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Turn Down the Volume or Change the Channel?: Emotional Effects of Detached Versus Positive Reappraisal

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Abstract

Cognitive reappraisal, or changing one's interpretation of an event in order to alter the emotional response to it, is thought to be a healthy and effective emotion regulation strategy. Although researchers recognize several distinct varieties of reappraisal, few studies have explicitly compared the effects of multiple reappraisal strategies on emotional responding. The present study compares the effects of detached and positive reappraisal on thought content, subjective emotional experience, physiological reactivity, and facial expressions of emotion while viewing film clips evoking sadness and disgust. While both forms of reappraisal reduced overall emotional responding to unpleasant stimuli, the effects of detached reappraisal were stronger in this regard, and positive reappraisal was more likely to maintain subjective experience and facial expression of stimulus-appropriate positive emotions. The two reappraisal strategies also produced somewhat different profiles of physiological responding. Differences between detached and positive reappraisal with respect to subjective experience and facial expression were more pronounced among men than women; the reverse was true for differences with respect to physiological responding. Beyond these effects on individual emotion response systems, detached and positive reappraisal also had somewhat different effects on coherence in change across response systems. Implications for our understanding of emotion regulation processes, and for emotion theory more broadly, are discussed.

Keywords

Emotion; Emotion Regulation; Reappraisal; Psychophysiology; Non-Verbal Expression

You're listening to the radio and a song that you dislike begins to play. You have several options, but two likely courses of action are (a) turn down the volume/turn off the radio, or (b) change the station to one playing a song you prefer. Both options remove the annoying song. Only one option leads to silence; only the other allows you to continue enjoying good music.

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¹Importantly, in the present study these effects of emotional responding per se will be layered on top of the "orienting response" to novel visual stimuli, which includes increased cardiac interbeat interval/heart rate deceleration as well as increased skin conductance. Thus, responses to upsetting visual stimuli such as films may involve an increase in interbeat interval, rather than a decrease, even when distress is present. The key analyses in the present manuscript examine relative changes in reactivity from "just watch" conditions to instructed reappraisal conditions to assess the impact of the reappraisal strategy on physiological responding (i.e., either reduced decrease or increased increase in interbeat interval would be taken as a sign of reduced sympathetic activation in response to the clips).

We are presented with similar options when we experience emotional distress. Substituting unwanted negative emotion for the disliked music in the analogy above, we have options of trying to minimize our feelings altogether, or trying to nudge our feelings in a more pleasant direction. People use a wide range of emotion regulation strategies to achieve each of these goals (Gross, 1998a). Social psychologists have shown particular interest in the strategy of *cognitive reappraisal*, or changing one's thoughts about/interpretation of an event in such a way as to alter the emotional response to that event (e.g., Gross, 1998a; Gross, 2002; Lazarus & Folkman, 1984; Ray, Wilhelm, & Gross, 2008; Richards & Gross, 1999; Richards & Gross, 2000; Tomaka, Blascovich, Kibler, & Ernst, 1997).

The general strategy of cognitive reappraisal encompasses a number of more specific strategies, reflecting particular ways of changing one's interpretation of events. However, few empirical studies have directly compared different sub-strategies of reappraisal. Research with this goal enhances our understanding of emotion regulation processes, but also addresses basic theoretical questions about the role of cognitive appraisal in driving the quality of emotional experience (Lazarus, 1991; Scherer, 1997). The present study examined the effects of two distinct sub-types of cognitive reappraisal – detached reappraisal and positive reappraisal – on subjective emotional experience, physiological reactivity, and facial expressions of emotion while viewing distressing film clips in a controlled laboratory setting.

Cognitive Reappraisal in Emotion Regulation

Emotion regulation has been defined as “the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions” (Gross, 1998b, p. 275). People implement a wide range of cognitive and behavioral strategies to influence their emotions, and these strategies vary in their implications for short-term emotional responding, as well as for long-term health and well-being (e.g., Folkman, 1997; Gross, 1998a; Gross & John, 2003; Penley, Tomaka, & Wiebe, 2002; Shiota, 2006).

In his work on stress and coping Richard Lazarus offered an early description of cognitive reappraisal (Lazarus, 1991; Lazarus & Alfert, 1964; Folkman & Lazarus, 1984). Lazarus' emphasis on reappraisal in coping was a natural extension of his theoretical perspective on emotion itself, which held that one's emotional response to some situation depends not on the objective properties of the situation, but on how one interprets or “appraises” the situation (Lazarus, 1991). In this framework each emotion is elicited by appraisal of a particular “core relational theme,” or perceived threat or potential benefit posed by the situation. For example, fear is elicited by a perceived “immediate, concrete, and overwhelming physical danger,” and anger by a perceived “demeaning offense against me and mine” (Lazarus, 1991).

Other researchers, defining appraisals in dimensional (e.g., high vs. low controllability) rather than categorical terms, have also emphasized the relationship between appraisals and the ensuing emotion (e.g., Scherer, 1997; Smith & Ellsworth, 1985). In both categorical and dimensional views, however, one may voluntarily “reappraise” the same situation, resulting in a different appraisal and a different emotional response. A key implication of this perspective is that reappraisal may be used not only to *reduce* emotional responding, but also to change the quality of emotional responding from one variety of emotion to another.

Studies of reappraisal have addressed both its underlying cognitive and neural mechanisms and its short- and long-term effects. In terms of mechanisms, reappraisal relies on effortful cognitive functions mediated by activation in the prefrontal cortex, presumably to suppress one's primary or automatic appraisal and generate alternative appraisals (e.g., Ochsner,

Bunge, Gross, & Gabrieli, 2002; Ochsner & Gross, 2005; Ochsner, Ray, Cooper, Robertson, Chopra, Gabrieli, & Gross, 2004). In laboratory animals, inhibitory projections from the prefrontal cortex to the amygdala have been found to reduce responsiveness of the latter structure to emotional stimuli (e.g., Quirk, Likhtik, Pelletier, & Paré, 2003). In humans, negative correlations have also been observed between prefrontal cortex and amygdala activation during instructed reappraisal (e.g., Ochsner et al., 2002; Ochsner & Gross, 2005; Ochsner et al., 2004). Because the amygdala projects to the hypothalamus and areas of the brainstem that regulate autonomic and hormonal responses (Pessoa & Adolphs, 2010) that are strongly implicated in subjective emotional experience (Cacioppo et al., 2000; James, 1884; Kreibitz, 2010), voluntary, effortful reappraisal may serve to modulate overall intensity of emotional responding.

Consistent with this proposal, instructed use of reappraisal in the laboratory has been found to reduce self-reported distress and facial expressions of negative emotion, without the enhanced peripheral signs of sympathetic responding and cognitive and social costs associated with simply suppressing emotional displays (e.g., Gross, 1998b; Gross, 2002; Ray, Wilhelm, & Gross, 2008; Richards & Gross, 1999; Richards & Gross, 2006). Moreover, frequent use of reappraisal has been found to have desirable real-world correlates, including high dispositional positive affect, low negative affect, high life satisfaction, greater sharing of emotion with others, greater peer-rated likeability, closer relationships, lower risk of depression, and higher psychological well-being (Gross & John, 2003). For these reasons, cognitive reappraisal is generally thought to promote physical and psychosocial health in the long term, as well as effectively regulating emotions in the moment.

Detached Versus Positive Reappraisal

Rather than being a single strategy, cognitive reappraisal encompasses a number of specific strategies that vary in how one re-interprets the target situation (e.g., Gilbert & Holahan, 1982; Lefcourt, Davidson, Shepherd, & Phillips, 1995; Ochsner et al., 2004; Shiota & Levenson, 2009). Self-report measures of reappraisal are often written in a way that taps broad characteristics of reappraisal rather than particular sub-strategies, and some laboratory instructions also leave specific reappraisal strategy up to the participant (e.g., Gross & John, 2003; Ochsner et al., 2002; Ray et al., 2008). However, much of the laboratory-based research on reappraisal has emphasized one particular sub-strategy, which we have called *detached reappraisal* (Shiota & Levenson, 2009). Detached reappraisal involves disengaging from all emotional implications of the target situation, focusing instead on aspects or interpretations that do not involve threats or potential benefits. Typical experimental instructions invite participants to think about the stimulus in a “detached and unemotional way” (e.g., Goldin, McRae, Ramel, & Gross, 2008; Gross, 1998a; McRae, Ochsner, Mauss, Gabrieli, & Gross, 2008). The aim of this strategy is to “turn down the volume” of emotion in general.

Health psychologists have shown particular interest in another version of cognitive reappraisal, referred to as *positive reappraisal*, or sometimes “benefit finding.” Positive reappraisal focuses on the positive aspects of a target situation, and/or benefits that accrue from that target situation (Folkman & Moskowitz, 2000). For example, in her studies of caregivers of partners with HIV, Folkman (1997) found that many participants reported developing levels of intimacy and trust that might not have been possible without the shared experience of illness, and coded this as an example of positive reappraisal. Questionnaire measures of dispositional positive reappraisal, such as sub-scales of the COPE (Carver, Scheier, & Weintraub, 1989) and Ways of Coping (Folkman, Lazarus, Pimley, & Novacek, 1987) questionnaires, include items such as “I’ve been looking for something good in what

is happening” and “I looked for the ‘silver lining’, so to speak, tried to look on the bright side of things.” These changes in how the situation is interpreted are thought to facilitate the experience of positive emotions, alongside or instead of negative emotions (Tugade & Fredrickson, 2004). Thus, positive reappraisal seeks to “change the channel” with respect to emotional experience, moving it in a positive direction.

Studies of self-reported positive reappraisal suggest that this may be a particularly healthy strategy, facilitating well-being even in the face of intense stressors. Those of Folkman’s (1997) caregivers who reported more frequent use of positive reappraisal also tended to report higher psychological well-being. Similarly, a meta-analysis found that positive reappraisal among AIDS patients was associated with better health behavior and physical health outcomes (Moskowitz, Hult, Bussolari, & Acree, 2009). In a week-long diary study with college students, Shiota (2006) found that more frequent use of positive reappraisal after the worst event of the day was associated with higher psychological well-being. Tugade and Fredrickson (2004) found that self-reported positive reappraisal in the face of a current problem was associated with high trait resilience, and that this relationship was mediated by the experience of positive emotion.

Positive reappraisal has been studied extensively using questionnaire methods – a PsycINFO search for keyword “positive reappraisal” produces more than 250 publications. However, we are aware of only one study that has directly contrasted the effects of experimentally instructed detached and positive reappraisal on emotional responding. In that study, Ochsner and colleagues (2004) instructed participants viewing aversive stimuli to use either a “self-focused” reappraisal approach, appraising depicted events in a detached, 3rd-person way, or a “situation-focused” approach in which they imagined the situation improving. Both instructions led to decreased subjective distress as well as reduction in amygdala reactivity to the images, although somewhat different areas of the prefrontal cortex were recruited by each strategy. Thus, there is some evidence that both strategies are effective in reducing distress. Studies have yet to compare the effects of experimentally instructed detached and positive reappraisal on the full spectrum of emotional responding: specific thought content, subjective experience, peripheral physiological reactivity, and facial expressions of emotion.

The Present Study

The present study compares the effects of experimentally instructed detached and positive reappraisal on four aspects of emotion – content of thoughts about the target stimulus, self-reported emotional experience, peripheral physiological reactivity, and facial expressions of emotion – while viewing distressing film clips in a controlled laboratory setting. Each participant completed trials “just watching” distressing film clips as well as trials with one of the two kinds of reappraisal, allowing us to measure the effects of reappraisal in terms of within-participant change in emotional responding. Stimuli included film clips designed primarily to elicit sadness and disgust, allowing us to ask whether the effects of these two reappraisal strategies were moderated by the type of distress participants were feeling.

Hypotheses regarding the effects of detached and positive reappraisal were guided by the neural mechanisms of reappraisal discussed above as well as evidence regarding the phenomenological, physiological, and expressive features of positive and negative emotions. First, participants instructed to use each of these strategies should show profiles of thought content consistent with the reappraisal instruction – i.e., reflecting attunement to unemotional versus positive aspects of distressing stimuli (Hypothesis 1). Second, both forms of reappraisal should reduce overall intensity of emotional responding to some degree, because both strategies invoke effortful cognitive processes that appear to inhibit amygdala activation linked to strong emotional experience (Ochsner et al., 2004). Specifically, both

forms of reappraisal should lead to reduced self-reported emotional intensity and experience of target emotions, reduced physiological arousal, and reduced facial expression of emotion (Hypothesis 2).

However, positive reappraisal should facilitate relative preservation of *positive* emotional experience and expression to a greater degree than detached reappraisal (Hypothesis 3). We expected that positive reappraisal would lead to improved overall affect valence by reducing distress while increasing or maintaining positive affect, whereas detached reappraisal should maintain affect valence by reducing both negative and positive affect (thereby preserving the ratio between the two). For a similar reason, we expected that detached reappraisal would lead to reduced overall emotional intensity, whereas positive reappraisal should lead to a less pronounced reduction. We expected that self-reported experience of target positive emotions for each film clip (amusement for disgusting clips and compassion for sad clips, identified on theoretical grounds and confirmed by pilot data) would be reduced in detached reappraisal but maintained in positive reappraisal. While analyses regarding differential physiological reactivity under detached and positive reappraisal were somewhat exploratory, evidence that both amusement and compassion may involve heightened sympathetic nervous system activation (e.g., Christie & Friedman, 2003; Giuliani, McRae, & Gross, 2008; Kreibig, Gendolla, & Scherer, 2010; Shiota, Neufeld, Yeung, Moser, & Perea, in press) suggested that positive reappraisal might also lead to less pronounced reduction in physiological arousal than detached reappraisal. We expected that smiling (a behavioral index of positive emotion across a range of eliciting situations, Ekman et al., 1987; Matsumoto, Keltner, Shiota, O'Sullivan, & Frank, 2008) would be reduced with detached reappraisal, but preserved in positive reappraisal.

In addition to examining effects of detached and positive reappraisal on individual aspects of emotional responding (subjective experience, physiological responding, and facial expression), we were also interested in implications for relationships *among* these response systems. Functional theories of emotion predict that changes in emotional experience, physiology, and expression should tend to co-occur – a prediction that has been called the *coherence hypothesis* (e.g., Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005). The present design allows us to ask whether reappraisal-driven changes in these three aspects of emotion cohere differently under detached and positive reappraisal. These analyses were also somewhat exploratory due to limited prior evidence on regulation and coherence. However, the predictions for each reappraisal strategy suggest a more complex package of effects in positive reappraisal (where some aspects of emotional responding should be reduced more than others) than in detached reappraisal (where all aspects of emotional responding should be reduced), leading to a hypothesis that coherence in change across response systems might be more pronounced in detached reappraisal than in positive reappraisal (Hypothesis 4).

Methods

Sample

Participants were 146 adults residing in the Northern California Bay Area. A professional survey research firm was used to recruit a sample of Bay Area men and women in their 20s, 40s, and 60s. Participants were recruited to be representative of the Bay Area in terms of ethnicity and socioeconomic status. Initial recruitment was conducted using flyers, newspaper ads, online postings (e.g., Craigslist), and presentations to local community-based organizations (e.g., religious organizations, senior centers), describing the study and including contact information for the recruitment firm. A telephone-based screening interview was conducted for all respondents, and eligible participants were scheduled for a laboratory session at the Berkeley Psychophysiology Laboratory at the University of

California, Berkeley. The screening excluded respondents who: (a) had participated in any other research study in the last six months; (b) did not use English as the primary language at home or work; (c) had Michigan Alcoholism Screening Test (Selzer, 1971) scores > 6; (d) were wheelchair-bound; (e) had diagnosed diabetes or any other medical condition that would prevent sitting comfortably in the laboratory chair for two hours; (f) were currently using psychoactive medication to treat an affective or anxiety disorder; or (g) were allergic to the adhesive used to attach the physiological sensors.

The resulting sample was equally divided among participants aged 20-29 years ($n = 49$), 40-49 years ($n = 49$), and 60-69 years ($n = 48$), as well as between males and females. Fifty-two percent of participants were ethnically European American, 18% were Asian-American or Pacific Islander, 14% were Latino/Latina, and 16% were African-American. Of the 146 participants, 70 received Detached Reappraisal instructions during the instructed reappraisal trials, and 76 received Positive Reappraisal instructions.² The profiles of the Detached and Positive Reappraisal sub-samples were nearly identical with respect to sex, age, and ethnic composition. Due to computer problems or unusable physiological data for three participants (all in the Positive Reappraisal condition) analyses of physiological data were limited to 143 participants. Due to recording problems leading to lost or uncodable audio/visual records for 18 participants (10 Detached Reappraisal, 8 Positive Reappraisal), analyses of facial expressions of emotion were limited to 128 participants.

Procedures

Upon arrival at the laboratory, participants reviewed and signed a consent form. A research assistant then attached the sensors used to measure physiological responses. Participants were assigned to an experimental condition, systematically crossing age, sex, ethnicity, reappraisal type, and stimulus tape (which determined film clip sequence). Next, an experimenter gave participants the instructions for the six film-viewing trials. Within each trial, participants viewed: (a) a large “X” on a television monitor for a 60-second trial baseline, during which they were asked to clear their minds of thoughts, feelings, and memories; (b) a 5-second image repeating the viewing instructions for that trial; (c) the film clip, which lasted approximately three minutes; and (d) a blank screen for a “recovery” period of 60 seconds (data from this recovery period were not used in the present analyses). After delivering the instructions, the experimenter left the room for the duration of the trial. At the end of the trial the experimenter re-entered the room, administered the emotional experience questionnaire (see Measures, below), and delivered instructions for the next trial.

For the first three trials (Just Watch), participants were asked to “just watch the film clip as though you were watching television at home, or a movie in a movie theater.” The first trial showed an emotionally neutral film, in order to help participants adjust to the experimental procedures; data from this trial are not used in the present analyses. In the second and third trials, participants saw one sad and one disgusting clip (see descriptions below), with order counterbalanced across the sample.

For the fourth and fifth trials (Reappraise), participants received the reappraisal instructions for their assigned condition. The Detached Reappraisal instruction was: “This time, while you are watching the film clip, please try to adopt a detached and unemotional attitude. As you watch the film clip, please try to think about what you are seeing objectively. Watch the film clip carefully, but please try to think about what you are seeing in such a way that you feel less negative emotion.” The Positive Reappraisal instruction was: “This time, while you

²A third sub-sample also participated, receiving non-specific regulation instructions prior to the 4th and 5th trials; these individuals are not included in the present analyses.

are watching the film clip, please try to think about positive aspects of what you are seeing. Watch the film clip carefully, but please try to think about what you are seeing in such a way that you feel less negative emotion.” In the two reappraisal trials participants viewed one sad and one disgusting film clip, with order counterbalanced across the sample.

The disgusting film clips were taken from the television show “Fear Factor,” and depicted a person engaged in an unpleasant eating activity – a prototypical elicitor of disgust. One clip showed a woman eating horse rectum, and the other showed a man sucking fluid from cow intestine. The two sad film clips were taken from feature films, and depicted a person learning of and mourning a close other’s death – a prototypical elicitor of sadness. One clip, from the film “21 Grams”, showed a mother learning of her two daughters’ death in a car accident. The other clip, from “The Champ”, showed a boy watching his mentor’s death after a boxing match. The order of these clips was counterbalanced across the sample, with one sad and one disgusting clip used in the Just Watch trials, and the others used in the Reappraise trials.

Participants also completed a sixth trial, watching a third disgusting film clip with instructions to suppress their emotional behavior; data from this trial are not used in the present analyses. After this final trial, an experimenter removed the physiological measurement sensors. Participants completed an interview about a recent emotion regulation experience (not used in the present analyses) and were debriefed. Participants received \$50 for participating in the 2.5 hour study.

Measures

Thoughts During the Film Clips—After each trial, participants were asked to describe what they were thinking about while viewing the film clip. Participants’ open-ended responses were videotaped, transcribed, and coded for the presence versus absence of specific thought content elements. The coding system was initially developed to reflect positive and neutral thoughts viewers might reasonably have had about the clips’ content; additional codes reflecting other commonly reported thoughts were added during the coder training process.

The final coding system included eight codes reflecting positive thoughts about the clip: positive evaluation of a character’s personality; finding a character physically attractive; describing a character’s positive feelings; positive evaluation of the acting in the film; finding the clip funny; “cheering” for the character; suggesting the character’s experience may lead to greater wisdom; and positive comment about the relationships between characters in the film.

The final coding system also included 12 codes reflecting detached/neutral thoughts about the clip: description of the physical setting; questioning the hygienic safety of the events (e.g., “did they cook the cow intestine to kill germs?”); questioning whether the events displayed were real/realistic; pretending something else was happening (e.g., Fear Factor contestant actually eating taffy); description of formal features of the clip (e.g., camera angle); thinking “it’s just a movie”; identifying an actor in or director of the clip; neutral comment on the acting technique or casting; description of the clip as emotionally manipulative; description of the plot as predictable; neutral personal association (e.g., actor looks like an acquaintance); and wondering why the researchers were using the clip in the study.

Content coding was performed by two trained research assistants, working from transcripts of the open-ended responses. Both coders coded all responses by 42 participants; percent agreement (a conservative measure of reliability, as it only “counts” agreement on presence

of codes, not absence of codes) was 76%. In addition to being analyzed individually, positive codes were summed for each participant to form a Positive Thoughts index, and the detached/neutral codes were summed to form a corresponding Neutral Thoughts index.

Subjective Emotional Experience—After each trial, participants were asked to report their emotional experience while viewing the film clip. Participants first rated the valence of their emotions on a scale from 0 (very negative) to 8 (very positive). Next, participants rated the overall intensity of their emotions on a scale from 0 (no emotion at all) to 8 (the strongest emotions I've ever felt). Participants then rated how strongly they had experienced each of nine emotions (Amusement/Humor, Anger, Contentment, Compassion, Disgust, Enthusiasm/Excitement, Fear, Sadness, and Surprise) while viewing the film clip on a scale from 0 (did not experience the emotion at all) to 8 (strongest experience of the emotion ever felt).

The present analyses examine ratings of Valence, Intensity, the target negative emotion for each trial (Disgust or Sadness, depending on clip), and a target positive emotion for each trial. Amusement was selected as the target positive emotion for the disgusting clips, based on humorous content of the clips (e.g., sight gags, contestant laughter), as well as pilot data indicating amusement as the highest-rated positive emotion. In the present sample, many participants openly laughed during the disgust clips, and Amusement ratings were highest among the positive emotions. Compassion was selected as the target positive emotion for the sad clips, as compassion was the most theoretically appropriate positive response to the clips, and Compassion ratings were the highest among positive emotions for these clips in both pilot testing and in the present data set.³ After the reappraisal trials, participants were also asked to rate how successful they thought they were at complying with the "instructions for dealing with your emotions during the film clip" on a scale from 0 (not at all successful) to 4 (very successful).

Physiological Reactivity—Continuous recordings were obtained of nine measures of peripheral physiological activity, using a system consisting of a Grass Model 7 polygraph, a Finapres blood pressure monitor, and a microcomputer with analog and digital input/output capabilities. Physiological measures were selected to sample broadly from major organ systems (cardiac, vascular, respiratory, and electrodermal), to allow for continuous measurement, to be as unobtrusive as possible, and to include measures used in our previous studies of emotion. The present analyses examine two measures that are commonly used in research on emotion, reliable as single measures (high signal-to-noise ratio), and reflect autonomic nervous system responding typically associated with emotional distress while being modulated by somewhat different receptor subtypes. Specifically: Cardiac inter-beat interval (IBI) was measured via electrodes with conductive gel placed in a bipolar configuration on the lower left rib cage and right clavicle. The interval between successive R-peaks of the electrocardiogram was measured in milliseconds. Shortened IBI (a.k.a. increased heart rate) is consistent with increased sympathetic or reduced parasympathetic influence on the heart, and is commonly observed during strong negative emotion.

Mean arterial pressure (MAP) was measured via an inflating cuff placed on the intermediate phalanx of the second finger of the nondominant hand, and adjusted continuously by the Finapres monitor to estimate blood pressure on each heartbeat. In general, increases in blood pressure (like shortened IBI) are consistent with increased sympathetic activation, due to increased cardiac contractility and/or increased peripheral vascular resistance.

³While compassion may be experienced simultaneously with sadness, it is commonly conceptualized as a positive emotion that facilitates nurturance and caregiving, and empirical evidence associates compassion with subjective feeling and action tendency clusters distinct from those of sadness and distress. For examples, see Fredrickson (1998) and Goetz and colleagues (2010).

A computer program written by one of the authors (RWL) calculated second-by-second averages for each physiological measure. Prior to additional analysis, all physiological data were examined by research assistants blind to age, sex, and experimental condition to remove artifacts and outliers. Data for each measure were then averaged into key epochs by calculating means for (a) the 60-second baseline preceding each stimulus film clip, and (b) the duration of the clip. Baseline-to-trial change scores were calculated for each measure for each trial by subtracting the baseline epoch mean from the film clip epoch mean.

Facial Expressions of Emotion—Participants were videotaped throughout the laboratory session, with their knowledge and consent, using a remotely-controlled camera partially concealed behind darkened glass. For each trial, emotional behavior was coded during the stimulus film clip and the first 10 seconds after the clip (a burst of expression often occurred immediately following the ending of the clip). Coding of target emotion expressions was based upon criteria derived from the Facial Affect Coding System⁴ and EMFACS (Ekman & Friesen, 1978; Friesen & Ekman, 1983), and included required and optional/enhancing action units. The present analyses examine expressions of the target negative emotion for each clip (disgust or sadness), and smiling during all clips. For disgust, required action units were AU 9 (nose wrinkle) and/or AU10 (upper lip raise), and optional action units included AU23 (lip tighten) and AU24 (lip press). For sadness, required action units were AU1 (inner brow raise) or AU5+4 (inner brow raise plus brow lower), and optional action units were AU6 (cheek raise), AU15 (lip corners down), AU17 (chin raise), and AU24 (lip press). For smiling, the required action unit was AU12 (lip corners up), and the optional action unit was AU6 (cheek raise).

Coding was segmented into 5-second “bins,” each rated for disgust, sadness, and smiling (other emotions were also coded, but were not used in the present analyses) on a scale from 0 (not present) to 3 (strongly present) reflecting both intensity and duration of the expression. Coders were blind to which film clip the participant was watching in each trial, as well as to Reappraisal Type condition. The present analyses examine the average ratings for target emotion expression (i.e., sadness facial expressions during sad films and disgust facial expressions during disgust films) across all bins of each film clip, as well as average smiling ratings across all bins of each film clip. Coding was completed by three individuals. Data from fourteen participants (10% of the sample) were coded by all three coders to assess reliability; single-coder, absolute agreement intraclass correlations were .69 for disgust, .76 for sadness, and .72 for smiling.

Analyses: General Approach

Mixed-model ANOVAS were used to compare perceived success in enacting Detached and Positive Reappraisal, as well as the effects of Detached and Positive Reappraisal instruction on thoughts during the film clips, subjective emotional experience, physiological responding, and facial expressions of the target emotions. The basic structure of these ANOVAs was $2 \times 2 \times 2 \times 2$ (Instruction [Just Watch versus Reappraise] $\times$ Reappraisal Type [Detached versus Positive] $\times$ Film Type [Disgusting versus Sad] $\times$ Sex). Reappraisal Type and Sex were treated as between-subjects factors, Instruction and Film Type as within-subject factors; Age (continuous) was entered as a covariate. In these analyses only main effects and interactions involving Instruction (Just Watch vs. Reappraise) were of interest, as this effect indicates a change associated with instructed reappraisal, and significant effects including an Instruction $\times$ Reappraisal Type interaction were taken to indicate differences in the effects of the two reappraisal strategies.⁵

⁴Facial expression coders had completed the FACS training course prior to coding the present data set, although they had not taken the certification test.

Analyses examining implications of detached and positive reappraisal for subjective experience and facial expression of target negative and positive emotions added Valence (Negative versus Positive target emotion) as an additional within-subjects factor, allowing a test of differential effects of the two reappraisal instructions on emotions of opposing valence. Analyses examining implications of detached and positive reappraisal for physiological reactivity added Physiological Measure as an additional within-subjects factor. This approach treats profile of physiological reactivity across both dependent measures as the outcome rather than examining each dependent measure individually. Prior to significance testing ANOVAS baseline-to-trial change scores for each measure (IBI and MAP) were standardized, and the z-scores for IBI were multiplied by -1 so that positive values consistently reflected increased arousal; these standardized scores were then used as the dependent measures.

Results

Perceived Success

Mean Perceived Success ratings are presented in Table 2, separately for each reappraisal type. The main effect of Reappraisal Type on Perceived Success at enacting the reappraisal instructions was not significant, $F(1, 132) = 0.62, n.s.$, and no interactions involving Reappraisal Type were significant. In both conditions, mean Success ratings were near 2.5 on the 0-4 scale, suggesting that participants felt moderately successful at enacting both strategies.

Thoughts During the Film Clips

Proportions of participants in each reappraisal condition who reported each of the 20 target thoughts are presented in Table 1, separately for disgusting and sad film clips. Analyses compared reports of each thought type (both mean total positive and negative thoughts, and frequencies of each individual thought) across the Detached versus Positive reappraisal conditions for reappraisal trials only, separately for disgusting and sad film clips.

Positive Thoughts—For the disgusting film clip viewed with “reappraise” instruction, participants who had received Positive Reappraisal instructions reported a significantly greater total number of positive thoughts than did those who had received Detached Reappraisal instructions (Mean Positive = .53, SE = .08; Mean Detached = .26, SE = .06; $F(1, 138) = 6.53, p = .012$). The same effect was observed for positive thoughts reported while viewing the sad film clip following reappraisal instruction (Mean Positive = .57, SE = .08; Mean Detached = .25, SE = .06; $F(1, 138) = 9.40, p = .003$). Those receiving Positive Reappraisal instruction reported about twice as many positive thoughts as those who received Detached Reappraisal instruction.

For individual positive thoughts, frequencies were consistently higher in the positive reappraisal condition than in the detached reappraisal condition for both film types. Likelihood ratios were calculated for this contrast for each positive thought for each type of film clip, asking whether that thought was reported significantly more often in one reappraisal condition than in the other. Frequencies for any single thought were typically low, so few of these contrasts were significant; however, effects that were significant were consistent with the particular content of each film type. Participants in the positive reappraisal condition were more likely to report thinking the disgusting clip was funny/

⁵Findings do not differ substantively from those reported herein when age is treated as a categorical factor rather than a continuous covariate, or when residuals obtained by regressing reappraisal trial values on “just watch” trial values are examined as dependent variables rather than treating Instruction (Watch vs. Reappraise) as a within-subjects factor.

amusing ($LR = 3.00, p = .083$), and also to comment on positive relationships among the characters ($LR = 4.05, p = .044$), than participants in the detached reappraisal condition. Participants in the positive reappraisal condition were also more likely than those in the detached reappraisal condition to have thought that the characters in the sad clip had good relationships with each other ($LR = 13.98, p < .001$), that the main character's experience would lead to wisdom ($LR = 4.05, p = .044$), and that a character in the sad clip showed positive emotion ($LR = 2.80, p = .094$).

Neutral Thoughts—For the disgusting film clip viewed with “reappraise” instruction, participants who had received Detached Reappraisal instructions reported a greater total number of neutral thoughts about the film's content than did those who received Positive Reappraisal instructions (Mean Detached = .60, SE = .09; Mean Positive = .35, SE = .07; $F(1, 138) = 4.60, p = .034$). The direction of this effect was the same for neutral thoughts reported during the post-reappraisal instruction sad clip, although the effect was not statistically significant (Mean Detached = .93, SE = .14; Mean Positive = .69, SE = .11; $F(1, 138) = 1.73, n.s.$).

For individual neutral thoughts, frequencies were consistently higher in the detached reappraisal condition than in the positive reappraisal condition for both film clips. Likelihood ratios were calculated for this contrast for each neutral thought for each film clip, and effects were again consistent with the particular content of each film type. Participants in the detached reappraisal condition were more likely than those in the positive reappraisal condition to report thinking about formal features of the disgusting film clip ($LR = 3.00, p = .083$); high-frequency thoughts also included wondering whether the depicted events were real, and identifying an actor in or director of the clip. Participants in the detached reappraisal condition were significantly more likely than those in the positive reappraisal condition to have made a neutral comment on the casting or acting in the sad clip ($LR = 13.98, p < .001$), and were also somewhat more likely to identify an actor or director and comment on the formal features of the sad clip.

Summary—On the whole, these effects indicate that participants complied with the instruction to use a particular reappraisal strategy, and were able to implement that strategy with success. Positive and neutral thoughts were tailored to the content of each clip, suggesting that participants were actively generating new appraisals specific to the stimuli in front of them (e.g., “The guy eating the cow intestine was really cute”; “Isn't that Ricky Schroeder?”) rather than relying on generic positive (e.g., “I was confident that I could do this”) or neutral (“I wonder how long this study will take?”) thoughts. Thus, both detached and positive reappraisal appeared to be driven by changes in participants' interpretations of the distressing stimuli themselves.

Subjective Emotional Experience

Mean ratings of overall Valence, overall Intensity, and intensity of Target Positive and Negative Emotions are reported in Table 2, separately for Watch and Reappraise trials in the Detached versus Positive Reappraisal conditions.

Valence—The main effect of Instruction on Valence was not significant, $F(1, 136) = .33, n.s.$. However, the interaction between Instruction and Reappraisal Type was significant, $F(1, 135) = 5.47, p = .021$. In follow-up ANOVAs conducted separately for each reappraisal type the main effect of Instruction was not significant for either Detached or Positive Reappraisal; however, the directions of change were toward more positive-valence affect with Positive Reappraisal, and toward more negative-valence affect for Detached Reappraisal.

Intensity—The main effect of Instruction was significant, such that Reappraisal instruction reduced overall Intensity of experience relative to Just Watch trials, $F(1, 135) = 4.22, p < .042$. This was moderated by Reappraisal Type, $F(1, 135) = 8.50, p = .004$. Follow-up ANOVAs conducted separately for each reappraisal type indicated that the effect of Detached Reappraisal on intensity was significant, $F(1, 66) = 4.78, p = .032$, but the effect of Positive Reappraisal was not, $F(1, 68) = .30, n.s.$. This interaction was not moderated by any other variable.

Target Emotions—The main effect of Instruction was not significant, $F(1, 135) = 1.81, n.s.$, although directionally reappraisal tended to reduce experience of the target emotions. The interaction between Instruction and Reappraisal Type was significant, $F(1, 135) = 4.14, p = .044$, such that Detached Reappraisal reduced target emotion experience more than Positive Reappraisal. This effect was not moderated by Valence alone, $F(1, 135) = .35, n.s.$. However, a four-way interaction among Instruction, Reappraisal Type, Valence, and Sex was significant, $F(1, 135) = 7.84, p = .006$. Follow-up ANOVAs were conducted separately for men and women.

Among men, the main effect of Instruction was not significant, $F(1, 63) = 2.02, n.s.$, nor was the Instruction $\times$ Reappraisal Type interaction, $F(1, 63) = .52, n.s.$. However, the three-way interaction among Instruction, Reappraisal Type, and Valence was significant, $F(1, 63) = 6.47, p = .013$. ANOVAs were conducted separately for each valence. For Target Negative emotions, neither the main effect of Instruction, $F(1, 63) = 1.36, n.s.$, nor the Instruction $\times$ Reappraisal Type interaction, $F(1, 63) = .16, n.s.$, was significant. For Target Positive Emotions, the main effect of Instruction was not significant, $F(1, 63) = 2.06, n.s.$, but the Instruction $\times$ Reappraisal Type interaction approached significance, $F(1, 63) = 3.61, p = .062$. Analyses conducted separately for each reappraisal type revealed that Detached Reappraisal instruction reduced subjective experience of the Target Positive Emotion, $F(1, 30) = 4.05, p = .053$, but Positive Reappraisal instruction had no such effect, $F(1, 32) = .01, n.s.$.

Among women, the main effect of Instruction was not significant, $F(1, 71) = .36, n.s.$, but the Instruction $\times$ Reappraisal Type interaction was significant, $F(1, 71) = 5.01, p = .028$, such that Detached Reappraisal reduced target emotion experience more than Positive Reappraisal. This effect was not further moderated by Valence, $F(1, 71) = 2.24, n.s.$.

Summary—Our hypotheses regarding the effects of detached and positive reappraisal on subjective emotional experience were partially supported. Detached and positive reappraisal had different effects on valence, with only positive reappraisal tending to improve valence. In contrast, only detached reappraisal led to significant reduction in overall emotional intensity. Averaging across positive and negative target emotions, detached reappraisal led to greater reduction in subjective experience than did positive reappraisal. Among men, but not women, positive reappraisal appeared to preserve experience of target positive emotions relative to the effects of detached reappraisal.

Physiological Reactivity

Mean unstandardized baseline-to-trial change scores for IBI and MAP are presented in Table 2, separately for Watch vs. Reappraise trials in the two Reappraisal conditions.

The main effect of Instruction on Physiological Reactivity was not significant, $F(1, 122) = 2.29, n.s.$, nor were the Instruction $\times$ Reappraisal Type interaction, $F(1, 122) = 1.50, n.s.$, or the three-way interaction among Instruction, Reappraisal Type, and Physiological Measure, $F(1, 122) = 1.22, n.s.$. The four-way interaction among Instruction, Reappraisal Type,

Physiological Measure, and Sex approached significance, however, $F(1, 122) = 3.17, p = .077$, so follow-up ANOVAs were conducted separately for men and women.

Among men the main effect of Instruction was significant, $F(1, 58) = 4.38, p = .041$. This effect was not moderated by Reappraisal Type, $F(1, 58) = .05, n.s.$, nor by Reappraisal Type in combination with any other variable. Among women, the main effect of Instruction was not significant, $F(1, 63) = .00, n.s.$, but the interaction between Instruction and Reappraisal Type was significant, $F(1, 63) = 5.10, p = .027$. This effect was significantly moderated by Physiological Measure, $F(1, 63) = 5.11, p = .027$. Follow-up ANOVAs were used to examine each Physiological Measure separately. For IBI, the main effect of Instruction was not significant, $F(1, 63) = 1.60, n.s.$, but the Instruction $\times$ Reappraisal Type interaction was significant, $F(1, 63) = 10.10, p = .002$. Although the main effect of Instruction on IBI was not significant for either Detached or Positive Reappraisal, examination of the means in each condition indicated that Positive Reappraisal tended to increase IBI reactivity whereas Detached Reappraisal tended to reduce it. For MAP, neither the main effect of Instruction, $F(1, 63) = 1.68, n.s.$, nor the Instruction $\times$ Reappraisal Type interaction, $F(1, 63) = .00, n.s.$ were significant, but the direction of change was toward reduced reactivity in MAP in both reappraisal conditions.

Summary—Effects of instructed reappraisal differed for men and women. Among men, reappraisal generally reduced physiological reactivity, with no apparent difference between the two reappraisal types. Detached and positive reappraisal did have different implications for women's physiological reactivity, with detached reappraisal tending to reduce cardiac reactivity to the films and positive reappraisal tending to increase it.

Facial Expressions of Emotion

The main effect of Instruction was significant, such that Reappraisal instruction generally tended to reduce facial expression of emotions relative to the Just Watch trials, $F(1, 118) = 7.23, p = .008$. The Instruction $\times$ Reappraisal Type interaction was also significant, $F(1, 118) = 5.93, p = .016$, such that Detached Reappraisal tended to reduce facial expressions to a greater degree than Positive Reappraisal. However, this interaction was qualified by a four-way interaction among Instruction, Reappraisal Type, Expression Valence, and Sex, $F(1, 118) = 11.10, p = .001$. Follow-up ANOVAs were thus conducted separately for each sex.

Among men the main effect of Instruction was not significant, $F(1, 58) = 1.83, n.s.$, but the Instruction $\times$ Reappraisal Type interaction was significant, $F(1, 58) = 6.03, p = .017$. This effect was further moderated by Valence, $F(1, 58) = 9.22, p = .004$, so ANOVAs were conducted separately for Target Negative Emotions and Smiling. For Target Negative Emotions neither the main effect of Instruction, $F(1, 58) = .41, n.s.$, nor the Instruction $\times$ Reappraisal Type interaction, $F(1, 58) = .35, n.s.$, was significant. For Smiling the main effect of Instruction approached significance, $F(1, 58) = 3.81, p = .056$, and the Instruction $\times$ Reappraisal Type interaction was significant, $F(1, 58) = 10.28, p = .002$. Separate analyses for Detached and Positive Reappraisal conditions revealed that Detached Reappraisal significantly reduced smiling, $F(1, 28) = 4.59, p = .041$, but Positive Reappraisal had not such effect, $F(1, 29) = .10, n.s.$

Among women, the main effect of Instruction was significant, $F(1, 59) = 5.30, p = .025$, but this effect was not significantly moderated by reappraisal type or any higher-order interaction involving reappraisal type.

Summary—Hypotheses regarding effects of detached and positive reappraisal on facial expressions were partially supported, though these effects differed somewhat between men and women. Averaging across sexes reappraisal instruction reduced expressivity, and this

was more true for detached than positive reappraisal. Among men, but not women, detached reappraisal reduced smiling while viewing the films whereas positive reappraisal preserved smiling.

Coherence In Change Across Experience, Physiology, and Expression

Just Watch Trials—Pearson's correlations across the entire sample of target positive and negative emotion experience with overall subjective emotional intensity, baseline-to-trial change in IBI and MAP, and target emotion expressions, as well as between target emotion expressions and baseline-to-trial change in IBI and MAP, are presented separately for "just watch" sad and disgusting film trials in Table 3. Between-subjects correlations in a single trial are not as meaningful as within-subjects correlations across trials/over time for measuring emotion response system coherence, as coherence is fundamentally a within-subject phenomenon (Mauss et al., 2005). However, examining these correlations is useful prior to examining coherence among *change* scores associated with instructed reappraisal.

Overall intensity of self-reported emotional experience was strongly associated with ratings of disgust, but not amusement, while viewing the disgusting film, and with both sadness and compassion while viewing the sad film (sadness and compassion ratings were highly correlated, $r = .83$, $p < .001$). Ratings of target negative emotion experience were unrelated to physiological reactivity. Higher ratings of target positive emotion experience loosely predicted greater physiological reactivity (increased arousal), but effects were small and not always significant. Ratings of disgust and amusement experience during the disgusting film were positively correlated with disgust expressions and smiling, respectively. Sadness and compassion experience were not significantly correlated with the corresponding expressions during the sad film. Expressions of target negative emotions were unrelated to physiological reactivity. Greater smiling was associated with significantly greater increases in arousal during the disgusting film, and with smaller increases in arousal during the sad film.

In sum, evidence for coherence among response systems during just watch trials was modest and inconsistent, although most correlations were in the predicted direction. Notably, physiological reactivity was predicted somewhat better by target positive emotion experience and expression than by target negative emotions. Correlations among aspects of emotional responding tended to be stronger in the disgusting film trials than in the sad trials, and self-reports of disgust and amusement were more independent those of sadness and compassion. The small size of correlations in these analyses should be interpreted cautiously because, as noted above, emotion response system coherence is really a within-subjects phenomenon over time. However, these findings led to a decision to only use the disgusting film trials in examining implications of instructed reappraisal for coherence in *change* from watch to reappraise trials.

Change From Just Watch to Reappraise Trials—In order to capture coherence in *change* in emotional responding due to reappraisal instruction, we (1) subtracted the "just watch" disgust trial value from the "reappraise" disgust trial value for each measure of emotional responding included in the "just watch" analyses above (for physiological reactivity these were baseline-to-trial change scores), and then (2) calculated Pearson's correlations between changes in target positive and negative emotion experience and changes in overall subjective emotional intensity, reactivity in IBI and MAP, and target emotion expressions, as well as between target emotion expressions and reactivity in IBI and MAP. These correlations, presented in Table 3, represent a compromise between within- and between-subjects coherence analyses because they ask whether within-individual change in one aspect of emotional responding predicts within-individual change in another aspect of responding across the sample. Since reappraisal-based changes typically involved reduction

in responding, more positive correlations indicate higher coherence, i.e. greater reduction in one aspect of emotional responding was associated with greater reduction in the other aspect as well. The exception is for analyses involving IBI, where *negative* correlations indicate greater coherence in change. These correlations were calculated separately for participants the detached vs. positive reappraisal conditions, allowing us to ask whether these strategies differed in their implications for coherence in change. Where difference in correlations across conditions was significant, Fisher's z-test for independent correlations is reported.

As expected, most correlations were directionally positive except those involving IBI, of which most were negative – effects consistent with coherence in change. Change in overall intensity of emotional experience was positively correlated with change in target positive and negative emotions. However, change in overall intensity was better predicted by change in disgust than change in amusement in the detached reappraisal condition, whereas it was more better predicted by change in amusement than disgust in the positive reappraisal condition. Thus, change in overall subjective intensity appeared more influenced by negative emotion in detached reappraisal, and more influenced by positive emotion in positive reappraisal.

In the detached reappraisal condition change in MAP was significantly associated with change in target negative emotion experience. This effect was not observed in the positive reappraisal condition, and the correlations differed significantly, $z = 1.99$, $p = .023$. No other correlations between emotional experience and physiological reactivity were significant.

In the detached reappraisal condition, changes in disgust and amusement experience were positively correlated with changes in disgust expressions and smiling, respectively. These effects were not observed in the positive reappraisal condition, and the difference between detached and positive reappraisal was significant for disgust expression, $z = 1.66$, $p = .049$. In the detached reappraisal condition, change in physiological reactivity was significantly predicted by change in smiling, but not in disgust expression. In the positive reappraisal condition the reverse was true – change in physiological reactivity was significantly predicted by change in disgust expression but not in smiling. The correlation of change in smiling with change in MAP differed significantly between the detached and positive reappraisal conditions, $z = 1.98$, $p = .024$.

Summary—Correlations of reappraisal-related change in emotional responding across responses systems were generally in the direction consistent with coherence, though they were not always significant. Coherence in change across emotional response systems showed a modest tendency to be stronger in detached reappraisal than in positive reappraisal, as hypothesized. Change in physiological reactivity was only predicted by change in disgust expression in positive reappraisal, and only predicted by change in smiling in detached reappraisal, suggesting that reappraisal-based reduction in physiological reactivity was linked more to decreased positive emotion in detached reappraisal, but more to decreased negative emotion in positive reappraisal.

Discussion

We examined the implications of two types of cognitive reappraisal – detached and positive – for content of thoughts, subjective emotional experience, physiological reactivity, and facial expressions of emotion while viewing distressing films. This study builds upon a previous body of research examining one or the other of these strategies separately (e.g., Folkman, 1997; Goldin et al., 2008; Gross, 1998b; McRae et al., 2008; Shiota, 2006; Tugade & Fredrickson, 2004), as well as one study contrasting the effects of the two strategies on the subjective experience and central nervous system markers of distress (Ochsner et al.,

2004). Although both strategies have been found to reduce distress (a finding further supported by the present study), we hypothesized that detached and positive reappraisal would have somewhat different implications for profiles of emotional responding. Specifically, we predicted that detached reappraisal would tend to push thought content in a neutral direction, reducing experience and expression of both positive and negative emotions, whereas positive reappraisal instruction should encourage more positive thought content and allow positive emotion to be maintained. Although analyses of physiological reactivity and coherence among reappraisal-related changes in experience, physiology, and expression were somewhat exploratory, prior research suggested that detached reappraisal might dampen physiological responding to a greater degree than positive reappraisal, and that changes in responding across these three aspects of emotion might “hang together” more tightly in detached than positive reappraisal.

Participants reported using both reappraisal strategies successfully, and those in the detached vs. positive reappraisal trials showed the expected differences in thought content (Hypothesis 1). Notably, the specific kinds of neutral and positive thoughts reported with high frequency were closely linked to the actual content of the various film clips, suggesting that participants were engaged in active reinterpretation of these stimuli, rather than general motivational self-talk. Reappraisal broadly speaking tended to reduce the overall intensity of subjective emotional experience, as well as facial expressions of emotion, relative to “just watch” trials (Hypothesis 2). Among men, reappraisal also tended to reduce physiological reactivity during the film clips regardless of specific strategy.

Implications of the two strategies also diverged in a number of ways, some predicted by Hypothesis 3, and some not. Within measures of subjective emotional experience, overall intensity of experience appeared to track target negative emotion with detached reappraisal, but target positive emotion in positive reappraisal. Detached reappraisal had an even stronger effect than positive reappraisal in reducing subjective experience and facial expression of target emotions (both negative and positive), an effect that we did not anticipate but that is consistent with an emphasis on overall dampening of emotion. Among women, detached reappraisal also tended to reduce overall physiological reactivity during the film clips, consistent with Hypothesis 3. In contrast, positive reappraisal was more likely to preserve positive emotional responding, although this manifested in different ways in men and women. Among men, experience and expression of positive emotions were maintained with positive reappraisal. Among women, positive reappraisal led to increased cardiac reactivity during the films; with the directional reduction in blood pressure reactivity, this profile is consistent with an engaged but not threatened response to the film clips (Tomaka, Blascovich, Kibler, & Ernst, 1997).

Implications of these two reappraisal styles for coherence in change among subjective experience, physiology, and expression should be considered tentative pending replication in future studies with a greater number of trials. Across both strategies, however, reappraisal-related change in one aspect of responding was correlated in the predicted direction with changes in other aspects of responding. These correlations tended to be somewhat stronger for detached than positive reappraisal, and in a few cases the difference between independent correlations reached significance, partially supporting Hypothesis 4. Also, reappraisal-based reduction in physiological reactivity was linked to decreased positive emotion expression in detached reappraisal, but to decreased negative emotion expression in positive reappraisal.

Taken as a whole, these findings suggest that detached reappraisal has the effect of globally reducing emotional responding (akin to “turning down the volume”), whereas positive reappraisal may shift the balance of emotional responding toward positive affect (akin to

“changing the channel”). Which strategy is “better?” Both forms of reappraisal are clearly preferable to some other strategies, which can exacerbate distress in the short term or over time. For example, attempts to suppress emotional expression tend to increase physiological stress responses rather than alleviating them, and do not necessarily improve subjective emotional experience (e.g., Gross, 1998b, 2002). Suppression effort also imposes substantial cognitive costs (Richards & Gross, 1999; Richards & Gross, 2006), and individuals who report frequent use of this strategy tend to have less satisfying interpersonal relationships (e.g., Gross & John, 2003; Srivastava, Tamir, McGonigal, John, & Gross, 2009). Suppression is certainly a necessary occasional skill for social survival. However, overuse of this strategy imposes serious costs and may even backfire in terms of implications for long-term relationship development. Broadly speaking, reappraisal is a far less costly approach to dealing with distressing circumstances.

While both are relatively healthy strategies, detached and positive reappraisal may confer different types of benefits. In the present study, detached reappraisal tended to be more effective at overall reduction of emotional responding. Detached reappraisal may be the better bet when emotions (especially complex emotions) threaten to become overwhelming, and/or when positive emotion is not really a plausible response to begin with. Also, detached reappraisal might facilitate taking concrete action to improve one’s situation, whereas positive reappraisal can sometimes inhibit such actions. Folkman and colleagues (1992) reported a positive correlation between dispositional positive reappraisal and frequency of high-risk sexual activity among gay and bisexual men. More research is needed to understand the conditions in which these two reappraisal strategies facilitate active coping rather than passive acceptance or denial of risk.

Positive reappraisal reduced overall emotional responding to a lesser degree, but tended to increase the ratio of positive to negative affect, leading to more positive overall valence. When it is feasible, positive emotion in the face of a distressing event may improve physical health and psychological well-being by mechanisms that go beyond alleviating distress per se (e.g., Folkman & Moskowitz, 2000; Lyubomirsky, King, & Diener, 2005; Pressman & Cohen, 2005; Tugade & Fredrickson, 2004). A growing number of studies find that positive emotions uniquely predict lower morbidity and risk of mortality (e.g., Danner, Snowdon, & Friesen, 2001; Moskowitz, Epel, & Acree, 2008; Ostir, Berges, Markides, & Ottenbacher, 2006). Expression of positive emotion (i.e., smiling) also predicts positive long-term psychosocial outcomes such as social embeddedness and marital stability (e.g., Harker & Keltner, 2001). A number of possible mechanisms for these effects are being investigated using longitudinal and experimental designs, including enhanced immune functioning (e.g., Cohen, Alper, Doyle, Treanor, & Turner, 2006; Solomon, Segerstrom, Grohr, Kemeny, & Fahey, 1997), oxytocin release (Uvnäs-Moberg, 1998), increased self-regulatory capacity leading to healthier lifestyle (e.g., Tice & Wallace, 2000), and enhanced social embeddedness and support (Lyubomirsky et al., 2005). Although detached reappraisal is very effective in reducing the subjective and physiological signs of distress, positive reappraisal may do so while preserving these benefits of positive emotion as well.

The moderating effects of sex in this study were unexpected, but interesting. Among men, reappraisal in general had limited effect on the experience and expression of target negative emotions, but a strong effect on physiological reactivity, and effects of detached and positive reappraisal differed most for the experience and expression of positive emotions. Among women, reappraisal in general reduced expressivity, and detached and positive reappraisal were more differentiated in terms of effects on subjective experience (with the latter preserving both positive and negative target emotions) and physiological responding. We are hesitant to over-interpret these unexpected sex differences, but one explanation is worth particular consideration. Women tend to report stronger negative emotions and express them

more intensely than men in the absence of instructed regulation, whereas men may tend toward stronger physiological responding to distress, although evidence on this latter point has been inconsistent (LaFrance & Banaji, 1992). This framing suggests that effects of reappraisal may be more dramatic for those aspects of negative emotional responding that were more intense to begin with. Conversely, the reverse may be true for positive emotions, especially amusement in response to a disgusting stimulus. Women are much more disgust-sensitive than men (Haidt, McCauley, & Rozin, 1994), and thus may have found it more difficult to disentangle disgust and amusement when faced with our “Fear Factor” clips. Although none of our effects were significantly moderated by film type, responses to the disgust films could still be responsible for the pattern of sex differences.

The present study is the first to use an experimental design to compare the effects of detached and positive reappraisal on a full range of emotional responding. Our methodology allowed us to examine emotional responding broadly (including emotional experience, physiological responding, and facial expressions of emotion) and to assess generalizability of findings across two negative emotions (disgust and sadness) that often need to be regulated in the real world. Moreover, the study used a highly diverse sample in terms of age, sex, ethnicity, and socio-economic status. The study also had several limitations. First, this was a study of “instructed” emotion regulation – participants were given specific instructions as to when and how to regulate their emotions. This experimental approach is critical for understanding what happens when these two strategies are enacted in response to explicit instructions. We see no reason to expect that these effects would be different when the strategies were enacted spontaneously, but this is a matter for further study. In addition, this experimental approach cannot tell us what kinds of strategies individuals might adopt when confronted in the real world with these kinds of emotional stimuli. The latter could be especially important in documenting differences in the strategy of choice associated with age and gender.

Our experimental design also produced a second important limitation. Because the reappraisal trials always followed the “just watch” trials in the present study, it is possible that the main effects of Instruction in reducing distress were partly due to habituation, rather than effects of reappraisal instruction per se. However, other studies using stimuli similar to ours have included conditions with multiple “just watch” trials, and their data do not suggest habituation across trials (e.g., Kupperbusch & Kunzmann, 2005). The emotionally-intense epochs of our film clips were short, and clips ended at the emotional climax of the scene without giving time for distress to resolve. Studies of exposure therapy in treating PTSD and phobias suggest that repeated exposures to stimuli of such short duration may actually sensitize responding to repeated presentations, rather than facilitating habituation (Foa & Rothbaum, 1998). More important, overall habituation effects would not account for the Instruction $\times$ Reappraisal Type interactions we observed, or the distinctive pattern of effects on positive versus negative emotional responding. Nonetheless, a strong follow-up study would need to include a condition with a second “just watch” trial to compare against the instructed reappraisal trials.

Third, the present findings address differences between detached and positive reappraisal with respect to short-term implications for emotional responding. Our approach does not allow conclusions regarding the long-term effects of using these strategies, or the effects of frequent dispositional use of these strategies. Existing studies offer some evidence that frequent use of cognitive reappraisal is associated with long-term benefits in terms of psychosocial well-being (e.g., Gross & John, 2003; Folkman, 1997; Moskowitz et al., 2009; Shiota, 2006; Tugade & Fredrickson, 2004). However, experimental and longitudinal data are needed to build upon these findings, and further research is needed to examine differences between detached and positive reappraisal with respect to long-term outcomes.

Conclusion

Despite dramatic increase in theory and research on cognitive reappraisal, few studies have compared the effects of multiple reappraisal strategies in a controlled laboratory setting, using standardized emotion stimuli and multiple measures of emotional responding. In this study, we demonstrated that detached and positive reappraisal are both effective in down-regulating distress when faced with stimuli that elicit sadness and disgust. However, detached reappraisal proved more effective at reducing overall emotional responding, whereas positive reappraisal tended to have the benefit of maintaining positive emotions, which may enhance health and well-being in ways that go beyond reducing distress. These findings add to our growing understanding of healthy emotion management, and further underscore the intimate role that cognition plays in shaping our emotional lives.

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Table 1

Frequencies of Positive and Neutral Thoughts During the Film Clips, by Film Type and Reappraisal Condition.

	Reappraise Disgust Film		Reappraise Sad Film	
	Detach	Positive	Detach	Positive
Positive Appraisals				
Positive character personality	1.5%	5.6%	0	2.8%
Character physically attractive	11.8%	15.3%	1.5%	4.2%
Character shows positive emotion	0	1.4%	1.5%	6.9% ⁺
Positive evaluation of acting	0	0	16.2%	18.1%
Film clip funny/amusing	10.3%	20.8% ⁺	4.4%	1.4%
Participant "cheering for character	2.9%	5.6%	0	0
Experience will lead to wisdom	0	0	0	4.2% [*]
Characters have good relationships	0	4.2% [*]	1.5%	19.4% [*]
Neutral Appraisals				
Describe physical setting of clip	0	1.4%	2.9%	4.2%
Question hygiene/safety of action	4.4%	4.2%	0	0
Question whether events depicted are real	14.7%	6.9%	10.3%	5.6%
Pretended something else happening	7.4%	4.2%	0	0
Describe formal features of clip	4.4% [*]	0	11.8%	6.9%
Thought "it's just a movie"	1.5%	0	5.9%	8.3%
Identify actor or director	19.1%	12.5%	22.1%	15.3%
Neutral comment on acting or casting	1.5%	0	33.8% ⁺	19.4%
Felt emotionally manipulated	0	0	2.9%	1.4%
Plot/events predictable	0	0	1.5%	8.3% ⁺
Neutral personal association	7.4%	4.2%	1.5%	0
Wondering why clip used	0	1.4%	0	0

Note. Significant and marginally significant likelihood ratios for frequencies in the detached versus positive reappraisal conditions are indicated by

^{*} $p < .05$,

⁺ $p < .10$ in the higher-frequency condition.

Table 2

Self-Reported Reappraisal Success, Self-Reported Emotional Experience, Physiological Reactivity, and Facial Expressions of Emotion in Watch versus Reappraise Trials, Detached versus Positive Reappraisal Conditions.

	Detached Reappraisal		Positive Reappraisal	
	Watch	Reappraise	Watch	Reappraise
Self-Reported Success	N/A	2.41 (.12)	N/A	2.54 (.11)
Self-Reported Experience				
Valence	2.99 (.18)	2.86 (.16)	2.67 (.18)	3.07 (.16)
Intensity	5.11 (.19)	4.09 (.21)	5.14 (.18)	4.84 (.20)
Target Negative Emotion Men	4.58 (.37)	4.41 (.36)	5.27 (.36)	4.86 (.35)
Women	5.31 (.35)	3.99 (.34)	5.44 (.34)	5.40 (.33)
Target Positive Emotion Men	4.31 (.36)	3.36 (.32)	4.39 (.35)	4.26 (.31)
Women	3.66 (.34)	2.79 (.30)	4.29 (.33)	4.01 (.30)
Physiological Reactivity, Baseline-to-Trial Change				
IBI Men	-2.58 (5.87)	+1.78 (5.00)	-6.92 (5.40)	+0.48 (4.61)
Women	-9.63 (5.40)	+3.66 (4.61)	+2.28 (5.41)	-2.04 (4.61)
MAP Men	+1.37 (0.68)	+0.75 (0.57)	+1.80 (0.62)	+1.20 (.052)
Women	+2.65 (0.62)	+1.60 (0.52)	+3.12 (.062)	+2.04 (.052)
Facial Expressions of Emotion				
Target Negative Emotion Men	.22 (.07)	.22 (.06)	.21 (.07)	.19 (.06)
Women	.44 (.07)	.23 (.06)	.35 (.06)	.31 (.06)
Smiling Men	.58 (.08)	.34 (.08)	.43 (.08)	.43 (.08)
Women	.44 (.08)	.30 (.08)	.52 (.08)	.41 (.07)

Note. Standard errors are in parentheses.

Table 3

“Coherence” Correlations among Subjective Emotional Experience, Physiological Reactivity, and Facial Expression: Just Watch Trials Only, and Change From Watch to Reappraise.

	Just Watch Only		Reappraise - Watch (Disgust Only)	
	Disgust	Sad	Detached	Positive
Self-Reported Experience: Overall Intensity with Target Emotions				
with Target Negative Emotion	.47 ** (145)	.74 ** (146)	.38 ** (70)	.18 (75)
with Target Positive Emotion	.10 (145)	.73 ** (146)	.22 ⁺ (70)	.42 ** (75)
Self-Reported Experience with Physiological Reactivity				
Target Negative Emotion with IBI	.06 (142)	-.07 (142)	-.08 (69)	.12 (73)
MAP	.02 (136)	.16 ⁺ (137)	.30 * (62)	-.03 (72)
Target Positive Emotion with IBI	-.18 * (142)	-.13 (142)	-.20 (69)	-.04 (73)
MAP	.11 (136)	.15 ⁺ (137)	.03 (62)	-.04 (72)
Target Emotion Self-Reported Experience with Facial Expression				
Negative Emotion	.19 * (127)	.14 (127)	.41 ** (59)	.14 (68)
Positive Emotion	.45 ** (127)	.06 (127)	.30 * (59)	.19 (68)
Facial Expressions with Physiological Reactivity				
Target Negative Emotion with IBI	-.08 (125)	.05 (125)	-.16 (59)	-.26 * (66)
MAP	.18 ⁺ (118)	.08 (119)	.18 (52)	.31 * (64)
Smiling with IBI	-.19 * (125)	.18 * (125)	-.22 ⁺ (59)	-.14 (66)
MAP	.27 ** (118)	-.10 (119)	.46 ** (52)	.13 (64)

** Notes. $p < .01$,

* $p < .05$,

⁺ $p < .10$; N for each test is in parentheses. Correlations in the “Just Watch Only” columns are across the entire sample, separately for the sad and disgusting film trials. Correlations for change from just watch to reappraise trials are for trials with the disgusting films only, and are presented separately for the detached and positive reappraisal conditions.