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Cognitive Reappraisal and Acceptance: Effects on Emotion, Physiology, and Perceived Cognitive Costs

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Abstract

Two emotion regulation strategies—cognitive reappraisal and acceptance—are both associated with beneficial psychological health outcomes over time. However, it remains unclear whether these 2 strategies are associated with differential consequences for emotion, physiology, or perceived cognitive costs in the short-term. The present study used a within-subjects design to examine the effects of reappraisal (reframing one's thoughts) and acceptance (accepting feelings without trying to control or judge them) on the subjective experience of negative emotions, positive emotions, and physiological responses during and following recovery from sad film clips shown in the laboratory. Participants also reported on perceived regulatory effort, difficulty, and success after deploying each emotion regulation strategy. In 2 samples of participants (N = 142), reappraisal (vs. acceptance) was associated with larger decreases in negative and larger increases in positive emotions, both during the film clips and recovery period. However, acceptance was perceived as less difficult to deploy than reappraisal, and was associated with a smaller dampening of skin conductance level (indicating more successful regulation) during the film clips in 1 sample. These results suggest that reappraisal and acceptance may exert differential short-term effects: Whereas reappraisal is more effective for changing subjective experiences in the short term, acceptance may be less difficult to deploy and be more effective at changing one's physiological response. Thus, these 2 strategies may both be considered "effective" for different reasons.

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Keywords

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The ability to regulate one's emotional states—by changing the duration, intensity, or expression of emotion—is important for psychological well-being (Gross, 1998; Gross & Thompson, 2007). Deficits in emotion regulation are associated with multiple psychological health problems, including mood disorders (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Gruber, Harvey, & Gross, 2012; Troy, Wilhelm, Shallcross, & Mauss, 2010), anxiety disorders (Campbell-Sills & Barlow, 2007), and decreased social functioning (Eisenberg, Hofer, & Vaughan, 2007; Gross & John, 2003). Thus, it is important to identify which specific emotion regulation strategies allow people to most effectively regulate their emotions and improve psychological health.

In the present study, we examine the effects of two emotion regulation strategies on short-term responses to a negative emotion induction in the laboratory: cognitive reappraisal, which involves reframing an emotional stimulus to change its emotional impact (Gross, 2015), and acceptance, which involves engaging with and nonjudgmentally accepting one's negative experiences (Segal, Williams, & Teasdale, 2002). At first glance, these two strategies may seem opposite in nature, with reappraisal explicitly focused on changing one's emotional states, and acceptance focused on *not* changing one's emotional states. Importantly, however, the existing literature on these two strategies suggests that, paradoxically, they both exert positive effects on psychological health (Shall-cross, Troy, & Mauss, 2015). Although both reappraisal and acceptance lead to beneficial long-term outcomes, by definition, both of these strategies involve very different short-term regulatory goals and different processes to achieve these goals. Therefore, it is important to examine whether there are differential short-term effects of acceptance and reappraisal. In the following sections, we review the existing literature on reappraisal and acceptance and their effects on emotional (i.e., the subjective experience of emotion) and physiological (i.e., sympathetic nervous system activity) responses, as well as the potential cognitive costs of each strategy.

Cognitive Reappraisal

Cognitive reappraisal is thought to be an effective strategy because it allows people to change the underlying appraisals that contribute to negative emotions (Gross, 1998; Lazarus & Folkman, 1984). Empirical evidence consistently indicates that cognitive reappraisal is beneficial for psychological health (for a meta-analysis, see Aldao et al., 2010). For example, high levels of habitual reappraisal use have been linked to better psychological health in cross-sectional (Garnefski & Kraaij, 2006; John & Gross, 2004) as well as prospective longitudinal studies (Kraaij, Pruym-boom, & Garnefski, 2002). Taken together, these studies support the hypothesis that reappraisal plays an important role in long-term psychological health.

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Effects on Emotional Experience

The studies above are consistent in highlighting the positive effects of reappraisal on long-term outcomes that relate to psychological health and well-being. Tightly controlled laboratory studies, in which reappraisal use is experimentally manipulated, expand upon these studies by examining the short-term effects of reappraisal on the subjective experience of emotion. For example, participants instructed to use reappraisal in the lab have consistently reported significant decreases in negative emotion, relative to other strategies like suppression and to control groups not instructed to regulate their emotions (Dandoy & Goldstein, 1990; Gross, 1998; Keng, Robins, Smoski, Dagenbach, & Leary, 2013; Wolgast, Lundh, & Viborg, 2011). Reappraisal is also associated with significant increases in positive emotions in the laboratory (McRae, Ciesielski, & Gross, 2012; Shiota & Levenson, 2012). A recent meta-analysis confirmed that reappraisal led to significant changes in the subjective experience of emotions—both negative and positive—across studies using laboratory paradigms (Webb, Miles, & Sheeran, 2012). These experimental studies build confidence in the conclusion that reappraisal has important short-term effects on the experience of both negative and positive emotion.

Effects on Physiology

These experimental studies have also examined the short-term effects of reappraisal on physiological responses to negative stimuli in the laboratory. Mauss, Cook, Cheng, and Gross (2007) found that those high in habitual reappraisal use responded to a laboratory anger induction with significantly less physiological reactivity relative to their low reappraisal counterparts. Similarly, Gross (1998) found that individuals instructed to use reappraisal experienced significantly less physiological reactivity relative to those instructed to suppress their emotions. It is important to note, however, that the physiological responses of those who reappraised were indistinguishable from those in a no-regulation control condition in the same study (Gross, 1998). Some studies, however, have found that reappraisal leads to larger reductions in physiological responses relative to a control group (Wolgast et al., 2011). In one exception to this pattern, however, a previous study that examined acoustic eyeblink startle magnitude found that reappraisal was associated with greater physiological reactivity relative to a suppression group (Asnaani, Sawyer, Aderka, & Hof-mann, 2013). Across studies, a recent meta-analysis showed that reappraisal was associated with significantly smaller and nonsignificant effects on physiology relative to observed effects on self-reported experience of emotion (Webb et al., 2012).

Cognitive Costs

How easily can individuals deploy reappraisal? And how many resources are required to use this strategy? Previous laboratory studies of emotion regulation suggest that reappraisal may be associated with minimal cognitive costs relative to suppression or control groups (Gross & Thompson, 2007). For example, unlike the use of suppression, the use of reappraisal does not negatively impact memory and, in some cases, may even improve memory for emotional events (Richards, Butler, & Gross, 2003; Richards & Gross, 2000). Reappraisal has also been shown to increase performance on standardized tests relative to a control group

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(Jamieson, Mendes, Blackstock, & Schmader, 2010). Together, these studies suggest that reappraisal does not lead to significant cognitive costs when used.

Recent theoretical and empirical considerations suggest that this conclusion may be premature, however. Many have argued that the successful use of reappraisal requires several potentially taxing cognitive processes, including working memory, task switching, and the ability to override a prepotent response (Gan, Yang, Chen, Zhang, & Yang, 2017; Hofmann, Schmeichel, & Baddeley, 2012; Ortner, Ste Marie, & Corno, 2016). For example, Ortner and colleagues (2016) suggested that reappraisal in emotionally intense situations may be particularly difficult because the individual will experience a conflict between the initial (often negative) appraisal and the new, less emotionally evocative reappraisal. As the emotional intensity of a situation increases, it may become increasingly difficult to override the original appraisal of the situation. In fact, experimental studies that manipulate reappraisal and emotional intensity support this hypothesis. Sheppes and Meiran (2007) found that reappraisal is less effective at changing the experience of negative emotions in intense emotional situations. In addition, people are less likely to choose to use reappraisal in emotionally intense situations (Sheppes et al., 2014), and the use of reappraisal is associated with decreased self-control resources and decreased performance on reaction time tasks when used in high-intensity situations (Ortner et al., 2016; Sheppes & Meiran, 2008). Studies that investigate the spontaneous use of emotion regulation strategies also suggest that people do not choose to use reappraisal very frequently to regulate their emotions relative to the use of suppression and distraction (Brans, Koval, Verduyn, Lim, & Kuppens, 2013; Suri, Whittaker, & Gross, 2015). Together, this evidence suggests that reappraisal may not be easy to deploy and may also produce significant cognitive costs, especially in situations characterized by high levels of emotional intensity. However, very little research has directly examined participants' perceptions of how difficult it is to deploy and successfully use reappraisal relative to other regulatory strategies.

Summary of Research on Cognitive Reappraisal

Overall, the existing literature on the effects of reappraisal shows that reappraisal is an effective way to change both negative and positive emotions over the short- and longer term. The effects of reappraisal on physiological responses in the laboratory, however, are mixed. Although reappraisal is not associated with significant *increases* in reactivity relative to control groups, it is not consistently associated with significant *decreases* in reactivity either. In terms of perceived cognitive costs, the results are also somewhat contradictory. Although reappraisal appears to be less difficult to use than suppression, it remains unclear whether reappraisal is perceived to be an "easy" emotion regulation strategy to use successfully, especially compared with other strategies.

Acceptance

As described above, reappraisal has long been studied and conceptualized as a beneficial emotion regulation strategy. More recent empirical attention has turned to the possible benefits of a seemingly contradictory strategy—acceptance. Unlike reappraisal, which focuses on changing the content of one's thoughts and feelings, acceptance involves

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changing how one *relates to* his or her thoughts and feelings (Linehan et al., 2006) by imparting the ability to become actively aware of emotions and to explicitly engage with them without evaluating them negatively (Segal et al., 2002). Thus, in this way, acceptance could be thought of as reappraisal's opposite: encouraging individuals to be aware of and accept how they feel, rather than trying to actively change how they feel.

Although acceptance appears to have very different goals than reappraisal, the literature suggests that the habitual use of acceptance exerts similar beneficial effects on psychological health. Correlational studies have shown that the use of acceptance in daily life is associated with decreased negative affect (Kashdan, Barrios, Forsyth, & Steger, 2006; Shallcross, Troy, Boland, & Mauss, 2010). There is also evidence that acceptance-based interventions (e.g., acceptance and commitment therapy, dialectical behavior therapy, mindfulness-based cognitive therapy) are associated with decreased negative affect and improved psychological health (Linehan et al., 2006; Ma & Teasdale, 2004; Shallcross et al., 2015).

Why might acceptance, a strategy that encourages one *not* to change one's emotions (including negative ones), be associated with better psychological health? Acceptance is thought to allow individuals to nonjudgmentally engage with the full range of human experiences and promote increased self-awareness, self-compassion, and behavioral flexibility (Hayes & Wilson, 2003; Kashdan et al., 2006). Similarly, the nonjudgment aspect of acceptance is thought to decrease the metacognitions that often accompany negative mood states—that is, one's negative evaluations of his or her emotions—which may, in turn, help to diffuse negative affective states (Keng, Smoski, & Robins, 2016; Troy, Shallcross, Davis, & Mauss, 2013).

Effects on Emotional Experience

Although the literature on the link between trait acceptance and long-term psychological health has consistently shown positive effects, laboratory studies that examine the short-term effects of acceptance have yielded inconsistent findings. Although some studies have indicated that acceptance leads to decreases in negative emotions, relative to other experimental groups (Levitt, Brown, Orsillo, & Barlow, 2004; Wolgast et al., 2011), others have found no differences (Dan-Glauser & Gross, 2013; Dunn, Billotti, Murphy, & Dagleish, 2009). Indeed, a meta-analysis of laboratory studies of emotion regulation found that acceptance does not exert a reliable effect on negative emotions (Kohl, Rief, & Glombiewski, 2012).

Very few laboratory studies have examined the effects of acceptance on positive emotions. In one experiment, Dan-Glauser and Gross (2015) found that acceptance was associated with significant increases in the experience of positive affect when viewing positively valenced pictures but not when viewing negatively valenced pictures. In that study, however, positive and negative affect were not measured as separate constructs—instead, negative and positive affect were simply opposite ends of one continuum (Dan-Glauser & Gross, 2015). Similarly, Asnaani and colleagues (2013) examined the effects of acceptance on self-reported distress in response to positive images; however, they did not measure positive affective responses. Therefore, the relationship between acceptance and positive affect remains unclear, especially in the context of negative stimuli.

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The inconsistency in the effects of acceptance on the subjective experience of emotion may be explained by a study conducted by Campbell-Sills, Barlow, Brown, and Hofmann (2006), which found that acceptance led to *increased* negative affect during a distressing film clip but *decreased* negative affect after a recovery period following the film. Similarly, a recent study found that a brief mindfulness instruction (which included acceptance as a component) led to initial increases in negative affect in response to negative stimuli relative to other experimental groups. However, after reexposure to the negative stimuli, those in the mindfulness condition displayed significantly lower levels of negative affect relative to other groups (Uusberg, Uusberg, Talpsep, & Paaver, 2016). This pattern of findings may not be surprising, given that acceptance initially involves inviting individuals to actively engage with and experience negative emotions. Hence, it may be that although acceptance does not immediately decrease negative affect during an emotional event, approaching negative emotions in a nonevaluative way may aid in emotional recovery by diffusing the experience of these emotions relatively quickly.

Effects on Physiology

Experimental studies that examine physiological responses in the laboratory have found that acceptance is associated with a more adaptive physiological profile relative to suppression across studies (Campbell-Sills et al., 2006; Dan-Glauser & Gross, 2015; Feldner, Zvolensky, Eifert, & Spira, 2003). Dunn and colleagues (2009) also found that acceptance was associated with less electrodermal reactivity following a distressing film clip relative to both a suppression and a control group. However, one previous study found that acceptance did not attenuate the magnitude of acoustic eyeblink startle relative to suppression while viewing emotion inducing images (Asnaani et al., 2013). Thus, although there are some mixed findings in the current literature, several previous studies suggest that acceptance is not associated with physiological costs when used, and may even be associated with significant decreases in physiological responding.

Cognitive Costs

Very little research has directly examined the perception of how difficult it is to deploy and successfully use acceptance. From a theoretical perspective, however, acceptance should not require higher level executive functions like working memory capacity or manipulation to the same degree that suppression or reappraisal might require (Shallcross, Ford, Floerke, & Mauss, 2013). Indeed, studies of mindfulness interventions—of which acceptance is a key aspect—have shown that the practice of mindfulness is associated with increased relaxation and awareness (Rosch, 2007; Salmon et al., 2004) and may even restore self-control resources (Friese, Messner, & Schaffner, 2012). Furthermore, Keng and colleagues (2013) found that a brief mindfulness intervention was associated with less interference on the Stroop task relative to both a control and a reappraisal group. Together, these studies provide preliminary evidence for the hypothesis that acceptance is less difficult and cognitively taxing to use relative to other strategies including reappraisal. However, none of the above studies specifically isolated the use of acceptance from the broader application of mindfulness. As a multidimensional process, mindfulness involves intentional awareness and acceptance of emotions, thoughts, and physical sensations, the skills of which are frequently developed through meditation practices (Allen, Blashki, Gullone, & Melbourne

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Academic Mindfulness Interest Group, 2006; Baer, Smith, & Allen, 2004; Coffey, Hartman, & Fredrickson, 2010). Thus, the perceived difficulty in using acceptance as a discrete process remains poorly understood.

Summary of Research on Acceptance

Taken together, the research summarized above has shown that trait acceptance is associated with positive psychological health outcomes over time. It remains unclear, however, how the use of acceptance affects one's responses to negative stimuli over the short-term. Although some evidence indicates that acceptance decreases short-term physiological responses, it is unclear how acceptance affects the experience of emotion (both negative and positive) during stimulus presentation and recovery. Even less is known about whether acceptance is perceived as difficult or cognitively taxing to use. Thus, laboratory experiments that examine the short-term effects of acceptance on both emotional and physiological responses, as well as the perceived cognitive costs, are needed.

Effects of Acceptance Versus Reappraisal

To date, we are aware of four experiments that have directly compared reappraisal and acceptance in the laboratory in nonclinical adult samples (Asnaani et al., 2013; Hofmann, Heering, Sawyer, & Asnaani, 2009; Szasz, Szentagotai, & Hofmann, 2011; Wolgast et al., 2011). When examining differences in emotional responding, two of these studies found that reappraisal was superior to acceptance for decreasing negative emotions (Hofmann et al., 2009; Szasz et al., 2011). In contrast, the remaining two studies found no differences in the effects of reappraisal and acceptance on the experience of negative emotions (Asnaani et al., 2013; Wolgast et al., 2011). Asnaani and colleagues (2013) also measured self-reported anxiety in response to positive stimuli and found no difference in the effectiveness of the two strategies. However, positive emotions were not measured separately from negative emotions in this experiment. Overall, then, the findings regarding the effects of reappraisal and acceptance on negative emotions are mixed, and the effects of these strategies on positive emotions has not been examined.

Only one of the three existing studies examined emotional responses after recovery periods following the emotion inductions. In this study, no significant differences were found between reappraisal and acceptance on negative emotions following a 3-min recovery period (Hofmann et al., 2009). Therefore, the time course of the effects of reappraisal and acceptance on emotional responding also remains poorly understood.

When examining changes in physiological reactivity to laboratory emotion inductions, findings are similarly mixed. Hofmann et al. (2009) found that reappraisal and acceptance both led to comparable decreases in physiological reactivity during a speech task and the recovery period, whereas Wolgast et al. (2011) found that reappraisal was more effective than acceptance at reducing physiological reactivity during film clips. Asnaani et al. (2013) found no differences between reappraisal and acceptance in decreasing acoustic eyeblink startle magnitude while viewing both negative and positive pictures in the laboratory. Therefore, it remains unclear whether reappraisal and acceptance have equivalent effects on physiological reactivity.

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Notably, none of the existing studies described above examined the perceived cognitive costs of using these two strategies. Thus, the question of whether individuals perceive these strategies differently, in terms of perceived difficulty and success when deploying each of these strategies, remains unanswered.

Why are the findings of previous experiments that compared reappraisal with acceptance so mixed? Notably, three of the four studies described above (Hofmann et al., 2009; Szasz et al., 2011; Wolgast et al., 2011) used between-subjects designs, which cannot easily account for individual differences in emotion regulation ability (which varies considerably across people; see Troy et al., 2010) or individual response biases in self-reported emotions (Augustine & Hemenover, 2009; Webb et al., 2012). Within-subjects designs can account for these individual differences by allowing each individual to act as their own control group, thus reducing sampling error and increasing the power to detect changes in affect caused by emotion regulation (Augustine & Hemenover, 2009; Webb et al., 2012).

Present Study

The present study sought to expand upon previous studies in six important ways. First, building upon the work of Asnaani and colleagues (2013), we used a within-subjects design to directly compare the effects of acceptance and reappraisal on emotional responses in the laboratory. Second, we examined changes in both emotional responses and skin conductance level (SCL), a measure of sympathetic nervous system activity. Third, we examined changes in the experience of both negative and positive emotions. Fourth, in order to examine whether reappraisal and acceptance exert differential effects over time, we assessed responses both during the film clips as well as after 2-min recovery periods following each film clip. Fifth, we examined the perceived cognitive costs of each strategy by asking participants to report on perceived effort, difficulty, and success after using each strategy. Finally, in order to examine the consistency and generalizability of observed effects, we recruited two separate samples of participants (first-year college students and a community sample) to complete the same laboratory procedure.

Given the consistent effects for reappraisal, and the inconsistent effects for acceptance on changes in emotional responses in previous research, we predicted that reappraisal would be more effective for both decreasing negative and increasing positive emotional responses both during the emotional stimuli and following recovery. Our hypotheses for differences in physiological responses were more tentative. Based on past literature, we predicted that neither reappraisal nor acceptance would be associated with significant physiological *costs*. However, we did not have clear directional hypotheses about how the two strategies may differ from one another in terms of physiological responding. Finally, given the preliminary literature on mindfulness and the theoretical considerations described above, we predicted that reappraisal would be perceived as more difficult to deploy successfully than acceptance.

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Method

Participants

Sample 1.—As part of a larger study on adjustment to stressful life events, first-year students at a liberal arts college in the Northeastern United States were recruited to participate. First-year students were chosen because past research has shown that the transition to college constitutes a substantial stressful event for young adults, and for many, requires long-term coping and adjustment (Srivastava, Tamir, McGonigal, John, & Gross, 2009). Students were recruited via flyers posted on campus and announcements made in classes comprised of first-year students. Participants were eligible to participate if they were over the age of 18, were currently in their first year of college, and had not been hospitalized for emotional reasons or attempted suicide in the past 6 months. Participants were compensated with their choice of $10 or course credit. A total of 77 eligible students completed the laboratory session described below (72% female; M_{age} = 18.3, SD = 0.51, range = 18–20). In terms of race/ethnicity, 57% of the students identified as White, 21% as Asian, 10% as multiple races, 8% as Black, and 4% as Hispanic/Latino. Because of technical difficulties, skin conductance data were available for only 55 participants. Another 13 participants engaged in excessive movement during at least one of the recovery periods, which left a total of 42 participants with usable skin conductance data during the recovery periods.

Sample 2.—Adults residing in the Lancaster, Pennsylvania, community were recruited to participate in a larger study on coping with stress. Participants were recruited via postings to online bulletin boards, announcements to local community groups and churches, and flyers posted in public spaces such as coffee shops, restaurants, and hospitals. To meet inclusion criteria, participants were required to have experienced a stressful life event in the past 4 months. During eligibility screening, a stressful life event was defined to participants as an event that began within the past 4 months and was perceived as having a significant, negative impact on the participant's life. The most common examples of qualifying stressful life events in the present study were: death of a family member or close friend (20%); serious illness or injury of a family member or close friend (15%); serious personal illness or injury (12%); job loss or continuing unemployment (26%); a long-distance move (12%); breakup, separation, or divorce from a romantic partner (23%); and other major financial stressors such as home foreclosure, borrowing large sums of money, or major change in financial status (17%). Percentages in the previous sentence add up to more than 100% because many participants reported experiencing more than one stressful life event during eligibility screening. Participants were excluded from the study if they did not report experiencing a qualifying stressful life event in the past 4 months, or if they reported a hospitalization for emotional reasons or a suicide attempt in the past 6 months. Participants were compensated $20 for completing the lab session.

A total of 65 eligible participants completed the laboratory procedure described below (68% female; M_{age} = 26.6, SD = 10.0, range = 18–60). In terms of race, 76% of participants identified as White, 7.5% as multiple races, 7.5% as Asian, 6% as Black, and 3% indicated "other." In terms of educational attainment, 15% of participants were high school graduates,

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50% had partial college education or technical training, 26% were college graduates, and 9% had graduate or professional training. Because of technical difficulties, skin conductance data were available for only 51 of the participants. Another three participants engaged in excessive movement during at least one of the recovery periods, leaving a total of 48 participants with usable skin conductance data during the recovery periods.

Procedure

Both samples completed the same procedure. This procedure was approved by the Institutional Review Board at Franklin & Marshall College prior to the recruitment of any participants. Eligible participants came into the laboratory for a session that lasted approximately 1 hr. A research assistant provided verbal and written explanations of study procedures, and all participants provided written informed consent before starting the session. To maximize privacy during data collection, participants were seated alone in an experiment room while a trained research assistant remained in an adjacent room connected via intercom. The lab session began with participants completing self-report questionnaires on the computer that assessed demographics and other constructs that are not reported here. After the questionnaires, all participants took a short break and then completed the emotion regulation task, which lasted approximately 30 min.

During this task, participants remained alone and seated in the experiment room. To collect skin conductance data, two sensors were attached to the palm of the nondominant hand. Figure 1 presents a schematic of the laboratory procedure. This task used a series of film clips that have been used previously in past research to induce sadness in the laboratory and to measure the effects of cognitive reappraisal (Sagui & Levens, 2016; Troy, Shallcross, & Mauss, 2013; Troy et al., 2010). In the present study, the previously used task was modified to measure the effects of *both* reappraisal and acceptance. To induce a comparable neutral mood state in all participants at the beginning of the task, all participants viewed a short (2-min) film clip about sand castles. After the neutral baseline, all participants viewed three sad film clips. These clips were each approximately 2 min in length and depicted two characters discussing an emotional event. Two previous studies have shown that these three film clips induce comparable levels of moderate (e.g., ratings between 5 and 7 on a 9-point scale) sadness in participants. Each sad film clip was followed by a 2-min recovery period, in which participants were instructed to simply sit quietly until the next task.

To avoid confounding emotion regulation effects with habituation to the sad film clips or regression to the mean, participants were randomly assigned to two groups in a within-individual repeated measures design. The order of the film clips was the same for both groups, but the order of regulation instructions differed for the two groups. The first sad film clip served as a sadness baseline for all participants—they were simply instructed to watch the film carefully. Experimental Group 1 received acceptance instructions during the second sad film and reappraisal instructions during the third sad film. Experimental Group 2 received reappraisal instructions on the second sad film and acceptance instructions on the third sad film. Thus, all participants engaged in both reappraisal and acceptance during the task.

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To ensure all participants attended to the emotion regulation instructions, all instructions were presented both visually (on the computer screen) and read aloud in a prerecorded audio file. We used the same reappraisal instructions as in past research (Troy, Shallcross, & Mauss, 2013; Troy et al., 2010). The acceptance instructions were adapted from those used by Hofmann and colleagues (2009), whereby participants were instructed to experience their feelings fully without trying to control or change them in any way. The full instructions for both emotion regulation conditions are presented in the Appendix.

After each film clip ended, participants were asked to report the maximum amount of 13 different emotions that they experienced during the film clip. These questions are described in more detail in the Measures section. Participants were also asked to report the intensity of each of the same 13 emotions that they were experiencing following the end of each recovery period. After film clips in which participants received regulation instructions, they were also asked a series of three process questions about the emotion regulation instructions: "How hard did you try to follow the instructions you were given?" (perceived effort), "How difficult was it to follow the instructions you were given?" (perceived difficulty), and "How successful were you at following the instructions you were given?" (perceived success). These questions were answered on a 1 (*not at all*) to 9 (*an extreme amount*) scale.

Measures

The laboratory task described above was used to examine changes in emotional and physiological responses caused by emotion regulation (cognitive reappraisal and acceptance, respectively). Below, we describe how we measured these responses.

Self-reported experience of emotion.—Following each film clip, participants were asked to rate the greatest amount of 13 different emotions that they experienced during the film clip on a 1 (*not at all*) to 9 (*an extreme amount*) scale. Following each recovery period, participants were asked to rate their current feelings of the same 13 emotions on the same scale. Mean levels of each of the individual 13 emotions for each of the sad film clips in both samples are depicted in Figure 2. The key emotion of interest was sadness, given that the film clips specifically targeted this emotion. However, as shown in Figure 2, a variety of other emotions, both negative and positive, were experienced during these film clips. Therefore, in addition to examining changes in sadness, we also examined a composite of seven other negative emotions (anger, anxiety, contempt, frustration, fear, hopelessness, and loneliness; all αs > .71 in both samples). We also examined changes in a composite of five positive emotions (amusement, interest, happiness, optimism, and love; all αs ≥ .60 in both samples).

SCL.—SCL was measured with Mindware's Bionex 8-slot Chassis at a sampling rate of 1,000 Hz. Two electrodes containing 0% chloride wet gel were attached to the thenar and hypothenar surfaces of the palm of the nondominant hand (Mindware Technologies, Gahanna, OH). Participants were instructed to keep the nondominant hand as still as possible for the entire task. All data were recorded using Biolab Acquisition Software (Mindware Technologies). Following data collection, Mindware's EDA 3.0.21 program was

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used for data reduction, artifact control, and the computation of the average SCL for each segment (either film clip or recovery period) for each participant.

Past research has shown that increased sadness is associated with a dampening of sympathetic nervous system activity (Kreibig, Wilhelm, Roth, & Gross, 2007; Kunzmann & Grühn, 2005; Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005). Therefore, as in past studies (Troy, Shallcross, & Mauss, 2013; Troy et al., 2010), we expected successful physiological regulation to be indicated by *smaller* decreases (i.e., less dampening of sympathetic nervous system activity) in SCL during regulation. Thus, when examining changes in SCL from baseline to regulation time points, larger (positive) change scores in SCL indicate more successful regulation of the physiological response, whereas smaller (negative) scores indicate a greater amount of sympathetic dampening during regulation.

Data Analysis Strategy

As in past studies (Troy et al., 2010; Troy, Shallcross, & Mauss, 2013), all emotion ratings and SCL data were converted to *z* scores before conducting statistical analyses. This allowed for the comparison of changes in self-reported emotional responses and SCL data on the same metric, to compare measures across participants who received differing emotion regulation instructions during different film clips, and for the comparison of task performance in this study with previous studies using the same film-clip paradigm.

To test our hypotheses regarding the differential effects of reappraisal versus acceptance instructions on emotional and physiological responses, we conducted a series of 2 (time point: baseline vs. regulation) × 2 (condition: acceptance vs. reappraisal) repeated measures ANOVAs in both samples. Both time and condition were entered as within-subjects factors. We used this repeated measures approach to examine each of our dependent variables: sadness, negative emotion, and positive emotion during the film clips; sadness, negative emotion, and positive emotion following recovery; and SCL during the film clips and during recovery.

Because we were interested in examining whether the change in emotional response from baseline to regulation varied as a function of regulation condition, we report the interactions between time and condition for each of our dependent variables. To examine differences in emotional responses *during* film clips, we entered the sadness baseline clip and regulated film clip as the two time points. When examining differences in emotional responses following *recovery*, we entered the recovery period following the sadness baseline clip and the recovery period following regulation as the two time points.

In order to graphically depict the observed Time × Condition interactions in the figures below, we display the difference scores (change from baseline to regulation time point) for the two regulation conditions for each dependent variable. In each case, positive change scores indicate increases and negative scores indicate decreases in each measure of emotional responding during regulation relative to baseline, and a significant Time × Condition interaction indicates that the change from baseline to regulation was significantly different between the acceptance and reappraisal conditions. In cases in which the Time × Condition interaction was significant, we also report the results of post hoc pairwise

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comparisons of emotional responses across the two conditions at the regulation time point in order to assess whether the regulation instructions led to significant differences in emotional responses.

To examine whether the emotion regulation instructions exerted differential effects on the three process questions regarding perceived effort ("How hard did you try to follow the instructions?"), difficulty ("How difficult was it to follow the instructions?"), and success ("How successful were you at following the instructions?"), we conducted a series of paired-samples *t* tests in which we entered participants' responses to each question following the reappraisal and acceptance conditions, respectively. All *p* values were corrected using the Holm-Bonferroni sequential correction to adjust for multiple comparisons.

Results

Sample 1 Results

Manipulation check.—Participants reported comparable levels of sadness during each of the sad film clips (raw sadness ratings for Sad Film 1, $M = 5.07$ $SD = 2.24$; Sad Film 2, $M = 5.28$, $SD = 2.45$; Sad Film 3, $M = 4.97$, $SD = 2.17$). A repeated measures ANOVA collapsing across instruction condition found no significant effect of film clip on sadness ratings, $F(2, 146) = 0.52$, $p = .59$. The effects of emotion regulation instructions on emotion ratings are examined in our primary analyses.

We also examined the effects of instruction order (reappraisal first vs. acceptance first) to determine whether instruction order affected task performance. All *p* values were subjected to Holm-Bonferroni sequential corrections to adjust for multiple comparisons (Holm, 1979). There were no significant differences associ ated with instruction order in any of the measures of emotional responding reported below (all *p*s > .33).

Effects of emotion regulation on self-reported emotions.

Differences during the film clips.: There was a significant interaction between time and condition when predicting sadness, $F(1, 73) = 9.00$, $p = .004$, $\eta_p^2 = .11$. As shown in Figure 3, Panel A, reappraisal was associated with larger decreases in sadness relative to acceptance. Post hoc pairwise comparisons also revealed that during the regulation time point, reappraisal was associated with less sadness ($M = -0.21$, standard error [*SE*] = 0.11) relative to acceptance ($M = 0.20$, $SE = 0.12$), $t(73) = -3.00$, $p = .004$, mean difference = −0.41, $SE = 0.14$, 95% confidence interval (CI) for the difference between means [−0.68, −0.14], $d = 0.35$.

There was not a significant Time × Condition interaction when predicting negative emotions, $F(1, 73) = 1.83$, $p = .18$, $\eta_p^2 = .02$. However, there was a significant Time × Condition interaction when predicting positive emotions, $F(1, 73) = 6.05$, $p = .02$, $\eta_p^2 = .08$. As shown in Figure 3, Panel A, reappraisal was associated with larger increases in positive emotions relative to acceptance. Post hoc pairwise comparisons revealed that during the regulation time point, reappraisal instructions were associated with greater levels of positive emotions

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(M = 0.13, SE = 0.09) relative to acceptance (M = −0.11, SE = 0.07), $t(73) = 2.46$, $p = .02$, mean difference = 0.24, SE = 0.10, 95% CI [0.05, 0.44], d = 0.29.

Differences during recovery periods.: As shown in Figure 3, Panel B, there were no significant Time × Condition interactions when predicting sadness, $F(1, 73) = 0.26$, $p = .61$, $\eta_p^2 = .004$, negative emotions, $F(1, 73) = 0.32$, $p = .58$, $\eta_p^2 = .004$, or positive emotions, $F(1, 73) = 0.11$, $p = .74$, $\eta_p^2 = .001$, following the recovery periods.

Effects of emotion regulation on physiological response.

Differences during the film clips.: There was a significant Time × Condition interaction when examining changes in SCL, $F(1, 54) = 8.87$, $p = .004$, $\eta_p^2 = .14$, As shown in Figure 4, Panel A, acceptance was associated with less dampening (and thus more successful regulation) of SCL relative to reappraisal. Post hoc pairwise comparisons revealed that during the regulation time point, acceptance was associated with greater levels of SCL (M =0.04, SE = 0.14) relative to reappraisal (M = −0.06, SE = 0.13), $t(56) = 2.64$, $p = .01$, mean difference = 0.10, SE = .04, 95% CI for difference [−0.18, −0.02], d = 0.36.

Differences during the recovery periods.: When examining differences in SCL following recovery periods, the Time × Condition interaction was marginally significant, $F(1, 41) = 3.67$, $p = .06$, $\eta_p^2 = .08$. As shown in Figure 4, Panel A, acceptance was associated with greater increases (and thus more successful recovery) in SCL relative to reappraisal. Post hoc pairwise comparisons revealed that during the regulation time point, acceptance was associated with marginally greater levels of SCL (M = 0.10, SE = 0.15) relative to reappraisal (M = 0.02, SE = 0.14), $t(46) = 1.94$, $p = .06$, mean difference = 0.08, SE = 0.04, 95% CI for difference [−0.01, 0.15], d = 0.28.

Effects of emotion regulation on perceived effort, difficulty, and success.—

Observed differences in the process questions assessing perceived effort, difficulty, and success are shown in Figure 5, Panel A. There were no significant differences in perceived effort expended during the two instruction conditions, $t(73) = -0.75$, $p = .46$, mean difference = −0.18, SE = 0.24, 95% CI [−0.65, 0.30], d = 0.10. On average, participants reported that they tried very hard to follow both sets of regulation instructions (acceptance effort, M = 6.97, SE = 0.23; reappraisal effort, M = 7.15, SE = 0.19). However, there were notable differences in perceived difficulty ratings, $t(73) = -5.11$, $p < .001$, mean difference = −2.01, SE = 0.39, 95% CI [−2.80, −1.23], d =0.80. Participants reported that it was more difficult to implement the reappraisal instructions (M = 5.80, SE = 0.30) than the acceptance instructions (M = 3.78, SE = 0.28). There were also significant differences in self-reported success in following the instructions, $t(72) = 3.56$, $p = .002$, mean difference = 1.03, SE =0.29, 95% CI [0.45, 1.60], d = 0.55. Participants rated themselves as more successful after using acceptance (M = 6.63, SE = 0.20) than after using reappraisal (M = 5.60, SE = 0.25).

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Sample 1 Discussion

During the presentation of the film clips, reappraisal was associated with significantly larger decreases in sadness and greater increases in positive emotions relative to acceptance. In fact, as can be seen in Figure 3, Panel A, although reappraisal was associated, on average, with *decreases* in sadness, acceptance was associated with *increased* sadness during the film clips relative to the sadness baseline. There were no significant differences when examining changes in the negative emotion composite.

There were also no significant differences between the two regulation strategies when comparing emotional responses during the recovery periods. However, this may have been caused by a potential floor effect: 51% of students reported experiencing no sadness following the baseline recovery period. Because we assessed recovery by examining change from the baseline recovery period to subsequent recovery periods following regulation instructions, for these 51% of participants, we were unable to detect any differences related to emotion regulation following recovery.

Results for SCL revealed a different pattern of effects. Although acceptance did not lead to significant decreases in sadness or to increases in positive emotions, it was associated with smaller decreases in SCL (and thus more successful physiological regulation) relative to reappraisal. The same pattern of effects was observed in SCL following recovery; however, this difference was only marginally significant. Together, these findings suggest that acceptance may have led to a decoupling of experienced emotions from physiological responses (Feldman, Lavalle, Gildawie, & Greeson, 2016). Thus, although participants do not report feeling less negative emotion after using this strategy, acceptance may exert positive effects at the physiological level by decreasing reactivity.

Across both emotion regulation conditions, participants reported that they tried very hard to implement the instructions they were given. However, participants found it more difficult to implement the reappraisal instructions than the acceptance instructions, and they reported lower levels of perceived success when implementing the reappraisal instructions than the acceptance instructions. This pattern of effects is particularly notable given the fact that the reappraisal instructions led to *higher* levels of actual success when it came to changing the experience of sadness and positive emotions during the task. Thus, although reappraisal appeared to be effective for changing people's emotional responses during the task, it was not perceived as an "easy" strategy to use. In this way, it could be that the regulatory "success" observed in emotional responses during the task may have come at a cognitive cost. Conversely, although acceptance did not lead to significant changes in short-term emotional responding, it was associated with a smaller dampening of skin conductance level (i.e., more successful physiological regulation) during the film clips, and people perceived it as less difficult to use and perceived themselves as more successful when using it.

These findings provide important preliminary evidence for the differential short-term effects of reappraisal and acceptance on emotional and physiological responses as well as perceived regulatory difficulty and success. One limitation of this study was the restricted variability in self-reported emotions during the first recovery period and the homogeneity of the sample in

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terms of age and education. Therefore, we sought to replicate these effects in a more heterogeneous community sample.

Sample 2 Results

Manipulation check.—Raw sadness ratings for the film clips in Sample 2 did not differ from sadness ratings in Sample 1 (all *p*s > .80). As in Study 1, participants reported comparable levels of sadness during each of the sad film clips (raw sadness ratings for Sad Film 1, $M = 5.00$ $SD = 2.37$; Sad Film 2, $M = 5.20$, $SD = 2.04$; Sad Film 3, $M = 5.02$, $SD = 2.10$). A repeated measures ANOVA collapsing across instruction condition found no significant effect of film clip on sadness ratings, $F(2, 130) = 0.29$, $p = .75$.

We examined the effects of instruction order (reappraisal first vs. acceptance first) on each of our measures of emotional responding in order to examine whether the order of instructions affected task performance. All *p* values were subjected to Holm-Bonferroni sequential corrections to adjust for multiple comparisons (Holm, 1979). There were no significant differences associated with instruction order in any of the measures of emotional responding reported below (all *p*s > .09).

Effects of emotion regulation on self-reported emotions.

Differences during the film clips.: There was a significant interaction between time and condition when predicting sadness, $F(1, 64) = 22.91$, $p < .001$, $\eta_p^2 = .26$. As shown in Figure 3, Panel C, reappraisal was associated with larger decreases in sadness relative to acceptance. Post hoc pairwise comparisons revealed that, during the regulation time point, reappraisal was associated with less sadness ($M = -0.31$, $SE = 0.12$) relative to acceptance ($M = 0.33$, $SE = 0.12$), $t(64) = -4.79$, $p < .001$, mean difference = −0.64, $SE = 0.13$, 95% CI [−0.90, −0.37], $d = 0.59$.

There was also a significant interaction between time and condition when predicting negative emotion, $F(1, 64) = 16.40$, $p < .001$, $\eta_p^2 = .20$. As shown in Figure 3, Panel C, reappraisal was associated with greater decreases in negative emotion relative to acceptance. Post hoc pairwise comparisons revealed that during the regulation time point, reappraisal was associated with less negative emotion ($M = -0.17$, $SE = 0.07$) relative to acceptance ($M = 0.19$, $SE = 0.10$), $t(64) = -4.05$, $p < .001$, mean difference = −0.36, $SE = 0.09$, 95% CI [−0.53, −0.18], $d = 0.53$.

Finally, there was a significant Time × Condition interaction when predicting positive emotion, $F(1, 64) = 8.68$, $p = .004$, $\eta_p^2 = .12$. As shown in Figure 3, Panel C, reappraisal was associated with greater increases in positive emotion relative to acceptance. Post hoc pairwise comparisons revealed that during the regulation time point, reappraisal was associated with greater positive emotion ($M = 0.16$, $SE = 0.09$) relative to acceptance ($M = -0.14$, $SE = 0.08$), $t(64) = 2.95$, $p = .004$, mean difference = 0.30, $SE = 0.10$, 95% CI [0.10, 0.50], $d = 0.37$.

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Differences during recovery periods.: There was a significant interaction between time and condition when predicting sadness, $F(1, 64) = 6.93$, $p = .01$, $\eta_p^2 = .10$. As shown in Figure 3, Panel D, reappraisal was associated with larger decreases in sadness relative to acceptance. Post hoc pairwise comparisons revealed that during the regulation time point, reappraisal was associated with less sadness ($M = -0.12$, $SE = 0.11$) relative to acceptance ($M = 0.14$, $SE = 0.14$), $t(64) = -2.63$, $p = .01$, mean difference = −0.26, $SE = 0.10$, 95% CI [−0.47, −0.06], $d = 0.34$.

There was also a significant Time × Condition interaction when predicting negative emotion, $F(1, 64) = 7.18$, $p = .01$, $\eta_p^2 = .10$. As shown in Figure 3, Panel D, reappraisal was associated with larger decreases in negative emotion relative to acceptance. Post hoc pairwise comparisons revealed that during the regulation time point, reappraisal was associated with less negative emotion ($M = -0.11$, $SE = 0.08$) relative to acceptance ($M = 0.11$, $SE = 0.11$), $t(64) = -2.68$, $p = .01$, mean difference = −0.22, $SE = 0.08$, 95% CI [−0.38, −0.06], $d = 0.36$.

There was not a significant Time × Condition interaction when predicting positive emotion, $F(1, 64) = 2.24$, $p = .14$, $\eta_p^2 = .03$.

Effects of emotion regulation on physiological response.

Differences during the film clips.: There was not a significant Time × Condition interaction when predicting SCL during the films, $F(1, 50) = 0.10$, $p = .76$, $\eta_p^2 = .002$.

Differences during the recovery periods.: There was not a significant Time × Condition interaction when predicting SCL during recovery, $F(1, 47) = 0.11$, $p = .74$, $\eta_p^2 = .002$.

Effects of emotion regulation on perceived effort, difficulty, and success.—

Observed differences in the process questions assessing perceived effort, difficulty, and success are shown in Figure 5, Panel B. There were no significant differences in perceived effort expended during the two instruction conditions, $t(64) = 0.13$, $p = .90$, mean difference = .03, $SE = 0.25$, 95% CI [−0.46, 0.52], $d = 0.02$. On average, participants reported that they tried very hard to implement both sets of regulation instructions (acceptance effort, $M = 7.28$, $SE = 0.25$; reappraisal effort, $M = 7.25$, $SE = 0.20$). There were significant differences in perceived difficulty ratings, however, $t(63) = -6.53$, $p < .001$, mean difference = −2.78, $SE = 0.43$, 95% CI [−3.63, −1.93], $d = 1.23$. Participants reported that it was more difficult to implement the reappraisal instructions ($M = 5.84$, $SE = 0.30$) than the acceptance instructions ($M = 3.06$, $SE = 0.27$). There were also significant differences in self-reported success in implementing the instructions, $t(64) = 3.03$, $p = .008$, mean difference =1.02, $SE = 0.34$, 95% CI [0.35, 1.68], $d = 0.52$. Participants rated themselves as more successful after using acceptance ($M = 7.06$, $SE = 0.23$) than after using reappraisal ($M = 6.05$, $SE = 0.25$).

Sample 2 Discussion

In Sample 2, we replicated the finding that reappraisal led to larger decreases in sadness and greater increases in positive emotions relative to acceptance. Reappraisal was also associated

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with larger decreases in negative emotions more broadly relative to acceptance. Thus, in both samples, we found a consistent pattern of effects: Reappraisal led to more successful regulation of the subjective experience of emotions—both negative and positive—during the film clips. We also found significant differences during the recovery periods in Sample 2, with reappraisal associated with significantly larger decreases in sadness and the negative emotion composite following recovery. The increase in variability in emotional responding in this sample (only 31%, compared with 51% in Sample 1, reported experiencing no sadness following the first recovery period) likely gave us more power to detect differences. Overall, in Sample 2, reappraisal was associated with more successful regulation of emotional responses, both during the film clips and the recovery periods relative to acceptance.

When examining differences in SCL, there were no significant differences associated with the emotion regulation instructions. One explanation for the differences in SCL in Sample 1 versus Sample 2 may be because higher levels of physiological reactivity were observed in Sample 1. We operationalized SCL reactivity as the difference in SCL from the neutral film clip to the first (baseline) sad film clip—higher levels of reactivity (i.e., larger decreases in SCL during the sad film) were observed in Sample 1 ($M = .37$, $SE = .06$) than in Sample 2 ($M = .20$, $SE = .06$), $t(114) = 2.00$, $p < .05$. This pattern of differences is consistent with evidence indicating that physiological reactivity may decrease with age (Levenson, Carstensen, Friesen, & Ekman, 1991; Shallcross et al., 2013). Given that we operationalized performance on this task as change in SCL from the first sad film clip to the regulated film clips, the lower levels of reactivity to the first film clip may have prevented us from being able to detect subsequent changes in SCL related to emotion regulation.

When examining changes in perceived effort, difficulty, and success in using emotion regulation, we replicated the findings reported for Sample 1. Specifically, participants reported trying equally hard to implement the regulation instructions in both conditions. However, as in Sample 1, participants perceived the reappraisal condition as more difficult than the acceptance condition, and rated themselves as more successful at implementing the acceptance instructions than the reappraisal instructions. This provides further support for the hypothesis that acceptance is less difficult and potentially less cognitively taxing to use than reappraisal.

General Discussion

The present study used a within-subjects design to examine the potentially divergent effects of two emotion regulation strategies that have been positively linked to psychological health: cognitive reappraisal and acceptance. Below, we discuss how each of these strategies affected short-term emotional responding, physiological responding, and perceived cognitive costs in the present study, and discuss the broader implications of these findings.

Effects on Emotional Experience

Across two samples, there was a consistent pattern of relationships between emotion regulation and emotional responses. Reappraisal was associated with greater reductions in negative emotions and increases in positive emotions during the film clips relative to

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acceptance. Reappraisal was also associated with significantly larger decreases in negative emotions following recovery in one sample.

This pattern suggests that reappraisal is the more effective strategy for changing the experience of positive and negative emotions both during the presentation of an emotional stimulus and during recovery. This finding is consistent with some prior research demonstrating the superior effects of reappraisal over acceptance for decreasing negative emotions (Hofmann et al., 2009; Szasz et al., 2011). It is also consistent with evidence that the effects of acceptance may not emerge until later in the emotional response (Campbell-Sills et al., 2006; Uusberg et al., 2016).

To our knowledge, this is the first study to directly compare the effects of reappraisal and acceptance on the experience of positive emotions. The fact that reappraisal was superior to acceptance at increasing positive emotions during the film clips in both samples is consistent with past research that has shown that reappraisal is an effective way to increase positive emotions, even in negative contexts (McRae et al., 2012; McRae & Mauss, 2016). Although past research has found acceptance to be superior to suppression at increasing positive emotions when viewing positively valenced pictures (Dan-Glauser & Gross, 2015), our study further suggests that reappraisal is more effective than acceptance for upregulating the experience of positive emotions in a negative emotional context.

Effects on Physiology

Overall, the present results suggest that although reappraisal is more effective than acceptance for regulating emotional responses, both during and immediately following a sadness induction, it may not be more effective for regulating physiological responding. For example, in Sample 1, acceptance was associated with smaller dampening of SCL relative to reappraisal (indicating more successful regulation of the physiological response), despite divergent effects on emotional experience (reappraisal was superior to acceptance) during the film clips. The same pattern of effects was observed during the recovery periods in Sample 1; however, this finding was only marginally significant. It is important to note that this pattern of effects on SCL was not replicated in Sample 2. However, this may have been caused by lower levels of observed SCL reactivity to the sad stimuli, thus reducing power to detect significant differences in Sample 2.

These results provide preliminary evidence that acceptance may allow individuals to decouple their subjective experience of emotions from their physiological responses. In other words, acceptance may allow individuals to *feel* negative emotions without experiencing maladaptive physiological consequences (Feldman et al., 2016). This decoupling has been shown to be associated with positive outcomes in prior studies and may occur because acceptance reduces negative cognitions of unpleasant emotional and physiological states, which can serve to maintain or heighten physiological arousal (Desbordes et al., 2014; Feldman et al., 2016). Thus, acceptance may decrease physiological responding by facilitating a less judgmental relationship with one’s emotions and bodily sensations (Feldman et al., 2016; Keng et al., 2016).

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The present results are consistent with past research demonstrating that acceptance is associated with decreases in physiological reactivity (Hofmann et al., 2009). It is conceivable that these short-term positive effects on the autonomic nervous system may, over time, influence negative affect. Indeed, longitudinal investigations of acceptance-based interventions demonstrate reductions in negative affect over time (Shallcross et al., 2015). Longer-term laboratory and clinical studies are needed that specifically examine the time course of acceptance and its effects on emotional responses to better elucidate when changes in subjective experience versus physiological responding emerge.

Perceived Cognitive Costs

A consistent pattern of effects emerged in both samples when examining differences in perceived regulatory effort, difficulty, and success between the two emotion regulation conditions. In both samples, participants reported trying equally hard to implement both sets of instructions. It may not be surprising that there were no differences in perceived effort, given that this particular question may have been tapping task compliance as well as task effort. However, participants reported that acceptance was less difficult to deploy than reappraisal, and they perceived themselves as more successful at implementing the instructions to accept than to reappraise.

The fact that participants found acceptance less effortful than reappraisal is consistent with evidence showing that acceptance may be associated with minimal cognitive costs (Keng et al., 2013; Schloss & Haaga, 2011; Shallcross et al., 2013). On a theoretical level, this may be explained by the fact that reappraisal involves active reinterpretation of the meaning and significance of emotional stimuli, which may require a high degree of cognitive effort and resources relative to acceptance (Shallcross et al., 2013; Troy,Shallcross, Davis, et al., 2013). It will be important for future research to follow up on the pattern of effects reported here to more systematically examine the relative cognitive resources required for successful reappraisal and acceptance.

Implications for Understanding Emotion Regulation

The present results have important implications for understanding what constitutes “effective” emotion regulation. Both reappraisal and acceptance have been linked to improved long-term psychological health outcomes. However, these two strategies were associated with differential short-term effects on emotion, physiology, and perceived cognitive costs in the present investigation. Thus, “effective” emotion regulation may not involve a one-size-fits-all approach in which all strategies work in a uniform way to regulate emotional states—instead, different strategies may exert differential effects on responses as they unfold over time. In particular, the present results suggest that reappraisal tends to be associated with more immediate emotional relief in negative situations, whereas acceptance may be better suited for decreasing short-term physiological reactivity to unpleasant stimuli. Given that individuals vary in terms of emotional and physiological reactivity to emotional stimuli (Shallcross et al., 2013; Troy et al., 2010), this suggests that these two strategies are likely to be differentially effective depending upon specific individual characteristics (e.g., emotional reactivity, physiological reactivity) as well as specific contextual demands (e.g., stressor duration).

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In addition, although reappraisal was associated with more successful regulation of emotional responses, participants perceived reappraisal as significantly more difficult to use than acceptance. This suggests that the positive effects of reappraisal may come at a cost—although individuals, on average, experienced emotional relief after using reappraisal, they did not consider reappraisal as easy to use and did not consider themselves to be as successful at using this strategy relative to acceptance. Indeed, this pattern of findings may explain why studies of spontaneous emotion regulation have shown that individuals do not frequently choose to use reappraisal, both in the laboratory and in daily life (Brans et al., 2013; Suri et al., 2015).

On the flip side, if acceptance is perceived as less cognitively taxing to deploy in daily life and its deployment is perceived to be more successful, it may be more likely to be used in daily life and may be one reason that it is associated with longer term benefits. A recent daily diary investigation provides preliminary support for this hypothesis—daily mindfulness (of which acceptance is a core component) was used nearly twice as often as daily reappraisal, and the use of mindfulness was more strongly tied to decreased negative affect than reappraisal (Brockman, Ciarrochi, Parker, & Kashdan, 2017). This study did not directly examine the use of acceptance, however. Therefore, this line of inquiry requires further exploration.

Clinical Implications

The present results also have important clinical implications. Many existing clinical interventions target the use of reappraisal (i.e., cognitive–behavioral therapy; Beck, 2011; Campbell-Sills & Barlow, 2007) and/or acceptance (acceptance-based interventions; Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Teasdale et al., 2000). Thus, understanding the short-term effects of these specific emotion regulation strategies could help elucidate which interventions should be most beneficial for which individuals. Our results are consistent with theoretical considerations that suggest that acceptance-based interventions may not be appropriate for individuals with acutely elevated depressive or anxiety symptoms precisely because acceptance involves engaging with unpleasant internal experiences, which, at critically elevated levels, may lead to symptomatic deterioration rather than alleviation (Segal et al., 2002; Teasdale et al., 2000). For individuals who are struggling with acute elevations in symptoms, our results suggest that reappraisal may be an important first line of defense, whereas acceptance may be beneficial in the longer term, perhaps after more immediate emotional relief has occurred. On a more general level, increased knowledge of the specific effects of particular emotion regulation strategies will be critical in allowing clinicians to tailor their treatments based on the particular needs, as well as the particular strengths and weaknesses, of each individual. This knowledge may additionally help to inform the success of personalized medicine initiatives (Ashley, 2015; Collins & Varmus, 2015). It will be important for future studies to include clinical samples in order to examine whether the pattern of effects reported here can be generalized to those who are experiencing acute elevations in depressive and/or anxiety symptoms.

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Limitations and Future Directions

As discussed above, the present findings add to the growing literature on the effects of reappraisal and acceptance. It is important to note, however, that our results are inconsistent with some past studies. For example, two previous studies found no differences between the two strategies in decreasing negative emotional responses (Asnaani et al., 2013; Wolgast et al., 2011). When examining changes in physiological responses, the present findings are also inconsistent with two previous studies that found no differences in physiological reactivity between the two strategies (Asnaani et al., 2013; Hofmann et al., 2009). In addition, Wolgast et al. (2011) found that reappraisal was superior to acceptance at reducing physiological reactivity—the opposite pattern of effects reported in the present study. Thus, there is a great deal of inconsistency in the literature examining the effects of reappraisal and acceptance on short-term responses.

What explains this inconsistency across studies when examining differences in emotional and physiological responding caused by reappraisal and acceptance? We suggest that there are four important factors that have differed across previous studies that may help to understand the inconsistency in results. First, there are important differences in experimental design across studies. Three of the four previous studies that have compared the effects of reappraisal and acceptance have used between-subjects designs (Hofmann et al., 2009; Szasz et al., 2011; Wolgast et al., 2011), which may not be able to account for important individual differences such as regulatory ability or individual response biases (Augustine & Hemenover, 2009). Thus, some past studies may have been unable to detect significant differences between strategies. On a related note, both the present study and many past studies have assessed the effectiveness of emotion regulation by examining changes or differences in emotional states, either by comparing change within individuals (as in the current study and in Asnaani et al., 2013) or by comparing differences between individuals (by comparing experimental and control groups; Wolgast et al., 2011). In both cases, it is possible that individuals use some form of emotion regulation during the baseline or control emotion inductions to make themselves feel better even when they have not been instructed to regulate. This limitation may reduce the ability to detect significant effects of emotion regulation in the laboratory and may lead to smaller or null effect sizes.

Second, past studies presented stimuli that varied in emotional intensity. For example, past studies have used negative stimuli that were, on average, high in emotional intensity (e.g., video of an arm amputation) and likely evoked greater levels of negative emotion than the film clips used in the present study (Asnaani et al., 2013; Wolgast et al., 2011). Past research suggests that the effectiveness of emotion regulation strategies—in particular, reappraisal—is moderated by the intensity of emotional stimuli (Sheppes & Meiran, 2007). Thus, although reappraisal was an effective strategy for changing emotions in response to a moderately intense emotional stimulus in the present study, such benefits may not have been found in the context of higher intensity stimuli.

Third, previous studies have also examined the effects of reappraisal and acceptance across very different emotional contexts, including stressful speeches (Hofman et al., 2009), an anger induction (Szasz et al., 2011), and film clips inducing sadness, disgust, and fear (Wolgast et al., 2011). Thus, the differences reported across studies may be driven by the

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fact that reappraisal and acceptance have differing effects depending upon the emotional context. In the present study, we chose to focus specifically on regulation in response to a sadness induction because the regulation of sadness has been shown to predict important psychological health outcomes, including depressive symptoms, anxiety symptoms, well-being, and nonsuicidal self-injury (Davis et al., 2014; Troy et al., 2010; Troy, Shallcross, & Mauss, 2013). Thus, the regulation of emotions in response to sad stimuli seems particularly important. It may be the case, however, that acceptance is more effective than reappraisal for regulating other emotions such as anxiety, perhaps by targeting the metacognitions that tend to accompany that emotional state (Troy, Shallcross, Davis, et al., 2013). It will be important for future research to examine this important hypothesis by systematically testing whether the effectiveness of reappraisal and acceptance vary depending upon the emotional context. Past research on emotion regulation has also used a wide variety of measures of momentary emotion responding to assess a range of different emotional states, which also leads to difficulty comparing results across studies. It will be important for future research to measure emotional states in a more systematic, comprehensive, and consistent way (for recommendations, see Weidman, Steckler, & Tracy, 2017).

Fourth, the term “reappraisal” is a large umbrella term that can refer to a wide range of specific strategies that involve changing how one thinks about an emotional stimulus (Gross & Thompson, 2007). In the current study, we used a positive reappraisal instruction that encouraged individuals to reframe the film clips in a more positive light. Past research on reappraisal has used similar instructions (McRae et al., 2012; Shiota & Levenson, 2012). However, McRae and colleagues (2012) delineated eight different types of reappraisal that participants used while viewing emotional images, and previous research suggests that different subtypes of reappraisal may exert differential effects on emotional responding (Shiota & Levenson, 2012). Thus, it is possible that the pattern of findings reported here may be different for different subtypes of reappraisal. More systematic investigations of this hypothesis are needed.

Based on the above noted differences across studies, it will be important for future studies to more systematically examine the effects of experimental design, emotional intensity, emotional context, and specific regulatory instructions in order to better understand when there are (and are not) differential effects of reappraisal and acceptance.

In addition, the present investigation was cross-sectional, and did not allow us to examine the long-term effects of reappraisal and acceptance on outcomes. Both theoretical and empirical considerations suggest that a different pattern of effects for acceptance may emerge over longer time periods (Campbell-Sills et al., 2006; Uusberg et al., 2016). Future studies that use longitudinal designs are needed.

Finally, in the present studies, we defined reappraisal and acceptance as two discrete emotion regulation strategies, and the study design did not allow us to examine the potential overlap between the two. It has been argued that reappraisal and acceptance share many commonalities (Arch & Craske, 2008; Garland, Farb, Goldin, & Fredrickson, 2015). Indeed, Garland and colleagues’ (2015) mindful reappraisal model theorizes that acceptance and reappraisal work in synergy with one another, with the use of mindfulness (including

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acceptance) leading to more successful reappraisal. There is also preliminary evidence that suggests that mindfulness based therapy is associated with greater ability to use reappraisal successfully (Troy, Shallcross, Davis, et al., 2013). Together, this evidence suggests that these two strategies, albeit rooted in different short-term goals, may improve psychological health via shared mechanisms. Addressing this hypothesis is one additional and important avenue for future investigation.

Conclusion

The present study used a within-subjects design to compare the effects of two emotion regulation strategies—cognitive reappraisal and acceptance—on short-term emotional, physiological, and perceived cognitive responses to a negative emotion induction. Results indicate that although reappraisal is more effective than acceptance at decreasing negative emotions and increasing positive emotions both during stimulus presentation and recovery, acceptance may be more effective than reappraisal at changing one's physiological response to emotional stimuli. Acceptance was also perceived as less difficult to use than reappraisal in both samples, suggesting that acceptance may be perceived as less cognitively costly than reappraisal. It will be important for future research to further investigate these effects in other emotional contexts and over longer periods of time to determine the consistency and generalizability of these findings.

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Appendix

Emotion Regulation Instructions

Full Reappraisal Instructions Used in the Emotion Regulation Task

Please watch the following film clip carefully. This time, as you watch, try to think about the situation you see in a more positive light. You can achieve this in several different ways. For example, try to imagine advice that you could give to the characters in the film clip to make them feel better. This could be advice that would help them think about the positive bearing this event could have on their lives. Or, think about the good things they might learn from this experience. Keep in mind that even though a situation may be painful in the moment, in the long run, it could make one's life better, or have unexpected good outcomes. In other words, try to think about the situation in as positive terms as you possibly can. This can be difficult at times, so it is very important that you try your best. Please ask the research assistant if you have questions about this task. It is very important that you carefully watch the film clip, but think about it from a positive perspective.

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Full Acceptance Instructions Used in the Emotion Regulation Task

Please watch the following film clip carefully. This time, as you watch, try to experience your feelings fully and do not try to control or change them in any way. It is quite normal for this film clip to create some level of discomfort or negative emotion. Nevertheless, please let your feelings run their natural course and allow yourself to stay with your emotions, as fully as possible, without trying to control your feelings in any way. In other words, try your best to fully accept the feelings that you experience during the film clip. This can be difficult at times, so it is very important that you try your best. Please ask the research assistant if you have questions about this task. It is very important that you carefully watch the film clip, but allow your feelings to run their natural course without trying to control or change them.

References

Aldao A, Nolen-Hoeksema S, & Schweizer S (2010). Emotion regulation strategies across psychopathology: A meta-analytic review. Clinical Psychology Review, 30, 217–237. 10.1016/j.cpr.2009.11.004 [PubMed: 20015584]

Allen NB, Blashki G, Gullone E, & Melbourne Academic Mindfulness Interest Group. (2006). Mindfulness-based psychotherapies: A review of conceptual foundations, empirical evidence and practical considerations. Australian and New Zealand Journal of Psychiatry, 40, 285–294. [PubMed: 16620310]

Arch JJ, & Craske MG (2008). Acceptance and commitment therapy and cognitive behavioral therapy for anxiety disorders: Different treatments, similar mechanisms? Clinical Psychology: Science and Practice, 15, 263–279. 10.1111/j.1468-2850.2008.00137.x

Ashley EA (2015). The precision medicine initiative: A new national effort. Journal of the American Medical Association, 313, 2119–2120. 10.1001/jama.2015.3595 [PubMed: 25928209]

Asnaani A, Sawyer AT, Aderka IM, & Hofmann SG (2013).Effect of suppression, reappraisal, and acceptance of emotional pictures on acoustic eye-blink startle magnitude. Journal of Experimental Psychopathology, 4, 182–193. 10.5127/jep.028112 [PubMed: 24551448]

Augustine AA, & Hemenover SH (2009). On the relative effectiveness of affect regulation strategies: A meta-analysis. Cognition and Emotion, 23, 1181–1220. 10.1080/02699930802396556

Baer RA, Smith GT, & Allen KB (2004). Assessment of mindfulness by self-report: The Kentucky inventory of mindfulness skills. Assessment, 11, 191–206. 10.1177/1073191104268029 [PubMed: 15358875]

Beck JS (2011). Cognitive behavior therapy: Basics and beyond. New York, NY: Guilford Press.

Brans K, Koval P, Verduyn P, Lim YL, & Kuppens P (2013). The regulation of negative and positive affect in daily life. Emotion, 13, 926–939. 10.1037/a0032400 [PubMed: 23731436]

Brockman R, Ciarrochi J., Parker P, & Kashdan T (2017). Emotion regulation strategies in daily life: Mindfulness, cognitive reappraisal and emotion suppression. Cognitive Behaviour Therapy, 46, 91–113. 10.1080/16506073.2016.1218926 [PubMed: 27684649]

Campbell-Sills L, & Barlow DH (2007). Incorporating emotion regulation into conceptualizations and treatments of anxiety and mood disorders In Gross JJ (Ed.), Handbook of emotion regulation (pp. 542–560). New York, NY: Guilford Press.

Campbell-Sills L, Barlow DH, Brown TA, & Hofmann SG (2006). Effects of suppression and acceptance on emotional responses of individuals with anxiety and mood disorders. Behaviour Research and Therapy, 44, 1251–1263. 10.1016/j.brat.2005.10.001 [PubMed: 16300723]

Coffey KA, Hartman M, & Fredrickson BL (2010). Deconstructing mindfulness and constructing mental health: Understanding mindfulness and its mechanisms of action. Mindfulness, 1, 235–253. 10.1007/s12671-010-0033-2

Collins FS, & Varmus H (2015). A new initiative on precision medicine. The New England Journal of Medicine, 372, 793–795. 10.1056/NEJMp1500523 [PubMed: 25635347]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Dandoy AC, & Goldstein AC (1990). The use of cognitive appraisal to reduce stress reactions: A replication. Journal of Social Behavior & Personality, 5, 275–285.

Dan-Glauser ES, & Gross JJ (2013). Emotion regulation and emotion coherence: Evidence for strategy-specific effects. Emotion, 13, 832–842. 10.1037/a0032672 [PubMed: 23731438]

Dan-Glauser ES, & Gross JJ (2015). The temporal dynamics of emotional acceptance: Experience, expression, and physiology. Biological Psychology, 108, 1–12. 10.1016/j.biopsycho.2015.03.005 [PubMed: 25782407]

Davis TS, Mauss IB, Lumian D, Troy AS, Shallcross AJ,Zarolia P, … McRae K (2014). Emotional reactivity and emotion regulation among adults with a history of self-harm: Laboratory self-report and functional MRI evidence. Journal of Abnormal Psychology, 123, 499–509. 10.1037/a0036962 [PubMed: 24865373]

Desbordes G, Gard T, Hoge EA, Hölzel BK, Kerr C, Lazar SW,… Vago DR (2014). Moving beyond mindfulness: Defining equa nimity as an outcome measure in meditation and contemplative research. Mindfulness, 6, 356–372. 10.1007/s12671-013-0269-8

Dunn BD, Billotti D, Murphy V, & Dalgleish T (2009). The consequences of effortful emotion regulation when processing distressing material: A comparison of suppression and acceptance. Behaviour Research and Therapy, 47, 761–773. 10.1016/j.brat.2009.05.007 [PubMed: 19559401]

Eisenberg N, Hofer C, & Vaughan J (2007). Effortful control and its socioemotional consequences In Gross JJ (Ed.), Handbook of emotion regulation (pp. 287–306). New York, NY: Guilford Press.

Feldman G, Lavalle J, Gildawie K, & Greeson JM (2016). Dispositional mindfulness uncouples physiological and emotional reactivity to a laboratory stressor and emotional reactivity to executive functioning lapses in daily life. Mindfulness, 7, 527–541. 10.1007/s12671-015-0487-3 [PubMed: 27087863]

Feldner MT, Zvolensky MJ, Eifert GH, & Spira AP (2003). Emotional avoidance: An experimental test of individual differences and response suppression using biological challenge. Behaviour Research and Therapy, 41, 403–411. 10.1016/S0005-7967(02)00020-7 [PubMed: 12643964]

Friese M, Messner C, & Schaffner Y (2012). Mindfulness meditation counteracts self-control depletion. Consciousness and Cognition: An International Journal, 21, 1016–1022. 10.1016/j.concog.2012.01.008

Gan S, Yang J, Chen X, Zhang X, & Yang Y (2017). High working memory load impairs the effect of cognitive reappraisal on emotional response: Evidence from an event-related potential study. Neuroscience Letters, 639, 126–131. 10.1016/j.neulet.2016.12.069 [PubMed: 28041962]

Garland EL, Farb NA, Goldin P, & Fredrickson BL (2015). Mindfulness broadens awareness and builds eudaimonic meaning: A process model of mindful positive emotion regulation. Psychological Inquiry, 26, 293–314. 10.1080/1047840X.2015.1064294 [PubMed: 27087765]

Garnefski N, & Kraaij V (2006). Relationships between cognitive emotion regulation strategies and depressive symptoms: A comparative study of five specific samples. Personality and Individual Differences, 40, 1659–1669. 10.1016/j.paid.2005.12.009

Gross JJ (1998). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. Journal of Personality and Social Psychology, 74, 224–237. 10.1037/0022-3514.74.1.224 [PubMed: 9457784]

Gross JJ (2015). Emotion regulation: Current status and future prospects. Psychological Inquiry, 26, 1–26. 10.1080/1047840X.2014.940781

Gross JJ, & John OP (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. Journal of Personality and Social Psychology, 85, 348–362. 10.1037/0022-3514.85.2.348 [PubMed: 12916575]

Gross JJ, & Thompson RA (2007). Emotion regulation: Conceptual foundations In Gross JJ (Ed.), Handbook of emotion regulation (pp. 3–24). New York, NY: Guilford Press.

Gruber J, Harvey AG, & Gross JJ (2012). When trying is not enough: Emotion regulation and the effort-success gap in bipolar disorder. Emotion, 12, 997–1003. 10.1037/a0026822 [PubMed: 22251049]

Hayes SC, Luoma JB, Bond FW, Masuda A, & Lillis J (2006).Acceptance and commitment therapy: Model, processes and outcomes. Behaviour Research and Therapy, 44, 1–25. 10.1016/j.brat.2005.06.006 [PubMed: 16300724]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Hayes SC, & Wilson KG (2003). Mindfulness: Method and process. Clinical Psychology: Science and Practice, 10, 161–165. 10.1093/clipsy.bpg018

Hofmann SG, Heering S, Sawyer AT, & Asnaani A (2009). How to handle anxiety: The effects of reappraisal, acceptance, and suppression strategies on anxious arousal. Behaviour Research and Therapy, 47, 389–394. 10.1016/j.brat.2009.02.010 [PubMed: 19281966]

Hofmann W, Schmeichel BJ, & Baddeley AD (2012). Executive functions and self-regulation. Trends in Cognitive Sciences, 16, 174–180. 10.1016/j.tics.2012.01.006 [PubMed: 22336729]

Holm S (1979). A simple sequentially rejective multiple test procedure.Scandinavian Journal of Statistics, 6, 65–70.

Jamieson JP, Mendes WB, Blackstock E, & Schmader T (2010). Turning the knots in your stomach into bows: Reappraising arousal improves performance on the GRE. Journal of Experimental Social Psychology, 46, 208–212. 10.1016/j.jesp.2009.08.015 [PubMed: 20161454]

John OP, & Gross JJ (2004). Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. Journal of Personality, 72, 1301–1334. 10.1111/j.1467-6494.2004.00298.x [PubMed: 15509284]

Kashdan TB, Barrios V, Forsyth JP, & Steger MF (2006).Experiential avoidance as a generalized psychological vulnerability: Comparisons with coping and emotion regulation strategies. Behaviour Research and Therapy, 44, 1301–1320. 10.1016/j.brat.2005.10.003 [PubMed: 16321362]

Keng SL, Robins CJ, Smoski MJ, Dagenbach J, & Leary MR (2013). Reappraisal and mindfulness: A comparison of subjective effects and cognitive costs. Behaviour Research and Therapy, 51, 899–904. 10.1016/j.brat.2013.10.006 [PubMed: 24225174]

Keng SL, Smoski MJ, & Robins CJ (2016). Effects of mindful acceptance and reappraisal training on maladaptive beliefs about rumi-nation. Mindfulness, 7, 493–503.

Kohl A, Rief W, & Glombiewski JA (2012). How effective are acceptance strategies? A meta-analytic review of experimental results. Journal of Behavior Therapy and Experimental Psychiatry, 43, 988–1001. 10.1016/j.jbtep.2012.03.004 [PubMed: 22561050]

Kraaij V, Pruymboom E, & Garnefski N (2002). Cognitive coping and depressive symptoms in the elderly: A longitudinal study. Aging & Mental Health, 6, 275–281. 10.1080/13607860220142387 [PubMed: 12217096]

Kreibig SD, Wilhelm FH, Roth WT, & Gross JJ (2007). Cardiovascular, electrodermal, and respiratory response patterns to fear and sadness-inducing films. Psychophysiology, 44, 787–806. 10.1111/j.1469-8986.2007.00550.x [PubMed: 17598878]

Kunzmann U, & Grühn D (2005). Age differences in emotional reactivity: The sample case of sadness. Psychology and Aging, 20, 47–59. 10.1037/0882-7974.20.1.47 [PubMed: 15769213]

Lazarus RS, & Folkman S (1984). Stress, appraisal, and coping. New York, NY: Springer.

Levenson RW, Carstensen LL, Friesen WV, & Ekman P (1991). Emotion, physiology, and expression in old age. Psychology and Aging, 6, 28–35. 10.1037/0882-7974.6.1.28 [PubMed: 2029364]

Levitt JT, Brown TA, Orsillo SM, & Barlow DH (2004). The effects of acceptance versus suppression of emotion on subjective and psychophysiological response to carbon dioxide challenge in patients with panic disorder. Behavior Therapy, 35, 747–766. 10.1016/S0005-7894(04)80018-2

Linehan MM, Comtois KA, Murray AM, Brown MZ, Gallop RJ, Heard HL, … Lindenboim N (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. Archives of General Psychiatry, 63, 757–766. 10.1001/archpsyc.63.7.757 [PubMed: 16818865]

Ma SH, & Teasdale JD (2004). Mindfulness-based cognitive therapy for depression: Replication and exploration of differential relapse prevention effects. Journal of Consulting and Clinical Psychology, 72, 31–40. 10.1037/0022-006X.72.1.31 [PubMed: 14756612]

Mauss IB, Cook CL, Cheng JYJ, & Gross JJ (2007). Individual differences in cognitive reappraisal: Experiential and physiological responses to an anger provocation. International Journal of Psychophysiology, 66, 116–124. 10.1016/j.ijpsycho.2007.03.017 [PubMed: 17543404]

Mauss IB, Levenson RW, McCarter L, Wilhelm FH, & Gross JJ (2005). The tie that binds? Coherence among emotion experience, behavior, and physiology. Emotion, 5, 175–190. 10.1037/1528-3542.5.2.175 [PubMed: 15982083]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

McRae K, Ciesielski B, & Gross JJ (2012). Unpacking cognitive reappraisal: Goals, tactics, and outcomes. Emotion, 12, 250–255. 10.1037/a0026351 [PubMed: 22148990]

McRae K, & Mauss IB (2016). Increasing positive emotion in negative contexts: Emotional consequences, neural correlates, and implication for resilience In Greene J, Morrison I, & Seligman M (Eds.), Positive neuroscience (pp. 159–174). Oxford, UK: Oxford University Press 10.1093/acprof:oso/9780199977925.003.0011

Ortner CNM, Ste Marie M, & Corno D (2016). Cognitive costs of reappraisal depend on both emotional stimulus intensity and individual differences in habitual reappraisal. PLoS ONE, 11(12), e0167253 10.1371/journal.pone.0167253 [PubMed: 27936022]

Richards JM, Butler EA, & Gross JJ (2003). Emotion regulation in romantic relationships: The cognitive consequences of concealing feelings. Journal of Social and Personal Relationships, 20, 599–620. 10.1177/02654075030205002

Richards JM, & Gross JJ (2000). Emotion regulation and memory: The cognitive costs of keeping one's cool. Journal of Personality and Social Psychology, 79, 410–424. 10.1037/0022-3514.79.3.410 [PubMed: 10981843]

Rosch E (2007). More than mindfulness: When you have a tiger by the tail, let it eat you. Psychological Inquiry, 18, 258–264. 10.1080/10478400701598371

Sagui SJ, & Levens SM (2016). Cognitive reappraisal ability buffers against the indirect effects of perceived stress reactivity on Type 2 diabetes. Health Psychology, 35, 1154–1158. 10.1037/hea0000359 [PubMed: 27089457]

Salmon P, Sephton S, Weissbecker I, Hoover K, Ulmer C, & Studts JL (2004). Mindfulness meditation in clinical practice. Cognitive and Behavioral Practice, 11, 434–446. 10.1016/S1077-7229(04)80060-9

Schloss HM, & Haaga DAF (2011). Interrelating behavioral measures of distress tolerance with self-reported experiential avoidance. Journal of Rational-Emotive & Cognitive-Behavior Therapy, 29, 53–63. 10.1007/s10942-011-0127-3 [PubMed: 21448252]

Segal ZV, Williams JMG, & Teasdale JD (2002). Mindfulness-based cognitive therapy for depression-A new approach to preventing relapse. New York, NY: Guilford Press.

Shallcross AJ, Ford BQ, Floerke VA, & Mauss IB (2013). Getting better with age: The relationship between age, acceptance, and negative affect. Journal of Personality and Social Psychology, 104, 734–749. 10.1037/a0031180 [PubMed: 23276266]

Shallcross AJ, Gross JJ, Visvanathan PD, Kumar N, Palfrey A, Ford BQ, … Mauss IB (2015). Relapse prevention in major depressive disorder: Mindfulness-based cognitive therapy versus an active control condition. Journal of Consulting and Clinical Psychology, 83, 964–975. 10.1037/ccp0000050 [PubMed: 26371618]

Shallcross AJ, Troy AS, Boland M, & Mauss IB (2010). Let it be: Accepting negative emotional experiences predicts decreased negative affect and depressive symptoms. Behaviour Research and Therapy, 48, 921–929. 10.1016/j.brat.2010.05.025 [PubMed: 20566191]

Shallcross AJ, Troy A, & Mauss IB (2015). Regulation of emotions under stress. Emerging Trends in the Social and Behavioral Sciences, 1–16. 10.1002/9781118900772.etrds0036

Sheppes G, & Meiran N (2007). Better late than never? On the dynamics of online regulation of sadness using distraction and cognitive reappraisal. Personality and Social Psychology Bulletin, 33, 1518–1532. 10.1177/0146167207305537 [PubMed: 17933748]

Sheppes G, & Meiran N (2008). Divergent cognitive costs for online forms of reappraisal and distraction. Emotion, 8, 870–874. 10.1037/a0013711 [PubMed: 19102598]

Sheppes G, Scheibe S, Suri G, Radu P, Blechert J, & Gross JJ (2014). Emotion regulation choice: A conceptual framework and supporting evidence. Journal of Experimental Psychology: General, 143, 163–181. 10.1037/a0030831 [PubMed: 23163767]

Shiota MN, & Levenson RW (2012). Turn down the volume or change the channel? Emotional effects of detached versus positive reappraisal. Journal of Personality and Social Psychology, 103, 416–429. 10.1037/a0029208 [PubMed: 22746676]

Srivastava S, Tamir M, McGonigal KM, John OP, & Gross JJ (2009). The social costs of emotional suppression: A prospective study of the transition to college. Journal of Personality and Social Psychology, 96, 883–897. 10.1037/a0014755 [PubMed: 19309209]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Suri G, Whittaker K, & Gross JJ (2015). Launching reappraisal: It's less common than you might think. Emotion, 15, 73–77. 10.1037/emo0000011 [PubMed: 24999912]

Szasz PL, Szentagotai A, & Hofmann SG (2011). The effect of emotion regulation strategies on anger. Behaviour Research and Therapy, 49, 114–119. 10.1016/j.brat.2010.11.011 [PubMed: 21185551]

Teasdale JD, Segal ZV, Williams JMG, Ridgeway VA, Soulsby JM, & Lau MA (2000). Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. Journal of Consulting and Clinical Psychology, 68, 615–623. 10.1037/0022-006X.68.4.615 [PubMed: 10965637]

Troy AS, Shallcross AJ, Davis TS, & Mauss IB (2013). History of mindfulness-based cognitive therapy is associated with increased cognitive reappraisal ability. Mindfulness, 4, 213–222. 10.1007/s12671-012-0114-5 [PubMed: 26005504]

Troy AS, Shallcross AJ, & Mauss IB (2013). A person-by-situation approach to emotion regulation: Cognitive reappraisal can either help or hurt, depending on the context. Psychological Science, 24, 2505–2514. 10.1177/0956797613496434 [PubMed: 24145331]

Troy AS, Wilhelm FH, Shallcross AJ, & Mauss IB (2010). Seeing the silver lining: Cognitive reappraisal ability moderates the relationship between stress and depressive symptoms. Emotion, 10, 783–795. 10.1037/a0020262 [PubMed: 21058843]

Uusberg H, Uusberg A, Talpsep T, & Paaver M (2016). Mechanisms of mindfulness: The dynamics of affective adaptation during open monitoring. Biological Psychology, 118, 94–106. 10.1016/j.biopsycho.2016.05.004 [PubMed: 27211913]

Webb TL, Miles E, & Sheeran P (2012). Dealing with feeling: A meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. Psychological Bulletin, 138, 775–808. 10.1037/a0027600 [PubMed: 22582737]

Weidman AC, Steckler CM, & Tracy JL (2017). The jingle and jangle of emotion assessment: Imprecise measurement, casual scale usage, and conceptual fuzziness in emotion research. Emotion, 17, 267–295. 10.1037/emo0000226 [PubMed: 27642656]

Wolgast M, Lundh LG, & Viborg G (2011). Cognitive reappraisal and acceptance: An experimental comparison of two emotion regulation strategies. Behaviour Research and Therapy, 49, 858–866. 10.1016/j.brat.2011.09.011 [PubMed: 21999941]

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Figure 1.

Schematic of emotion regulation task. Self-reported emotions were collected after each film clip and recovery period. Skin conductance level data were recorded for the entire duration of the task. R = recovery period.

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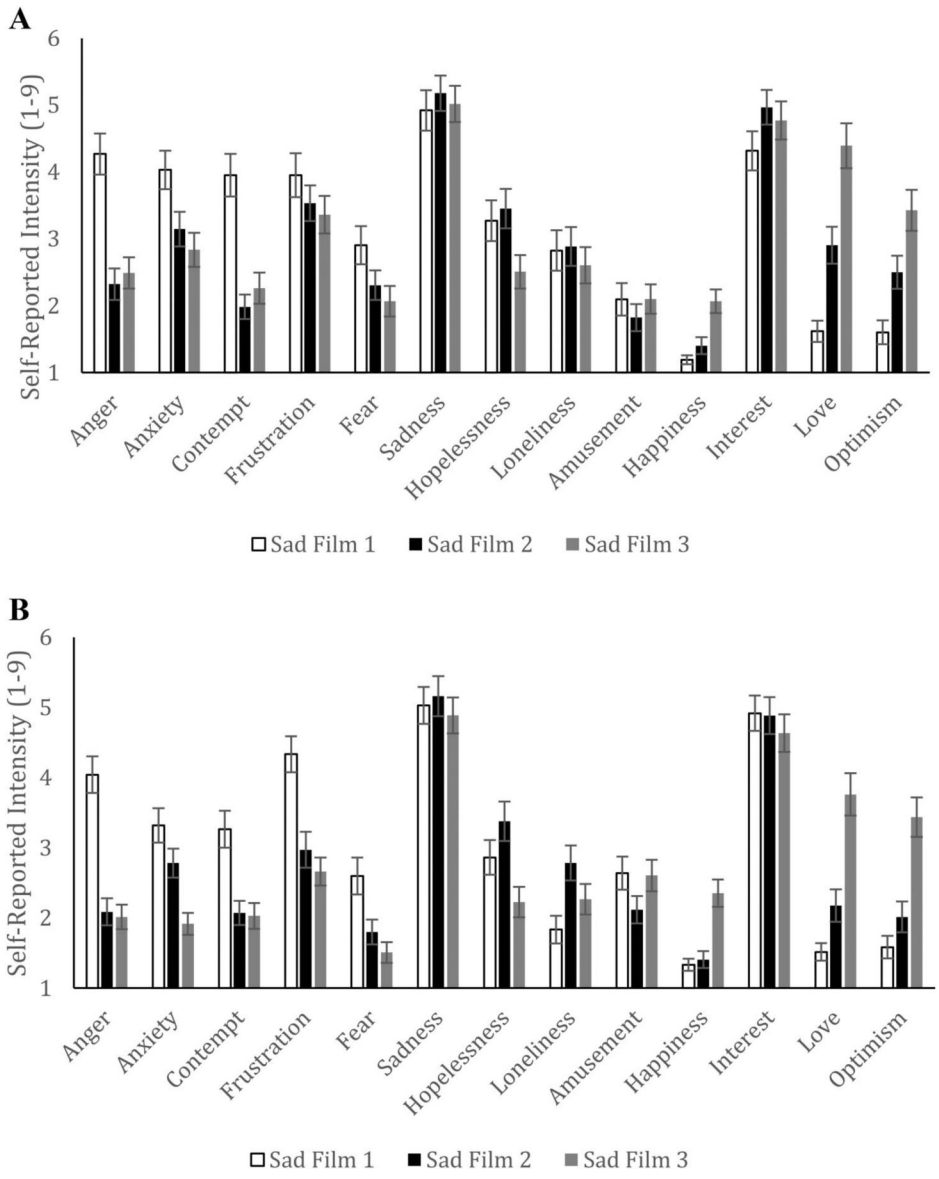

Figure 2.

Mean emotion ratings for 13 different emotions during the sadness inducing film clips in Sample 1 (Panel A) and Sample 2 (Panel B). Error bars represent standard error of the mean.

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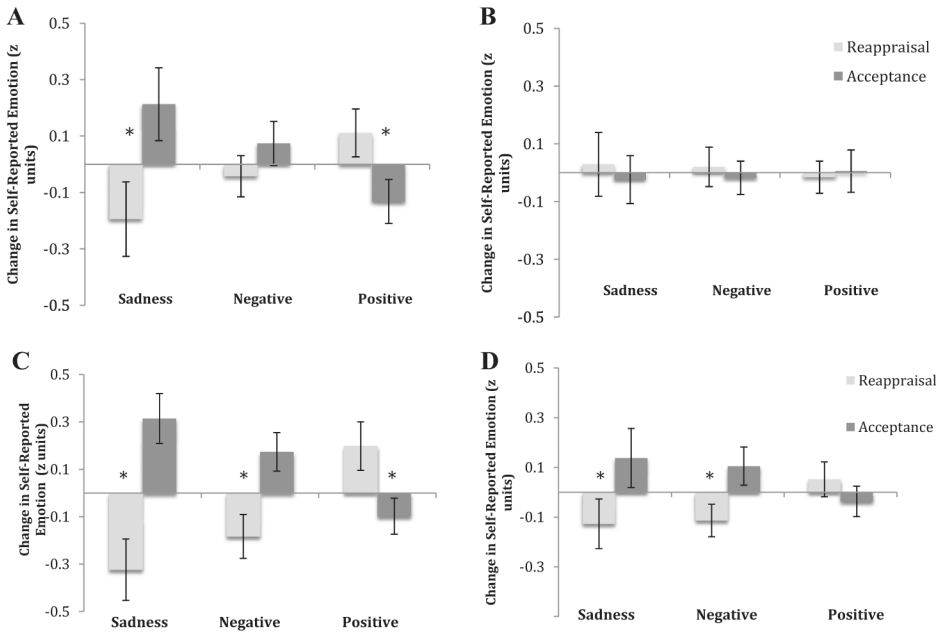

Figure 3.

Effects of emotion regulation instructions on self-reported emotions. Panel A shows responses during the sad film clips in Sample 1, and Panel B shows responses following the recovery periods in Sample 1. Panel C shows responses during the sad film clips in Sample 2, and Panel D shows responses following the recovery periods in Sample 2. Results shown for changes in self-reported sadness, a composite of negative emotions, and a composite of positive emotions. In all cases, a positive change score indicates an increase in emotions following regulation instructions (relative to the sadness baseline), whereas a negative change score indicates a decrease in emotions following regulation instructions (relative to the sadness baseline). Error bars represent standard error of the mean. Asterisks denote a significant difference between reappraisal and acceptance.

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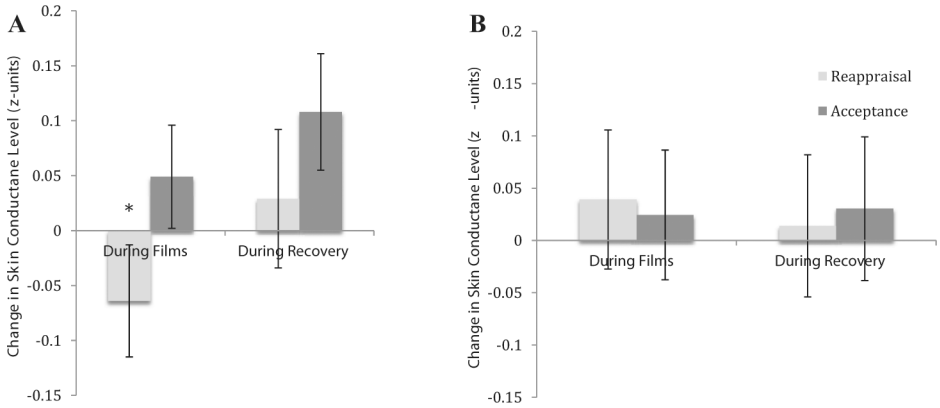

Figure 4.

Effects of emotion regulation instructions on skin conductance level during the sad film clips and recovery periods in Sample 1 (Panel A) and Sample 2 (Panel B). In all cases, a larger (positive) change score indicates more successful emotion regulation (smaller decreases in sympathetic nervous system activity). Error bars represent standard error of the mean. Asterisks indicate a significant difference between reappraisal and acceptance.

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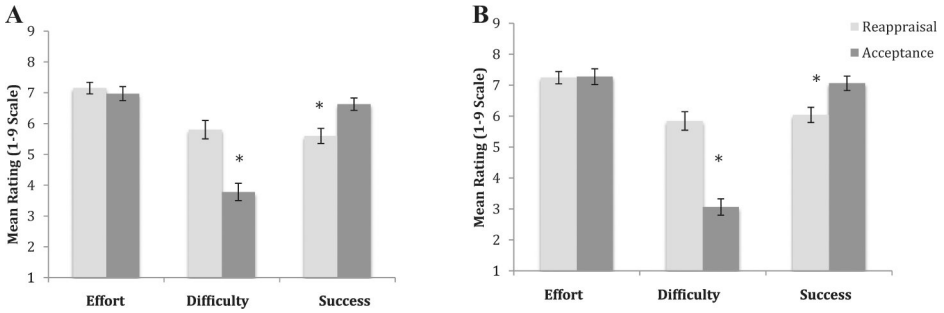

Figure 5.

Effects of emotion regulation instructions on perceived regulatory effort, difficulty, and success. Panel A shows results for Sample 1 (student sample), and Panel B shows results for Sample 2 (community sample). Error bars represent the standard error of the mean. Asterisks denote a significant difference between reappraisal and acceptance.