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Emotion-Regulation Choice

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Abstract

Despite centuries of speculation about how to manage negative emotions, little is actually known about which emotion-regulation strategies people choose to use when confronted with negative situations of varying intensity. On the basis of a new process conception of emotion regulation, we hypothesized that in low-intensity negative situations, people would show a relative preference to choose to regulate emotions by engagement reappraisal, which allows emotional processing. However, we expected people in high-intensity negative situations to show a relative preference to choose to regulate emotions by disengagement distraction, which blocks emotional processing at an early stage before it gathers force. In three experiments, we created emotional contexts that varied in intensity, using either emotional pictures (Experiments 1 and 2) or unpredictable electric stimulation (Experiment 3). In response to these emotional contexts, participants chose between using either reappraisal or distraction as an emotion-regulation strategy. Results in all experiments supported our hypothesis. This pattern in the choice of emotion-regulation strategies has important implications for the understanding of healthy adaptation.

Keywords

choice, emotion, emotion regulation, self-regulation, emotional control, self-control

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Overwhelmed by the assassination of his father, Shakespeare's (1623/2003) Hamlet famously pondered whether he should manage his feelings by continuing to engage the "slings and arrows of outrageous fortune" or by disengaging from his "sea of troubles" (p. 158) through sleep or death. The different emotional circumstances of even quotidian trials and tribulations require people to choose which emotion-regulation strategies to use.

Hamlet understood intuitively what researchers now know empirically: People can adjust their emotions in various ways to suit their needs in a given situation (see Gross, 2007, and Koole, 2009, for reviews). One crucial finding in the field of emotion regulation is that emotion-regulation strategies can have very different outcomes in different contexts (e.g., Cheng, 2001). Accordingly, several recent theoretical accounts have emphasized the importance of flexible choice among emotion-regulation strategies in the face of different situational demands (Gross, 2007; Kashdan & Rottenberg, 2010; Watkins, 2011).

Although choice of strategies is now widely viewed as an important factor in the regulation of emotion, it has not been directly studied. This is because prior experimental research has focused on the consequences of directly instructing participants to use specific regulation strategies and not on which regulation strategies are chosen in different emotional situations. For example, although several studies have demonstrated that a greater ability to flexibly alternate between enhancing and suppressing emotions predicts better long-term adjustment (e.g., Bonanno, Papa, Lalande, Westphal, & Coifman, 2004; Westphal, Seivert, & Bonanno, 2010), the regulation strategies employed by participants in these and other studies were determined by the researchers. Therefore, the question of which regulation strategies individuals choose in different emotional contexts remains unanswered.

To address this question, we created different levels of negative emotional intensity (a key dimension of variation across emotional contexts) and examined individuals' choice between two commonly used emotion-regulation strategies. In forming our hypothesis, we drew from our recent theoretical framework, which emphasizes that regulatory strategies can modify the cognitive processing of emotional information at two major stages (Sheppes & Gross, 2011).

According to our account, incoming emotional information can be regulated at an early processing stage via a filtering mechanism that blocks it from capturing selective attention. Such early disengagement from cognitive processing of emotional information does not permit elaborative processing, which may be important for a full evaluation of a situation and

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the preparation of an adaptive response (Bradley, Codispoti, Cuthbert, & Lang, 2001; Wilson & Gilbert, 2008). However, disengagement at an early stage can successfully modulate low- and high-intensity emotional information before it gathers force. A major early-disengagement regulation strategy is *distraction*, which involves disengaging from negative emotion by producing neutral thoughts; that is, an early filter is used to block emotional information before it is represented in working memory for further evaluative processing (see Fig. 1a).

Incoming emotional information that passes the early filter can still be regulated at a late stage via a second filtering mechanism that operates at the level of semantic meaning and determines the final output of the system. In this case, engagement with emotional processing allows elaborated cognitive processing of the emotional information, but because this emotional information gathers force prior to its late modulation, engagement with emotional processing is less effective than early disengagement at modulating high-intensity emotional information. A major late-engagement strategy is *reappraisal*, which involves engaging with negative emotion by allowing emotional information to be represented in working memory and provided with elaborated meaning before it is reinterpreted via a late filter (see Fig. 1b).

Recent behavioral, electrophysiological, and neuroimaging studies in which participants have been instructed to employ early-disengagement distraction and late-engagement reappraisal are consistent with our account. Specifically, whereas engagement reappraisal has been shown to successfully modulate low-intensity emotions and to allow emotional processing, disengagement distraction has been found to result in impaired emotional processing but to be more effective at modulating high-intensity emotional stimuli (Sheppes & Meiran, 2007, 2008). Reappraisal allows elaborative processing, which is reflected by a late modulation of the late positive potential (LPP), an electrocortical component that indicates increased processing of emotionally arousing information. In contrast, distraction involves early but stronger LPP modulation in cases of high emotional intensity (Thiruchselvam, Blechert, Sheppes, Rydstrom, & Gross, 2011). Reappraisal, which operates via a neural network associated with affective meaning, results in weaker modulation of the amygdala's response to high-intensity negative emotional stimuli than does distraction, which recruits a neural network associated with attentional control (Kanske, Heissler, Schonfelder, Bongers, & Wessa, 2011; McRae et al., 2010).

One crucial prediction that derives from our framework is that healthy individuals should demonstrate flexible regulatory choice, showing a relative preference for engagement reappraisal, which can modulate the emotional response while permitting thorough processing, in low-intensity emotional contexts and a relative preference for disengagement distraction, which blocks the emotional response before it gathers force, in high-intensity emotional contexts. In the present research, we sought to test this prediction in three experiments in which we manipulated the intensity of negative emotional contexts via emotional pictures (Experiments 1 and 2) and unpredictable electric stimulation (Experiment 3). In all three experiments, we examined participants' choices between disengagement distraction and engagement reappraisal.

Experiment 1

Our goal in Experiment 1 was to examine which emotion-regulation strategies participants chose to use in response to low-intensity and high-intensity negative pictures.

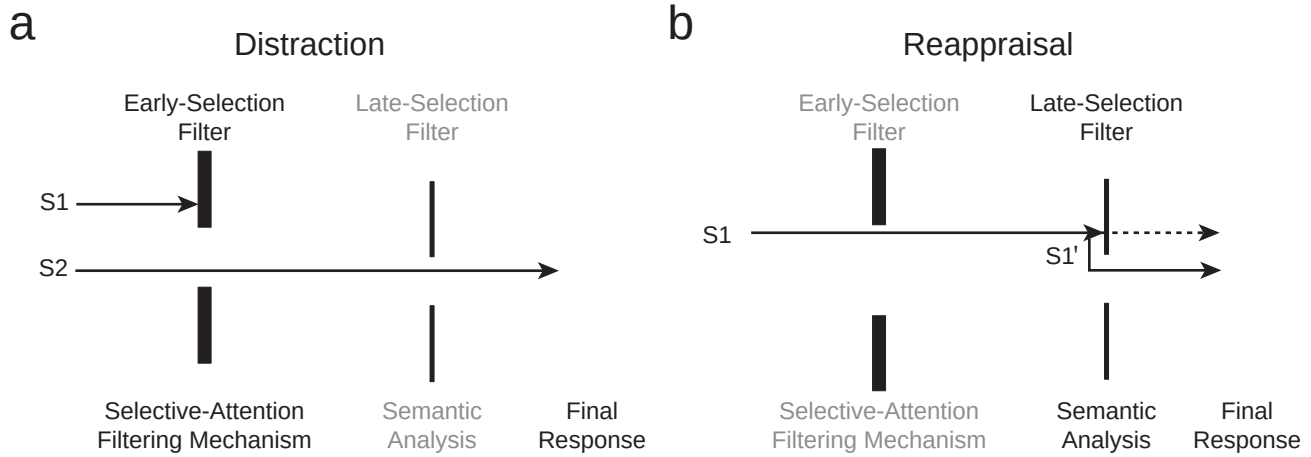

Fig. 1. Illustrations (adapted from Sheppes & Gross, 2011) of the underlying operation of distraction and reappraisal. The thickness of the lines representing the early-selection and late-selection filters reflects the ability of these filters to block emotional processing. In disengagement distraction (a), incoming emotional information (represented by the arrow for Stimulus 1, S1) is filtered out at an early selection phase. A neutral stream of information (represented by arrow S2) that corresponds to the neutral thoughts produced in distraction and that is semantically independent from the original emotional information dominates the final response. In engagement reappraisal (b), incoming emotional information (represented by arrow S1) passes the early filter, is attended, undergoes semantic analysis, and is provided with elaborative meaning prior to modulation via a neutral reinterpretation (represented by arrow S1') that is semantically dependent on the original emotional information. High-intensity emotional information (represented by the dashed arrow) passes through the late-selection filter and affects the final response.

Method

Twenty healthy students (7 men, 13 women) viewed pictures meant to elicit varying levels of negative emotion (Lang, Bradley, & Cuthbert, 2008). During a four-trial training phase, participants looked at negative pictures and were instructed either to think about something that was emotionally neutral (distraction) or to think about each picture in a way that reduced its negative meaning (reappraisal). The training phase consisted of two distraction trials and two reappraisal trials (one low-intensity trial and one high-intensity trial for each strategy[1]); the order of strategies used on these trials was counterbalanced.

Participants then completed eight practice trials. The strategies employed by participants on four of these trials were predetermined (one trial for each strategy at each intensity level); in the remaining four trials (two trials at each intensity level), participants freely chose which strategy to use. To ensure that participants understood and adhered to the regulation strategies, we instructed them to talk out loud about their chosen strategies during the training and practice trials. Participants were corrected by the experimenter as needed. This procedure revealed that all participants were able to learn and employ both strategies; no participants had to be excluded from analyses.

Stimuli in the choice phase of the experiment comprised 30 pictures from the International Affective Picture System (Lang et al., 2008). We divided these pictures into two sets with differing intensity levels on the basis of their normative ratings for arousal (1 = *low*; 9 = *high*) and valence (1 = *very unpleasant*; 9 = *highly pleasant*). The 30 pictures (see the Supplemental Material available online for a complete list of stimuli) consisted of 15 low-intensity pictures (mean arousal = 5.01; mean valence = 3.41[2]) and 15 high-intensity pictures (mean arousal = 6.12; mean valence = 1.99), Fs(1, 28) > 19.01, ps < .001. Previous studies have established that arousal and valence differences of the magnitude separating our low-intensity and high-intensity stimuli are sufficient to create different levels of emotional-response activation, as indicated by physiological arousal (Bradley et al., 2001) and electrocortical markers of negativity (Weinberg & Hajcak, 2010). On each of the 30 trials, participants previewed a picture for 500 ms and then chose between the reappraisal and distraction strategies by pressing one of two buttons; assignment of the reappraisal and distraction strategies to the response buttons was counterbalanced across participants. Participants then implemented their chosen strategy while viewing the picture for 5,000 ms. We videotaped participants to ensure that they viewed each picture the whole time.

Results and discussion

Figure 2a shows that participants chose to employ reappraisal on 76.3% of the low-intensity trials (95% confidence interval, or CI: [66.3, 86.3]), but chose to employ distraction on 70.7% of the high-intensity trials (95% CI: [60.7, 80.7]), $F(1, 19) = 47.54$, $p < .000001$, $\eta_p^2 = .71$. This bias in regulatory decision making was observed in 90% (18/20) of the participants. These findings provide clear support for our hypothesis.

Experiment 2

Our three main goals in Experiment 2 were to attempt to replicate the results of Experiment 1, to further show that participants adhered to their chosen strategies, and to seek empirical evidence for the differential processing involved in distraction and reappraisal.

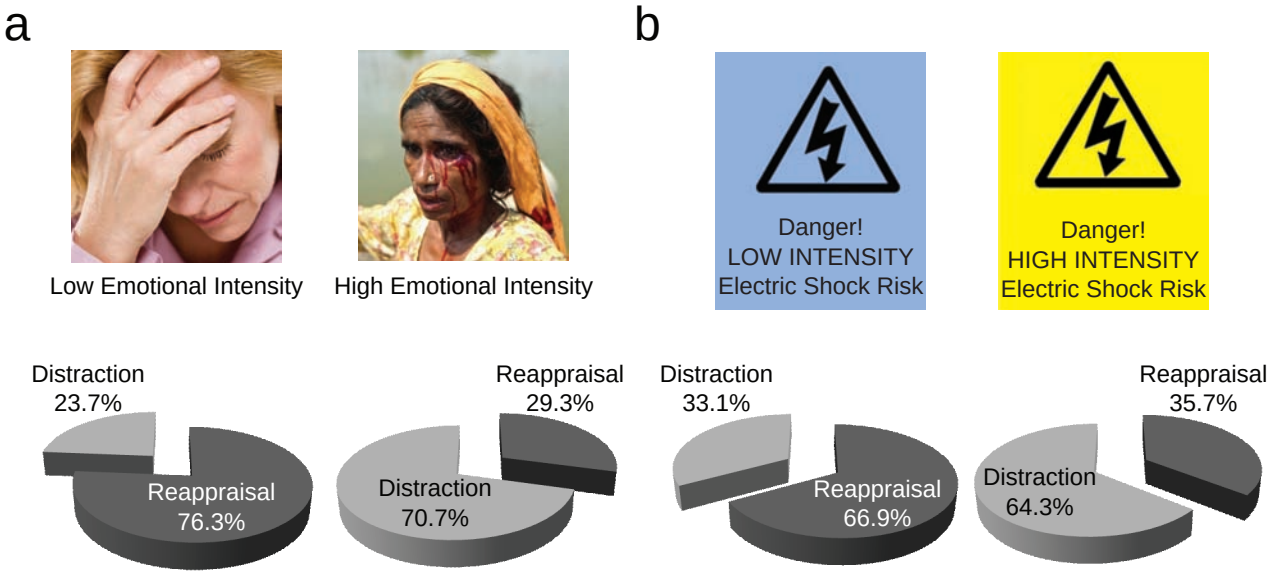

Fig. 2. Examples of stimuli (top row) and results (bottom row) from (a) Experiment 1 and (b) Experiment 3. The pie charts show the percentage of trials on which participants chose to employ distraction or reappraisal in response to low-intensity and high-intensity emotional pictures (Experiment 1) and in response to low-intensity and high-intensity electric shocks (Experiment 3). In compliance with copyright laws, the pictures in (a) are similar but not identical to the pictures presented in the experiment.

Method

Twenty healthy students (13 men, 7 women) participated in Experiment 2, which was identical to Experiment 1 except for the following changes. In order to better estimate adherence to the chosen strategies, we instructed participants to talk out loud about their chosen strategy on each trial not only during the training and practice phases, but also during the choice phase. Following the choice phase, participants were given a surprise memory test to assess their memory of the pictures presented (Kron, Schul, Cohen, & Hassin, 2010). This test allowed us to evaluate the differing emotional processing involved in distraction and reappraisal: The blocking of emotional information from being processed via disengagement distraction should result in worse memory than should the elaborated emotional processing of engagement reappraisal (Sheppes & Meiran, 2007, 2008).

On each of the 30 trials of the memory test, participants were presented with two pictures. One picture had been presented during the choice phase (e.g., a picture of a crying baby); the other picture was a Photoshop-modified version of the same picture. In half of these modified pictures, a central emotional feature had been added (e.g., the baby had extra tears); in the other half, a central emotional feature had been excluded (e.g., the baby was missing a few tears). Above the two pictures, a keyword pertaining to the difference between the pictures was presented (e.g., "tears"). Note that we performed a conservative test of the link between impaired memory for emotional content and the distraction strategy in our choice paradigm because some aspects of our procedure could have affected our results. For example, participants attended to all of the pictures while they were previewed prior to each regulatory choice in the choice phase, and highly arousing emotional features, which are associated with a preference for distraction, are better remembered than low-intensity emotional features are (Mather, 2007).

Results and discussion

Results from Experiment 2 replicated those from Experiment 1: Participants chose to employ reappraisal on 74.9% of the low-intensity trials (95% CI: [66.3, 83.6]), but chose to employ distraction on 60.0% of the high-intensity trials (95% CI: [51.3, 68.7]), $F(1, 19) = 56.30$, $p < .00001$, $\eta_p^2 = .75$. This pattern of results was observed in 90% (18/20) of participants.

To evaluate participants' adherence to their choice of strategy, a judge blind to participants' regulatory choices (as indicated by which response button they pressed) coded which strategy participants talked about during the 5,000-ms regulatory implementation period. Agreement approached a perfect score (98.4%).

An analysis of variance revealed that memory for emotional content was impaired following disengagement distraction ($M = 55.3\%$ correct, $SD = 3.4\%$), relative to engagement reappraisal ($M = 65.4\%$ correct, $SD = 2.9\%$), $F(1, 19) = 4.53$, $p < .05$, $\eta_p^2 = .19$, an indication of differential processing. Furthermore, participants' performance on the memory test was significantly greater than chance (50%) for pictures they had viewed while employing reappraisal, $t(19) = 5.12$, $p < .00001$, but not for pictures they had viewed while employing distraction, $t(19) = 1.55$, n.s.

Experiment 3

Although affective pictures are powerful inducers of negative emotions, they are nonetheless only symbolic representations of real-life events. Therefore, in Experiment 3, we tested whether participants would display the same pattern of choices demonstrated in Experiments 1 and 2 when regulating anticipatory anxiety in response to the administration of unpredictable electric shocks of varying intensity.

Method

Sixteen healthy students (6 men, 10 women) took part in this experiment. We used a customized calibration to determine low-intensity and high-intensity levels of electric stimulation, which was administered via two Ag-AgCl electrodes placed on the lower left arm. High-intensity stimulation was perceived as strong, unpleasant, and requiring effort to tolerate. Low-intensity stimulation was perceived as mild, slightly unpleasant, and requiring little effort to tolerate. The mean objective level of intensity of the low-intensity shocks was 56% of that of the high-intensity shocks. In a training phase, participants were instructed on how to employ the distraction and reappraisal strategies and were guided through four example trials, one for each strategy at each intensity level. Participants then completed six practice trials in which they received shocks; the strategies employed by participants on four trials were predetermined (one trial for each strategy at each intensity level), and the strategies employed on the other two trials (one high-intensity trial and one low-intensity trial) were freely chosen by participants.

As in Experiment 1, we ensured that participants understood and adhered to the strategies by having them talk out loud about their strategy on each trial of the training and practice phases. This procedure showed that participants were able to learn and employ both strategies, and no participant needed to be excluded from analysis. The choice phase of the experiment comprised 20 trials on which an electric shock was administered (10 trials at each level of intensity). On each trial, participants viewed a brief written description of the intensity level of the upcoming shock and then chose between the reappraisal and distraction strategies. Before each shock was administered, participants implemented their chosen strategy during an anticipatory period. The length of this period varied pseudorandomly across trials: 5, 10, 13, or 17 s ($M = 12.5$ s). Between trials, participants were given a 10-s break to minimize possible effects of their sensory pain.

Results and discussion

Figure 2b shows that participants chose to employ reappraisal on 66.9% of the low-intensity-shock trials (95% CI: [52.9, 80.9]), but chose distraction on 64.3% of the high-intensity-shock trials (95% CI: [50.3, 78.3]), $F(1, 15) = 11.29$, $p < .01$, $\eta_p^2 = .43$. This pattern of results was observed in 75% (12/16) of participants. These findings provide a conceptual replication of our results from Experiments 1 and 2 and show that our findings from the two earlier studies generalize to a real-life emotion-eliciting context.

General Discussion

Our results from three experiments involving symbolic and real-life emotion-eliciting contexts demonstrate that healthy individuals manage their emotions by flexibly switching between a relative preference for engagement reappraisal, which allows emotional processing, when the intensity of negative emotion is low and for disengagement distraction, which blocks emotional processing at an early stage, when the intensity of negative emotion is high.

Our finding that individuals choose to engage with low-intensity emotional stimuli via reappraisal is consistent with previous studies that have repeatedly shown that the reinterpretation of emotional events can be a highly effective form of emotion regulation (see Gross, 2002, for a review). By contrast, our finding that individuals choose to disengage from high-intensity emotional stimuli via distraction may be somewhat more surprising. Classical conceptual models have highlighted the importance of engagement with emotional stimuli and the adverse impact of chronic disengagement and inhibition (e.g., Pennebaker, 1997). However, a new generation of studies has begun to cast doubt on these initial findings by showing that under adverse situations, reduced emotional responding sometimes predicts better long-term functioning (Bonanno & Keltner, 1997).

Our results and theorizing provide an important extension of prior models of emotion regulation. According to the process model of emotion regulation (Gross, 2002), emotion-regulation strategies differ in the timing of their primary impact during the emotion-generative process. The biasing of the deployment of attention in distraction occurs earlier than does the modulation of stimulus meaning in reappraisal. Nevertheless, this model emphasizes commonalities between distraction and reappraisal by categorizing both strategies as antecedent focused; in other words, they both operate before emotional-response tendencies are fully activated. Our new framework highlights distinctions between types of processing within the antecedent-focused regulation category and suggests that engagement reappraisal may be optimal in low-intensity emotional situations but costly, relative to disengagement distraction, in high-intensity emotional situations (Sheppes & Gross, 2011).

Our findings dovetail nicely with accounts of diverse forms of psychopathology in which emotional equilibrium breaks down under conditions of diminished flexibility in emotion regulation (Kashdan & Rottenberg, 2010). For example, depression is thought to involve an inflexible and maladaptive ruminative engagement with highly negative emotional information, and anxiety is thought to involve an inflexible and maladaptive avoidant disengagement from low-intensity negative information.

Our research leaves many questions to be answered by future studies. First, although emotional intensity appears to be a key determinant of emotion-regulation choice, other factors in the choice of emotion-regulation strategies, such as individuals' goals and the availability of cognitive resources, should be evaluated. Second, because we directly assessed choices between two commonly used regulation strategies, our results illuminate many contexts in which people are motivated to regulate negative emotions and thus need to choose between salient regulatory options. Future research will be needed to assess the absolute preference associated with each regulation strategy. Finally, although the regulatory-choice preferences we observed were quite consistent, future studies should evaluate individual differences in regulatory choices and their relationship to long-term adaptation.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Supplemental Material

Additional supporting information may be found at http://pss.sagepub.com/content/by/supplemental-data

Notes

1. In an effort to minimize the influence of this knowledge on their regulatory choice behavior, we did not explicitly tell participants that the emotional pictures varied in intensity.
2. In the International Affective Picture System, lower scores on the valence scale represent higher levels of negative emotion.

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