one standard deviation below

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<sup>2</sup> We used this effect size as the basis for our power analysis in Study 3.

the mean), creativity was higher in the reappraisal condition than the other emotion regulation conditions,  $B = 4.62$ ,  $t(315) = 3.29$ ,  $p = 0.001$ . For people with high openness (one standard deviation above the mean), there was no significant difference in creativity between the reappraisal condition and the other conditions,  $B = -1.10$ ,  $t(315) = -0.76$ ,  $p = 0.45$ .

The simple slope analyses above examine the effect of reappraisal relative to the other three conditions in aggregate. For individual comparisons between the reappraisal condition and each of the other conditions, we ran spotlight analyses with emotion regulation as the independent variable and openness as a continuous moderator. When openness was low (one standard deviation below the mean), creativity was higher in the reappraisal condition than in any of the other conditions,  $ts > 2.2$ ,  $ps < 0.03$ ,  $ds > 0.35$ . When openness was high (one standard deviation above the mean), creativity in the reappraisal condition did not differ from any of the other conditions,  $ts < 1.6$ ,  $ps > 0.12$ ,  $ds < 0.25$ .<sup>3</sup>

**Mediation analysis.** Cognitive flexibility is often a mediator in creativity research because considering many categories can lead to the generation of novel ideas (e.g., De Dreu et al., 2008, 2011; Kim & Zhong, 2017; Miron-Spektor & Beenen, 2015). To test whether cognitive flexibility mediated the effect of the interaction of reappraisal and openness on creativity (Hypothesis 3), we first examined the effects of reappraisal and openness on cognitive flexibility. OLS regression with experimental condition, openness, and their interaction as predictors and

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<sup>3</sup> As a robustness check, we also calculated creativity by averaging novelty and usefulness scores and repeated the test of Hypothesis 2 (see Ellis et al., 2013, for a similar cross-validation). The results were nearly identical to the analyses that used the multiplicative measure of creativity. Specifically, the interaction of reappraisal and openness on creativity was significant,  $B = -0.31$ ,  $t(315) = -2.88$ ,  $p = 0.004$ ,  $f^2 = 0.03$ . Simple slope analyses revealed that for people with low openness (one standard deviation below the mean), creativity was higher in the reappraisal condition than in the other conditions,  $B = 0.49$ ,  $t(315) = 3.67$ ,  $p = 0.0003$ . For people with high openness (one standard deviation above the mean), there was no difference in creativity between the reappraisal condition and the other conditions,  $B = -0.06$ ,  $t(315) = -0.46$ ,  $p = 0.65$ . In short, the results supported Hypothesis 2 irrespective of how we operationalized creativity.

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cognitive flexibility as the criterion indicated a marginal effect of the reappraisal condition relative to other emotion regulation conditions,  $B = 0.19$ ,  $t(315) = 1.78$ ,  $p = 0.08$ . There was also a positive effect of openness on cognitive flexibility,  $B = 0.16$ ,  $t(315) = 2.44$ ,  $p = 0.02$ . More important, the interaction of reappraisal and openness on cognitive flexibility was significant,  $B = -0.27$ ,  $t(315) = -2.33$ ,  $p = 0.02$ . Simple slope analyses revealed that for people with low openness (one standard deviation below the mean), cognitive flexibility was higher in the reappraisal condition than the other emotion regulation conditions,  $B = 0.44$ ,  $t(315) = 2.95$ ,  $p = 0.003$ . For people with high openness (one standard deviation above the mean), there was no significant difference in cognitive flexibility between the reappraisal condition and the other conditions,  $B = -0.06$ ,  $t(315) = -0.38$ ,  $p = 0.70$ .

Next, we examined the indirect effect of the interaction of reappraisal and openness on creativity through cognitive flexibility using Model 8 of the PROCESS macro with 5000 bootstrap samples (Hayes, 2013). Model 8 is a moderated mediation model that treats openness as a potential moderator of both the direct effect of reappraisal on creativity and the indirect effect of reappraisal on creativity through cognitive flexibility. In support of Hypothesis 3, we found a significant indirect effect of the interaction of reappraisal and openness on creativity through cognitive flexibility, *indirect effect* = -1.93,  $SE = 0.97$ , 95% CI [-3.92, -0.08]. When openness was low (one standard deviation below the mean), the indirect effect of reappraisal through cognitive flexibility was significant, *indirect effect* = 3.08,  $SE = 1.13$ , 95% CI [0.90, 5.35]. When openness was high (one standard deviation above the mean), the indirect effect through cognitive flexibility was not significant, *indirect effect* = -0.41,  $SE = 1.25$ , 95% CI [-2.90, 1.95].

**Supplemental analyses**

**Emotional experience.** One potential alternative explanation for the effect of reappraisal on creativity is that reappraisal influenced participants' emotional experiences and this change in emotional experience was responsible for the effect on creativity. As discussed above, this alternative explanation is unlikely because the effect of anger on creativity is either positive or null (Baas, DeDreu, & Nijstad, 2008; Davis, 2009), which runs counter to the observed effects. Nevertheless, we ran comprehensive analyses to test this alternative explanation (see the supplemental materials). The analyses indicate that emotions cannot explain our findings. Most important, there was no interaction of reappraisal and openness on either anger or happiness. Therefore, the pattern of the effects of emotion regulation condition and openness are fundamentally different on emotional experience than on creativity, which indicates that emotional experience cannot account for the effects on creativity. Also, using analyses that controlled for anger and happiness, the results of the hypothesis tests remained unchanged.

**Other personality traits.** Our theory focuses on the moderating role of openness because of its unique link to flexible thinking (McCrae, 1987; Raja & Johns, 2010). Prior research sometimes finds associations between creativity and other personality traits, including a positive correlation between creativity and extraversion and a negative correlation between creativity and conscientiousness (Zare & Flinchbaugh, 2019). However, these personality traits are linked to creativity through a motivational rather than cognitive path; they influence creativity through motivation for achievement and change (Zare & Flinchbaugh, 2019). That is, creativity is partly a function of people's desire to challenge the status quo, but our theory mainly concerns the cognitive capacity that enables them to do so. Therefore, other personality traits are theoretically more distal to cognitive flexibility. Nevertheless, we tested the interaction of reappraisal and

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each of the other personality traits in the five-factor model of personality (i.e., conscientiousness, extraversion, agreeableness, neuroticism) on creativity. None of the other personality traits interacted with reappraisal and influenced creativity,  $B_s < 1.1$ , *ns*.

**Discussion**

Study 2 found that low-openness individuals who used reappraisal to regulate their emotions were more creative on a subsequent task than those who used other strategies to regulate their emotions or did not regulate their emotions (Hypothesis 2). Also, our behavioral measure of cognitive flexibility mediated the positive effect of reappraisal on creativity for low-openness individuals (Hypothesis 3). Two aspects of our design helped us rule out the alternative explanation that the differences in creativity might be accounted for by participants' different emotional experiences across conditions. First, we used anger as the focal emotion, and the effect of anger on creativity is either positive or absent (but not negative), depending on the situation (De Dreu et al., 2008; Davis, 2009). Therefore, given that reappraisal should reduce anger, the effect of emotions in this study would run counter to our hypotheses. In short, using anger as the focal emotion provided a conservative test of our hypotheses. Second, we empirically ruled out this alternative explanation by measuring anger and happiness and using them as control variables in the regression. Even with these controls, we still found support for Hypothesis 2. In sum, Study 2 indicated that recent experience reappraising emotional events enhanced creativity in low-openness individuals, and this effect was independent from the effect of reappraisal on emotional experience itself. Furthermore, we tested the effects of other personality traits, but only found the hypothesized effects for openness, which is uniquely associated with the cognitive processes that are the focus of our theory.

**Study 3**

Study 3 differs from Study 2 in two important ways. First, we manipulate state openness in our experiment to allow for stronger causal inference. To the best of our knowledge, only one published study has successfully manipulated state openness (Schutte, Malouff, Segrera, Wolf, & Rodgers, 2003). Experimentally manipulating openness addresses the potential concern that the observed interaction between reappraisal and openness is driven by some unobserved variable associated with openness. Second, to address generalizability, Study 3 uses a different emotion induction task than Study 2. Rather than watch an emotion-eliciting video, participants in Study 3 are asked to write about a recent situation that made them angry. Autobiographical recall tasks elicit past emotions and therefore offer an opportunity for emotion regulation (Keltner, Ellsworth, & Edwards, 1993).

Study 3 uses a 2 Emotion Regulation (reappraisal, distraction)  $\times$  2 Openness (inhibited, accentuated) between-subjects design. That is, after examining multiple emotion regulation conditions in Study 2, we simplify the experimental design by comparing reappraisal and distraction. Distraction is an appropriate and rigorous comparison with reappraisal for two reasons. First, based on the process model of emotion regulation (Gross, 1998, 2015), both reappraisal and distraction are antecedent-focused emotion regulation strategies—they modify the cognitive processes that give rise to emotions. Suppression alters the expressions of emotions and therefore is a response-focused strategy. A similar argument about emotional labor differentiates between deep and surface acting (Hochschild, 1983). Both reappraisal and distraction constitute deep acting while suppression is a form of surface acting (Grandey, 2000).

Second, distraction and reappraisal are equally effective at mitigating undesirable emotions but involve different cognitive processes (Denson et al., 2012; Sheppes & Meiran,

2007). Therefore, using distraction as a comparison condition allows us to disentangle the effects of different emotion regulation strategies while minimizing differences in emotional experience. Neither suppression nor no regulation conditions would be as comparable in terms of participants' emotional experiences.

We pre-registered the study details, including the sample size, exclusion criteria, design, measurements, and analyses (see <https://aspredicted.org/blind.php?x=4pb7xf>).

### **Participants**

To identify an appropriate sample size, we conducted a power analysis with G\*power (Faul et al., 2007). We assumed an effect size  $f^2 = 0.03$  based on the interaction of reappraisal and openness on creativity in Study 2. A sample size of approximately 190 would be adequate to obtain 80% power at  $\alpha = 0.05$ . Therefore, we recruited 200 participants from the online survey platform Prolific Academic. Based on the pre-registered exclusion criteria, 23 participants were excluded from the sample because they did not provide a response to the creativity task ( $n = 4$ ), or did not complete the openness manipulation prompt ( $n = 11$ ) or the emotion regulation prompt ( $n = 8$ ). The resultant sample ( $N = 177$ ) was 59.3% female and ranged in age from 18 to 85 ( $M = 35.96$ ,  $SD = 14.18$ ); 86.3% identified as White, 5.1% as Asian, 3.4% as African American, 1.1% as Hispanic or Latino, and 4.0% as mixed race or ethnicity. Most had at least one year of full-time work experience (89.0%), including 53.2% who had at least 10 years of experience.

### **Design and Procedure**

Participants completed three ostensibly unrelated tasks. First, participants were randomly assigned to conditions of the openness manipulation, which was framed as a study of people's memory of life events (adapted from Schutte et al., 2003). All participants received three prompts and wrote a paragraph about a memory that fit the situation described in each prompt.



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Participants in the openness inhibition condition wrote about three experiences selected to highlight the value of routine and conventions: (a) A conversation that confirmed their existing beliefs, (b) A time they tried a new type of food and did not enjoy the experience, and (c) A time they returned to a very familiar place. Those in the openness accentuation condition wrote about three experiences selected to highlight the value of new experiences: (a) An intellectual conversation that challenged their existing views, (b) A time they tried a new type of food and enjoyed the experience, and (c) A time they traveled to a new place they had always wanted to visit. At the end of the task, participants completed a manipulation check of state openness.

Second, all participants were asked to recall a recent event that made them feel especially angry and describe the event in writing as vividly as they could (Keltner et al., 1993; see also Young, Tiedens, Jung, & Tsai, 2011). Then, participants completed the emotion regulation procedure, which varied as a function of experimental condition. Participants randomly assigned to the reappraisal condition were asked to revisit the angering event they had just recalled and write about how they could relieve the anger by thinking about it from a different perspective (McRae et al., 2012). Participants assigned to the distraction condition were asked to write about what they could see from the window closest to them (e.g., Fabiansson & Denson, 2012; Rusting & Nolen-Hoeksema, 1998; Watkins, Teasdale, & Williams, 2000).

Third, participants completed the creativity task used in Study 2 immediately after the emotion regulation task. Participants could work on the creativity task for as long as they wanted. At the end of the study, participants completed measures of their emotional state and a few demographic questions. All measures included in the study are reported below.

**Measures**

**Creativity.** As in Study 2, two independent coders who were blind to the experimental conditions coded the responses for novelty and usefulness on seven-point scales. Inter-rater reliability was sufficient for both novelty ( $ICC = 0.81, p < 0.001$ ) and usefulness ( $ICC = 0.93, p < 0.001$ ). Therefore, their assessments were averaged. Creativity was then calculated by multiplying the novelty and usefulness ratings.

**Cognitive flexibility.** We assessed cognitive flexibility by counting the number of categories of ideas each participant generated (De Dreu et al., 2011). Two independent coders who were blind to the experimental conditions assigned each idea to one of the eleven categories ( $ICC = 0.96, p < 0.001$ ). On average, participants used 2.43 categories ( $SD = 1.36$ ).

**State openness.** We adapted the trait openness scale used in Study 2 (John & Srivastava, 1999) to measure state openness ( $\alpha = 0.82$ ). The original measure asks respondents to rate themselves as they are generally. Following Schutte et al. (2003), we modified the instructions to ask respondents to rate how they see themselves at the present moment, not as they wish to be in the future or as they were in the past. Participants responded on a seven-point scale with scale point labels that ranged from 1 = *strongly disagree* to 7 = *strongly agree*.

**Emotional state.** Finally, we asked participants to report how they felt after the emotion regulation task using the same four items and five-point scales as in Study 2. To assess anger, we averaged responses for *anger* and *rage* ( $\alpha = 0.88$ ). To assess happiness, we averaged responses for *happiness* and *enjoyment* ( $\alpha = 0.91$ ). The anger and the happiness indices were negatively correlated with each other ( $r = -0.26, p < 0.01$ ).

## Results

Table 4 displays descriptive statistics and bivariate correlations of key variables. Table 5

reports means and standard deviations by condition for the manipulation checks, mediator, and dependent variable.

**State openness manipulation check.** A two-way ANOVA with emotion regulation condition, openness condition, and their interaction as independent variables and state openness as the dependent variable found a significant main effect of condition,  $F(1, 173) = 5.61, p = 0.02, \eta_p^2 = 0.03$ . State openness was higher in the accentuation condition ( $M = 5.20, SD = 0.92$ ) than in the inhibition condition ( $M = 4.89, SD = 0.88$ ). There was no effect of emotion regulation condition or the interaction,  $F_s < 1.0, p_s > 0.3, \eta_p^2 < 0.01$ . Therefore, the openness manipulation was successful.

**Reappraisal manipulation check.** Two independent coders who were blind to the experimental conditions coded participants' answers to the emotion regulation prompt. Coders were given the definition of reappraisal and asked to rate on a binary scale whether each participant's answer involved reappraisal of the emotional events. The two coders agreed on 93% of their codes. Discrepancies were resolved through discussion.

We conducted a binary logistic regression with emotion regulation condition, openness condition, and their interaction as predictors and the reappraisal manipulation check as the criterion. There was a significant effect of emotion regulation condition,  $B = 7.16, SE = 0.94, \text{Wald } \chi^2(1) = 57.44, p < 0.001$ . The vast majority of participants in the reappraisal condition (94%) used reappraisal to regulate their emotions, whereas none did in the distraction condition (0%),  $\chi^2(1) = 158.03, p < 0.001$ . There was no effect of openness condition or the interaction,  $B_s < 1.0, SE_s > 0.9, \text{Wald } \chi^2_s < 0.2, p_s > 0.60$ .

**Hypotheses testing.** A 2 (Emotion Regulation: reappraisal, distraction)  $\times$  2 (Openness:

inhibited, accentuated) ANOVA with creativity as the dependent variable tested Hypothesis 2, which predicted that the positive effect of reappraisal on creativity would be stronger when openness is inhibited compared to accentuated. Results indicated a significant interaction,  $F(1, 173) = 6.91, p = 0.009, \eta_p^2 = 0.04$  (see Figure 2). As predicted, simple comparisons revealed that for participants in the openness inhibition condition, creativity was higher in the reappraisal condition than the distraction condition,  $t(173) = 2.39, p = 0.02, d = 0.51$ . For participants in the openness accentuation condition, there was no significant difference in creativity between the reappraisal and distraction conditions,  $t(173) = 1.27, p = 0.20, d = 0.27$ . Thus, Hypothesis 2 was supported. There were no main effects of emotion regulation or openness,  $F_s < 0.7, ns$ .<sup>4</sup>

We also examined the simple effect of our openness manipulation in the distraction condition to assess how our results compare with prior research on openness that did not involve emotions or emotion regulation. As expected, the effect was positive and more than trivial in terms of magnitude, although not statistically significant,  $t(173) = 1.41, p = 0.16, d = 0.30$ .

**Mediation analysis.** To investigate whether reappraisal enhanced subsequent creativity by promoting cognitive flexibility (Hypothesis 3), we first examined the effects of emotion regulation and openness on cognitive flexibility. A 2 (Emotion Regulation: reappraisal, distraction)  $\times$  2 (Openness: inhibited, accentuated) ANOVA with cognitive flexibility as the dependent variable indicated a significant interaction,  $F(1, 173) = 4.99, p = 0.03, \eta_p^2 = 0.03$ .

Simple comparisons revealed that for participants in the openness inhibition condition, cognitive

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<sup>4</sup> As in Study 2, we also calculated creativity by averaging novelty and usefulness ratings and repeating the hypothesis tests. The results were virtually the same as analyses that used the multiplicative measure for creativity. Specifically, a 2 (Emotion Regulation: reappraisal, distraction)  $\times$  2 (Openness: inhibited, accentuated) ANOVA with creativity as the dependent variable found a significant interaction,  $F(1, 173) = 7.06, p = 0.009, \eta_p^2 = 0.04$ . Simple comparisons revealed that when openness was inhibited, creativity was higher in the reappraisal condition than the distraction condition,  $t(173) = 2.43, p = 0.02, d = 0.52$ . When openness was accentuated, there was no significant difference in creativity between the reappraisal condition and the distraction condition,  $t(173) = 1.26, p = 0.20, d = 0.26$ . In short, the results supported Hypothesis 2 irrespective of how we operationalized creativity.

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flexibility was marginally higher in the reappraisal condition than the distraction condition,  $t(173) = 1.94, p = 0.054, d = 0.42$ . For participants in the openness accentuation condition, there was no significant difference in cognitive flexibility between the reappraisal and distraction conditions,  $t(173) = 1.18, p = 0.24, d = 0.25$ . There were no main effects of emotion regulation or openness,  $F_s < 2.2, ns$ .

Next, to examine the significance of the indirect effect of the interaction of reappraisal and openness on creativity through cognitive flexibility, we conducted a bootstrap mediation analysis with 5000 samples using PROCESS Model 8 (Hayes, 2013). In support of Hypothesis 3, we found a significant indirect effect of the interaction of emotion regulation and openness on creativity through cognitive flexibility, *indirect effect* = -4.66, *SE* = 2.17, 95% CI [-9.05, -0.61]. In the openness inhibition condition, the indirect effect of reappraisal through cognitive flexibility was significant, *indirect effect* = 2.92, *SE* = 1.52, 95% CI [0.02, 5.94]. In the openness accentuation condition, the indirect effect through cognitive flexibility was not significant, *indirect effect* = -1.73, *SE* = 1.48, 95% CI [-4.67, 1.09].

**Supplemental analyses of emotional experience.** As in Study 2, we empirically addressed the alternative explanation that participants' emotional experience may have accounted for the observed differences in creativity. Using distraction as the comparison condition partly addressed this concern because reappraisal and distraction are equally effective at mitigating emotional experiences (Sheppes & Meiran, 2007). However, we ran comprehensive analyses to test this alternative explanation (see the supplemental materials). The analyses indicate that emotions cannot explain our findings. Most important, there was no interaction of reappraisal and openness on either anger or happiness. Also, using analyses that controlled for

anger and happiness, the results of the hypothesis tests remained unchanged.

## **Discussion**

Study 3 manipulated openness and found that the effect of reappraisal on creativity differed as a function of openness. When openness was low, people were more creative after using reappraisal than distraction to regulate their emotions. When openness was high, creativity did not depend on which emotion regulation strategies people used. Thus, Study 3 ruled out the potential concern that the results of Study 2 may have been caused by some unobserved variable associated with trait openness.

Study 3 also provided further support for the mechanism we theorized to underlie the phenomenon. As in Study 2, changes in cognitive flexibility mediated the effect of reappraisal on creativity when openness was low. Although any emotion regulation strategy may reduce unwanted emotions, only reappraisal enhances creativity by activating cognitive processes that facilitate creativity. Moreover, the alternative explanation that emotional experience might have accounted for the observed differences in creativity was not supported by the data.

## **General Discussion**

Although emotions are often heavily regulated in the workplace (Grandey, 2000), little is known about how specific emotion regulation strategies influence subsequent creativity.

Drawing from the creative cognition approach (Finke et al., 1992) and the process model of emotion regulation (Gross, 1998, 2015), we theorized that the use of reappraisal should be positively associated with creativity because both involve considering new approaches or adopting different perspectives. Moreover, based on the interactionist perspective on creativity (Woodman & Schoenfeldt, 1989; Zhou & Hoever, 2014), we expected that experience with reappraisal would boost creativity for people low (but not high) in openness because fostering

cognitive flexibility would compensate for their propensity to rely on conventional perspectives and normative ideas.

Three studies supported our hypotheses. Consistent with theories that suggest that reappraisal and creativity have cognitive underpinnings in common, Study 1 demonstrated a positive association between creativity and the use of reappraisal; people who more frequently use reappraisal tended to be more creative. Building on evidence of this association, we then examined the effectiveness of reappraisal-based interventions on subsequent creativity in two experiments. Using reappraisal to regulate emotions enhanced subsequent creativity for low-openness individuals relative to not regulating emotions and using either distraction or suppression to regulate emotions. Cognitive flexibility mediated the interaction of reappraisal and openness on creativity. Together, our findings indicate that an intervention that provides training and practice with reappraisal can help unlock the creative potential of employees who tend not to be particularly creative when left to their own devices.

Our theory focuses on how reappraisal can induce cognitive flexibility, which carries over to subsequent tasks and enhances creativity. Other emotion regulation strategies involve different processes. Distraction involves shifting attention away from the disturbing emotional event. Suppression involves inhibiting expressions of emotions (Gross, 1998, 2015). Therefore, distraction and suppression do not involve viewing the situation differently and should not promote creative thinking. Across three studies, we compared reappraisal with alternative strategies and demonstrated a unique link between reappraisal and creativity. That is, reappraisal, distraction, and suppression are all emotion regulation strategies that people commonly use to manage their emotions, but they involve different cognitive processes and have different effects on creativity. Our results indicate that experience with reappraisal shapes cognitive patterns,

which has downstream benefits for creative performance.

Our studies also included three features that allowed us to rule out the possibility that emotions were responsible for the changes in creativity that we observed. First, Studies 2 and 3 provided conservative tests of our hypotheses because they used anger as the focal emotion. Prior research indicates that, if anything, anger facilitates instead of inhibits creativity (De Dreu et al., 2008). Therefore, if residual anger had any effects in our studies, it should have made it more difficult for us to observe the hypothesized differences across our key comparison conditions. In contrast, we found that people low in openness who used reappraisal to regulate their anger exhibited greater creativity than those in the comparison conditions. Second, we also measured emotions and included them as covariates in our analyses. The pattern of results was the same regardless of whether we statistically controlled for the effects of anger on creativity. Third, the supplemental analyses of the effect of emotion regulation on anger and happiness indicate that emotions cannot explain our findings. In sum, the studies strongly support our claim that the effects we observed on creativity are attributable to the reappraisal process, not emotional experiences themselves.

### **Theoretical Implications**

Our work contributes to the research on the antecedents of creativity by demonstrating that people's creative thinking skills vary across relatively short time periods and are more malleable than previously assumed. Creativity is usually conceptualized as an outcome of the interplay among motivation, domain-relevant knowledge, and creative thinking skills (Amabile, 1988). A large part of management research on creativity focuses on how to enhance individuals' motivation and how to cultivate a workforce with diverse knowledge and expertise (Amabile & Pratt, 2016; Hirst, van Knippenberg, & Zhou, 2009). Existing work on creative thinking often



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examines associations between creativity and individual differences, such as need for cognition (Wu, Parker, & de Jong, 2014), tolerance for ambiguity (Zenasni, Besancon, & Lubart, 2008), and intuitive thinking styles (Clegg, Unsworth, Epitropaki, & Parker, 2002). It is undoubtedly important to understand these associations, perhaps especially in the context of personnel selection. However, the implications of this approach are less clear for personnel development, given that individual differences are generally conceptualized as stable characteristics or dispositions. Therefore, one particularly novel aspect of the current research is that it indicates people's cognitive styles are at least somewhat malleable and can be enhanced by short-term interventions. Moreover, we used relatively minimalistic intervention that involved only a single instance of reappraisal. The results indicated that relatively little exposure to reappraisal was sufficient to produce an effect on creativity. Future research should consider whether more extensive practice with reappraisal yields even stronger effects.

Our work also contributes to the interactionist perspective on creativity by identifying a means to enhance creativity for individuals who tend to be low on creativity when left to their own devices. The interactionist perspective identifies several contextual factors that improve creativity of those already prone to flexible thinking (Baer, 2010; Baer & Oldham, 2006; George & Zhou, 2001). Given that creativity is the product of motivation and cognitive capacity (Amabile, 1988), low-openness individuals may not benefit from these factors because additional motivation may be insufficient to overcome barriers associated with their default cognitive style. Therefore, one important implication of the current research is that it is possible to unlock the creative potential of conventional thinkers by inducing flexible thinking. More broadly, our work illustrates the utility of the creative cognition approach to identifying interventions that can enhance creativity in those who are not naturally prone to creative thinking.

Our findings also highlight the benefits of understanding and distinguishing among emotion regulation strategies. Much of the organizational behavior research on emotion management focuses on surface versus deep acting, which broadly differentiates people's attempts to modify the emotional display versus the emotional experience (Grandey, 2000; Hochschild, 1983; Scott et al., 2020). Less attention has been paid to differences among deep acting strategies, such as distraction and reappraisal (Elfenbein, 2007). The lack of attention may be due, in part, to the assumption that any effect of emotion regulation on creativity is due to the changes that any given emotion regulation strategy has on people's emotional states (Ivcevic & Brackett, 2015; Parke et al., 2015). Therefore, to the extent that the strategies can effectively mitigate undesirable emotions, the distinction among them may seem unnecessary. We challenge this assumption by highlighting the different cognitive processes that underlie reappraisal, suppression, and distraction and documenting that they have divergent downstream effects on cognition and behavior.

Furthermore, our results indicate that using reappraisal has downstream consequences that influence a much broader set of phenomena than previously considered. Prior work focuses on how reappraising emotional events may influence stress, mental health, and memory of emotional events (e.g., Ehring et al., 2010; Gross, 2002; Richards & Gross, 2000). We find that reappraisal influences more than just the emotions people experience in response to a focal event. How people react to an emotional event originates from their appraisals in terms of the event's significance for their own wellbeing and their capacity to cope with it (Lazarus, Kanner, & Folkman, 1980). Therefore, appraisals depend in part on people's ingrained perspectives and assumptions, which are prone to various constraints and biases (Bazerman & Moore, 2009). Our results support our theory that reappraisal prompts people to be more creative by inducing

flexible thinking. Future research should explore whether reappraising emotional events also mitigates cognitive biases that are associated with limited information processing, such as anchoring bias (Tversky & Kahneman, 1974), confirmation bias (Snyder & Swann, 1978), status quo bias (Samuelson & Zeckhauser, 1988), or even stereotypes (Fiske, Cuddy, Glick, & Xu, 2002). In short, we find that the effects of reappraisal extend beyond the affective domain, which suggests that reappraisal may influence a broad range of cognitions and behaviors.

### **Practical Implications**

Our research demonstrates that the use of emotion regulation strategies influences not only the emotional experience itself but also subsequent creative thinking. We do not suggest that managers evoke negative emotions in their employees to provide employees with opportunities to use reappraisal. However, negative emotions are inevitable in the workplace, and employees can choose which emotion regulation strategy they use to cope with them. Therefore, one practical implication of the current research is that employees who find themselves in a situation that calls for emotion regulation could opt to practice reappraisal rather than distraction or suppression and then choose to work on tasks that call for creativity. Employees also could foster their creativity in the longer term by utilizing emotional episodes in their everyday life as opportunities to practice reappraisal and increase their flexible thinking. Of course, one could cultivate their creativity through cognitive exercises, such as novel conceptual combination tasks (Wan & Chiu, 2002), but doing so would involve an extra time commitment. People are more likely to use suppression rather than reappraisal to manage their emotions at work, but using reappraisal leads to better mental wellbeing and social relationships than other strategies (Seppälä & Bradley, 2019). Our studies identify yet another benefit of practicing reappraisal when coping with emotionally-charged experiences. In short, research on the

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emotion-creativity relationship indicates that managers interested in promoting creativity should foster positive emotions (Davis, 2009), and the current research suggests that considering how we are regulating the emotions may be as important as the emotional experience itself.

Our research also has implications for hiring and training processes in organizations. Our findings illustrate that organizations can cultivate creativity in everyone, not just in a limited set of individuals who are naturally gifted in creativity. Job candidates are often slotted to creative and non-creative jobs based on cues that signal creative potential (Elsbach & Kramer, 2003; Koppman, 2016). Not only are these cues relatively poor at predicting performance (Elsbach & Kramer, 2003; Kasof, 1995), but this hiring practice may also limit employers' access to employees with knowledge and experience that also play major roles in generating creative outcomes. Although creative thinking is often conceptualized as a stable characteristic (Torrance & Goff, 1989), our work shows that it can also be fostered. Therefore, organizations can develop training and interventions to cultivate creativity in their employees, even for those who lack the personality traits that are conducive to creativity.

Beyond hiring and training, groups and organizations also have norms about emotional displays that could guide people's use of emotion regulation (Elfenbein, 2007; Parke & Seo, 2017). Leaders could provide training on reappraisal and publically model their own use of reappraisal to facilitate norms of using reappraisal in response to emotional events. Left on their own, managers and employees tend to suppress their negative emotions or avoid discussing disturbing issues (Chiang, Chen, Liu, Akutsu, & Wang, 2021; Vuori & Huy, 2016). The current research suggests that reappraising emotional events may be a more desirable strategy for organizations to handle shared negative emotions among their members, which may facilitate discovery of new opportunities and generation of creative ideas.

**Limitations**

The current package of studies has some limitations. First, we focused on the most commonly used emotion regulation strategies that are available options to most people, but we did not consider all possible regulation strategies (Elfenbein, 2007; Gross, 1998). Because our theory centers on the cognitive process that underlies reappraisal, distraction and suppression are appropriate comparisons. Like reappraisal, distraction and suppression rely on cognitive processing rather than taking actions to alter the situation (Elfenbein, 2007). We did not examine other emotion regulation strategies that preempt emotions by changing the situation, such as situation selection and situation modification (Gross, 1998), because they fundamentally differ from reappraisal by requiring control over the external environment. That said, future research could investigate whether these other strategies influence creativity through different mechanisms.

Second, we focused on the *generation* of creative ideas, not other stages in the innovation process. Generating creative ideas is a necessary but not sufficient condition for innovation. For a creative idea to eventually turn into a creative product, it also needs to be elaborated, evaluated, and implemented (Amabile, 1988; Mueller, Melwani, & Goncalo, 2012; Perry-Smith & Mannucci, 2017). Future research could examine whether emotion regulation can influence other stages in developing a creative product, such as by facilitating people's receptivity to novel ideas. It may be that the cognitive flexibility involved in reappraisal helps people appreciate others' ideas as well as generate more creative ideas on their own.

Third, we theorized that reappraisal intervention should be particularly effective at boosting creativity for people prone to thinking conventionally because it compensates for their natural tendency to rely on familiar perspectives. We operationalized conventional thinking

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using low openness because openness is part of the predominant model of personality and has been validated extensively in terms of its stability and predictive power (Costa & McCrae, 1992). However, future research could operationalize the tendency toward conventional thinking in other ways, such as scoring low in divergent thinking skills (Guilford, 1967; McCrae, 1987) or in tests of creative personality (Gough, 1979).

Finally, we excluded the data from some participants in Studies 2 and 3 based on pre-registered criteria designed to identify those who obviously were not engaged in the tasks (e.g., did not respond to the primary measures). Screening out inattentive participants decreases noise and increases validity of the data (Oppenheimer, Meyvis, & Davidenko, 2009). The percentage of participants we excluded in our studies is similar to or below the rates of inattention and attrition in other online samples (e.g., Aguinis, Villamor, & Ramani, 2021). If there were something particular to our studies that prompted disengagement from some participants, our disengagement rates would be higher than average. Therefore, it seems likely that our disengagement rates represent random effects. However, we cannot determine why participants disengaged from the tasks in our studies, and any systematic difference between these participants and those who completed all of the measures would be a threat to generalizability.

### **Conclusion**

The current paper extends our understanding of the relationships among emotion regulation strategies, openness to experience, and creativity. Our results indicate that when low-openness individuals reappraise negative emotional events, they exhibit greater creativity in subsequent tasks, because reappraisal fosters cognitive flexibility. More broadly, the results suggest that the cognitive processes that underlie emotion regulation carry over and may therefore have a variety of downstream consequences on cognitions and behavior, not just

emotions. Interventions based on this effect may help tap the creative potential of low-openness individuals who hold many roles in organizations and possess domain-relevant knowledge that is necessary for creative problem solving.

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**Table 1***Means, Standard Deviations, and Correlations in Study 1*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. Reappraisal	5.00	1.02	-				
2. Suppression	3.82	1.19	0.13*	-			
3. Creativity	4.69	0.96	0.29**	0.04	-		
4. Age	20.45	2.17	-0.04	0.04	-0.05	-	
5. Gender	0.62	0.48	0.04	-0.13*	-0.16**	-0.09	-
6. Latino	0.15	0.36	0.10	-0.00	0.02	0.01	0.01
7. White	0.12	0.32	-0.03	-0.16**	0.07	0.11	-0.06

*Note.* \*  $p < 0.05$  (2-tailed); \*\*  $p < 0.01$  (2-tailed).

For gender, 0 = male, 1 = female. For ethnicity, we used dummy coding with Asian as the reference group because it was the largest in the sample (Cohen et al., 2003). We do not report correlations with dummy variables for African American or mixed-race subsamples due to their small sizes. We omit correlations between dummy variables because they are meaningless.

**Table 2***Means, Standard Deviations, and Correlations in Study 2*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8
1. Openness	4.90	0.91	-							
2. Conscientiousness	5.25	1.00	-0.03	-						
3. Extraversion	3.96	1.26	0.16**	0.28**	-					
4. Agreeableness	5.24	0.91	-0.04	0.39**	0.28**	-				
5. Neuroticism	4.20	1.24	0.00	-0.44**	-0.33**	-0.32**	-			
6. Cognitive flexibility	1.93	1.10	0.14*	-0.003	0.12*	0.10	-0.09	-		
7. Novelty	3.17	1.71	0.15**	-0.06	0.07	0.03	-0.10	0.75**	-	
8. Usefulness	5.83	0.77	0.11	-0.02	0.07	-0.04	0.00	0.18**	0.19**	-
9. Creativity	18.77	10.45	0.16**	-0.07	0.07	0.01	-0.08	0.76**	0.98**	0.32**

\*  $p < 0.05$  (2-tailed); \*\*  $p < 0.01$  (2-tailed).

**Table 3***Means and Standard Deviations by Condition in Study 2*

	Condition							
	Reappraisal		Distraction		Suppression		No regulation	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Reappraisal manipulation check	4.88	(1.72)	4.07	(1.61)	3.67	(1.98)	2.66	(1.54)
Distraction manipulation check	2.54	(1.70)	6.05	(1.06)	2.68	(1.80)	2.11	(1.39)
Suppression manipulation check	4.18	(1.48)	4.95	(1.42)	6.49	(0.85)	3.66	(1.56)
Openness	4.84	(0.91)	4.61	(0.94)	5.10	(0.83)	5.02	(0.87)
Cognitive flexibility	2.10	(1.18)	1.69	(0.96)	1.89	(1.06)	2.04	(1.16)
Creativity	20.49	(10.69)	16.52	(9.62)	18.24	(9.94)	19.93	(11.22)

**Table 4***Means, Standard Deviations, and Correlations in Study 3*

Variable	<i>M</i>	<i>SD</i>	1	2	3
1. Flexibility	2.43	1.36	-		
2. Novelty	4.07	1.70	0.77**	-	
3. Usefulness	5.88	0.38	-0.31**	-0.33**	-
4. Creativity	23.72	9.58	0.74**	0.98**	-0.12

\*\*  $p < 0.01$  (2-tailed).

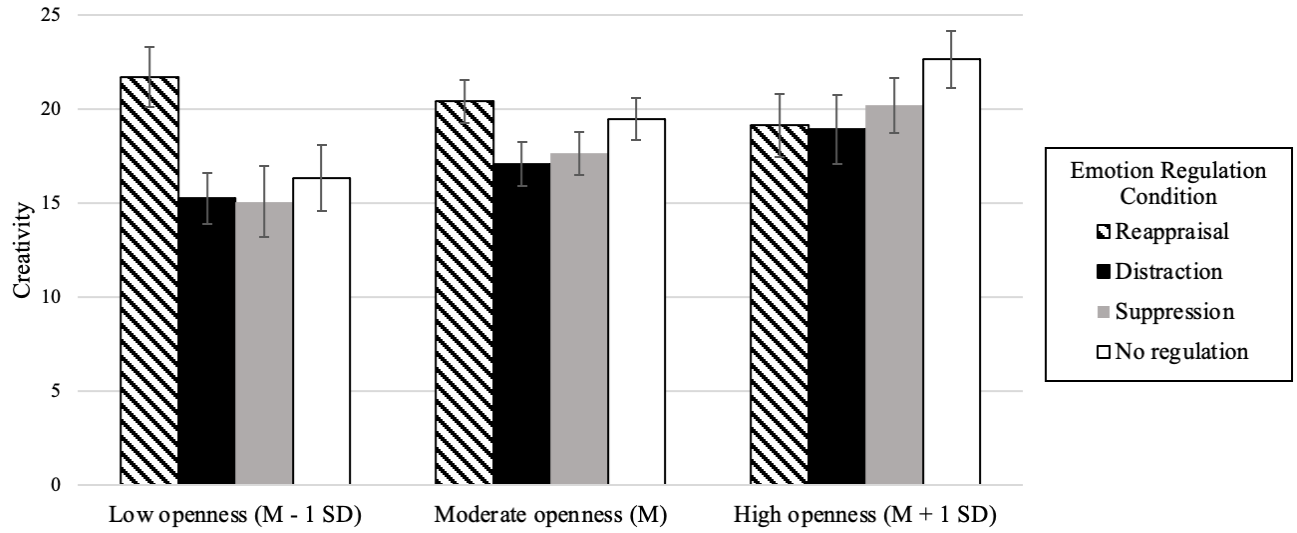
**Table 5***Means and Standard Deviations by Condition in Study 3*

	Openness inhibited				Openness accentuated			
	Reappraisal		Distraction		Reappraisal		Distraction	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Reappraisal manipulation check	0.95	(0.22)	0.00	(0.00)	0.93	(0.25)	0.00	(0.00)
State openness manipulation check	4.81	(0.92)	4.95	(0.86)	5.15	(0.98)	5.26	(0.85)
Flexibility	2.88	(1.37)	2.31	(1.28)	2.13	(1.30)	2.47	(1.41)
Creativity	26.76	(9.98)	21.84	(10.05)	22.11	(8.34)	24.68	(9.42)

**Figure 1**

*The Effects of Emotion Regulation Strategy and Trait Openness on Creativity in Study 2*

## REAPPRAISAL, OPENNESS, AND CREATIVITY

**Figure 2**

*The Effects of Emotion Regulation and Openness Manipulations on Creativity in Study 3*

