The Generality of Effects of Emotional Experience on Emotion-Regulation Choice

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Links:

Preregistration for Experiment1:
https://osf.io/jrgy5/?view_only=f3e35a7a421f446f9e20ce3a21b8ba09
Data and materials Experiment 1:
https://osf.io/x39tv/?view_only=cdaf040903d74be7943d0ae6d7e5f5c9

Preregistration for Experiment 2:
https://osf.io/9uncq/?view_only=6ad5a1d7d3b540d084f1fb5d99599adc
Data and materials Experiment 2:
https://osf.io/5y2sn/?view_only=bae80b3e30fd4e44a1e933cf0697c773

Abstract

To understand how emotional experiences affect general strategic preferences, we assessed participants' preferred strategies of regulating emotional responses to previewed and not-yet-encountered stimuli. For previewed stimuli, participants selected distraction more often than reappraisal for high-(vs. low-) intensity negative-valence visual images (replicating Sheppes et al., 2011), and the same intensity/choice pattern emerged for previewed auditory sounds. Most notably, participants' recent emotional experiences also influenced their choices for regulating emotional responses to not-yet-encountered stimuli. Exposure to high- (vs. low-) intensity negative-valence visual images increased selection of distraction (vs. reappraisal) for regulating responses to upcoming (not-yet-encountered) visual images (Experiment 1), and the same intensity/choice pattern emerged whereby stimuli encountered in one modality (visual) impacted choices for regulating responses to stimuli of a different modality (auditory; Experiment 2). These results suggest that emotional experiences directly impact people's strategic inclinations.

Keywords: emotion regulation; choice; engagement; disengagement; emotion

The Generality of Effects of Emotional Experience on Emotion-Regulation Choice

When emotions ill suit a situation, people attempt to regulate them. Strategies of emotion regulation include distraction, which involves focusing on unrelated thoughts, and reappraisal, which involves thinking about an emotional cue to change its meaning (Gross, 2002). Given the availability of different emotion-regulation strategies, understanding how people decide among them has emerged as an important topic of study (Sheppes & Levin, 2013). Of central concern to this paper are processes by which the emotional experience a person seeks to regulate itself may influence the strategy-selection process. Research on emotions and reasoning has documented numerous affective influences on decision making, including effects of incidental affect, suggesting that affective experiences shape reasoning (Blanchette & Richards, 2010; Storbeck & Clore, 2008). From this standpoint, a person's emotional state, independent of its cause, could influence his or her selection of a strategy of emotion regulation. To address this possibility, we investigated whether emotional experiences shape preferences for emotion-regulation strategies for stimuli not yet encountered. Our predictions build on recent advances in research on emotion-regulation choice, as reviewed next.

How people select strategies of emotion regulation has been illuminated powerfully by Sheppes and colleagues' (2011) experimental paradigm. In their paradigm, participants view a brief presentation of an image, after which they choose between distraction and reappraisal to regulate their emotional responses to that stimulus (Sheppes, Scheibe, Suri, & Gross, 2011). The same stimulus next reappears for a longer duration, during which participants implement their chosen emotion-regulation strategy. A key finding from work using this paradigm is that participants most often select distraction for regulating their responses to highly intense stimuli, whereas they most often select reappraisal for stimuli lower in intensity (Sheppes et al., 2011).

For example, people generally prefer distraction (rather than reappraisal) for pictorial stimuli that are extremely negative in valence and high in arousal than for pictorial stimuli that are moderately negative in valence and moderate in arousal (Sheppes et al., 2011). Further substantiating the relation between stimulus intensity and emotion-regulation choice, amplitude of the late-positive potential (an event-related potential that is enhanced for emotionally intense compared to neutral stimuli; Schupp et al., 2000) when previewing a negatively valenced image predicts an increased tendency to choose distraction over reappraisal for regulating emotional responses to the image (Shafir et al., 2016).

To explain the influence of stimulus intensity on emotion-regulation choice, Sheppes and Levin (2013) have emphasized people's sensitivities to costs and benefits associated with implementing different regulatory strategies (cf. Anderson, 2003; Fessler, 2001; Freitas & Salovey, 2000). Following this view, emotional, cognitive and motivational factors influence regulatory choices as a function of anticipated consequences of using different strategies under different conditions, culminating in a decision to pursue an immediate interruption of emotional experience by using distraction (an early-attentional strategy) or a longer-term adaptation using reappraisal (a late-semantic processing strategy). When encountering highly intense emotional stimuli, early disengagement/distraction is particularly attractive because it draws attention away from information before it becomes maximally aversive. However, reappraisal, more so than distraction, impacts longer-term adaptation, as when a person re-encounters a stimulus for which he or she had developed an alternative interpretation (Thiruchselvam et al., 2011; Shafir, et al., 2016). Accordingly, with lower-intensity (relative to higher-intensity) emotional stimuli, the benefits of reappraisal appear to outweigh it costs. For these reasons, preferences for distraction (rather than reappraisal) for regulating responses to high- (relative to low-) intensity emotional

stimuli can be seen to reflect sensitivities to costs and benefits of using the different strategies under different conditions.

Further indicating that cost-benefit sensitivities influence emotion-regulation choice, small cash payments influence which strategy participants select (Sheppes et al., 2014; Study 1). Addressing the presumably greater cognitive effort needed to carry out reappraisal relative to distraction, moreover, several studies have found that reducing the processing costs of reappraisal increases the likelihood that participants select reappraisal rather than distraction. Providing participants with experimenter-generated reappraisals, for example, increases the likelihood that participants select reappraisal (rather than distraction) for both high-intensity and low-intensity emotional images (Sheppes et al., 2014; Study 2). In a related vein, reappraisal affordances, operationalized as stimuli's (low) degree of difficulty in being reinterpretable via an alternate meaning, also have been found to influence emotion-regulation choice (Suri et al., 2018). In one key study of reappraisal affordances, participants read vignettes with high- and low-intensity emotional content and high and low reappraisal affordances. After reading the vignettes, participants chose an emotion-regulation strategy (distraction or reappraisal) and then rated the reappraisal difficulty and intensity of the vignette. Reappraisal affordances were found to relate to emotion-regulation choice, such that emotional stimuli with higher reappraisal difficulty led to fewer choices of reappraisal (Suri et al., 2018). Whether through cash inducements, experimenter training, or stimulus affordances, then, altering the processing costs and direct and indirect benefits of choosing different emotion-regulation strategies clearly impacts emotion-regulation choice.

In contrast with well-documented effects of cost/benefit sensitivities on emotion-regulation choice, relatively little research has examined whether emotional experiences

themselves impact people's more general preferences for different strategies of emotion regulation. Yet the possibility that exposure to an emotional cue can affect general preference for different courses of action is grounded in previous work spanning several theoretical and methodological traditions. In one classic study, participants preferred avoiding environments to the extent that they were depicted via pictorial stimuli extremely negative in valence and high in arousal (Russell & Mehrabian, 1978). In a related vein, research on the automaticity of evaluation suggests a significant effect of stimulus valence on the rudimentary defensive behavior of using pushing-away movements (Phaf, Mohr, Rotteveel, & Wicherts, 2014). Indicating incidental effects of emotional cues on subsequent actions, moreover, psychophysiological work has found that exposure to pictorial stimuli extremely negative in valence and high in arousal potentiates the startle response to unrelated stimuli (Bradley et al., 2001). A commonality across these findings, then, is that exposure to intensely negatively valenced stimuli promotes preferences for strategically defensive behavior, such as withdrawal, avoidance, and vigilance.

More generally, Frijda (1987) has conceptualized emotional experience as comprised partly of action tendencies. Supporting that theory, people's listings of action readiness in emotional contexts (e.g., "I wanted to stay close"; "I wanted to protect myself from someone or something") allow accurate predictions of the eliciting emotions (Frijda, Kuipers, & ter Schure, 1989). Further studies have confirmed and extended these findings. Research on intergroup processes, for example, has found that behavioral proclivities (e.g., toward confrontation and avoidance) relate strongly to emotional responses to outgroup members (for review, see Mackie & Smith, 2015). In research on affective dimensionality, moreover, Fontaine, Scherer, Roesch, and Ellsworth (2007) assessed respondents' ratings, across three different languages, of

emotional terms on several emotional components, including appraisals, facial expressions, and action tendencies. Factor analyses indicated strong positive loadings on a dimension interpreted as unpleasantness for several action tendencies connoting withdrawal, avoidance, and vigilance (i.e., “Wanted to undo what was happening,” “Wanted to prevent or stop sensory contact,” “Wanted to keep or push things away,” and “Wanted to run away in whatever direction”). From the standpoint of research on action tendencies, then, impetuses toward withdrawal, avoidance, and vigilance are inherent to emotional responses to intensely unpleasant cues.

Considering research on incidental affective influences on defensive behavior (e.g., Bradley et al., 2001) and on action tendencies associated with aversive emotional features (e.g., Fontaine et al., 2007), exposure to emotional cues may affect preferred strategies of emotion regulation when anticipated costs and benefits of pursuing the different strategies are unclear. More specifically, as distinct means of emotion regulation, distraction and reappraisal entail different degrees of engagement with emotion-eliciting cues. As noted by Sheppes and Levin (2013), distraction allows some disengagement from the cue through attention re-allocation, whereas reappraisal requires additional engagement with the cue as one generates alternative meanings for it. Accordingly, to the extent that emotional responses are comprised of action tendencies, exposure to an intensely unpleasant emotional cue may support preferences toward disengagement (via distraction rather reappraisal) from potentially emotion-arousing cues. A strong test of this hypothesis entails exposing participants to aversive emotional cues of different intensities and assessing participants’ preferences for regulating their responses to (novel) stimuli that have not yet been encountered. In such a context, it would not be possible to base one’s emotion-regulation decision on cost-benefit sensitivities, given that one would not yet have knowledge of the upcoming specific stimulus or its associated costs and benefits.

In all previous emotion-regulation-choice studies of which we are aware, participants have been informed of the exact image or shock intensity (Sheppes et al., 2011) of a stimulus before deciding how to regulate their emotional responses to it. In contrast, our experiments tested whether recent emotional experiences would influence emotion-regulation choices for newly encountered stimuli. Consistent with most previous research on emotion-regulation choice, we presented participants with aversive stimuli of varying intensities. As in previous work (e.g., Sheppes et al., 2011), high-intensity aversive stimuli were selected to be lower in valence and higher in arousal than lower-intensity aversive stimuli. The above-reviewed work on incidental affective influences on defensive behavior (e.g., Bradley et al., 2001) and on action tendencies associated with aversive emotional features (e.g., Fontaine et al., 2007) supports the prediction that high-intensity (relative to low-intensity) aversive stimuli will increase preferences toward withdrawal, avoidance, and vigilance. Accordingly, we tested the prediction that high-intensity aversive stimuli would then impact participants' preferences for distraction (rather than reappraisal) as a means of regulating their responses to newly encountered stimuli.

Experiment 1 tested whether exposure to a visual image would impact one's decision about how to regulate one's emotional response to a subsequently viewed image. Experiment 2 examined a potential cross-modality effect; it tested whether exposure to a visual image would impact one's decision about how to regulate one's emotional response to a subsequent auditory stimulus. In both experiments, we predicted that exposure to high-intensity (relative to low-intensity) aversive stimuli would facilitate selecting distraction rather than reappraisal for regulating emotional responses to stimuli not yet encountered. Prior to data collection, we pre-registered these hypotheses, along with our methods and data-analysis plans (for Experiment 1,

see https://osf.io/jrgy5/?view_only=f3e35a7a421f446f9e20ce3a21b8ba09; for Experiment 2, see https://osf.io/9uncq/?view_only=6ad5a1d7d3b540d084f1fb5d99599adc).

Experiment 1

We hypothesized that high- (relative to low-) intensity negative emotional experiences would increase choosing distraction (rather than reappraisal) on the upcoming trial, before participants learned of the specific visual stimulus they next would encounter. Support for his hypothesis would indicate that exposure to emotional cues can cause general shifts in strategic preferences of emotion regulation.

Methods

Participants

Forty-eight undergraduates from Stony Brook University participated in exchange for course credit. We settled on this sample size through a statistical power analysis, which indicated that a minimum of 40 participants was required to realize statistical power of .95, with $\alpha = .05$ and effect size *f* of 0.50, for this within-subjects design. In our power analysis, we estimated effect size based partly on the findings of Sheppes and colleagues (2011). However, we anticipated a somewhat smaller effect size for uninformed choices than for informed choices (as in previous research), which is why we lowered the effect size estimate for the present study relative to earlier studies. Although our target sample size for Experiment 1 was 40, we posted more than 40 timeslots (given that timeslots don't all always fill up), and we stopped running the study when all the participants that had signed up had participated. This study was approved by the Stony Brook Institutional Review Board. All participants gave written informed consent.

Procedure

Participants were told that the study examined physiological responses to emotional images. This cover story was used to minimize any tendencies of participants to ponder the goals of the study pertaining to uninformed emotion-regulation choice or to attempt to guess any experimenter hypotheses (cf. Orne, 1962). Aligned with this stated aim, two electrodes were taped to the participant's skin and appeared to be connected to signal amplifiers; moreover, atop the computer monitor was a camera said to measure the participant's pupil dilation (the electrodes and camera in fact recorded no data). After providing informed consent, participants were seated in a room with a desktop computer for a four-trial training phase and a practice session. In the training phase, participants viewed negative pictures from the international affective picture system database (IAPS; Lang, Bradley, & Cuthbert, 2008) and were instructed to either think about something emotionally neutral (distraction) or to think about the picture in a way that reduced its negative meaning (reappraisal; adapted from Sheppes, Scheibe, Suri, Radu, Blechert, & Gross, 2014). Practice consisted of six trials in which emotion-regulation strategies were predetermined and two in which they were chosen by the participant. Throughout the training and practice phases, participants verbalized aloud the strategies they used and were corrected by the experimenter when needed. The remainder of the experiment, in which participants performed the modified emotion-regulation task (described in detail below), took place in a sound-attenuated chamber. Order of strategy training and response-mapping of button presses were counterbalanced across participants.

Modified Emotion Regulation Task

Participants learned about three trial types: Preview, Watch, and Choice. During Preview trials, participants made informed emotion-regulation decisions by choosing a strategy to implement for the specific image they had just previewed. A Preview trial began with a cue

("preview"; 2000 msec) followed by an image (500 msec). Participants then saw two options of strategies (rethink and distract), which they chose between via a button press. They then were reminded of the strategy they had chosen (2000 msec) before viewing the same image and implementing their strategy (5000 msec). On Watch trials, participants were instructed to "allow [their] natural thoughts and feelings to arise while looking at the picture" and to "simply view the pictures and think about the emotional message they portray" without using any strategies. A Watch trial began with a cue ("watch"; 2000 msec) followed by a high-intensity negative image or low-intensity negative image (5000 msec). On Choice trials, participants chose which strategy, distract or reappraise, to use for a new, unknown picture they would see next. Upon making the decision to distract or reappraise, a reminder cue of the choice made was shown (2000 msec), followed by a high- or low-intensity image (randomized), and the participant implemented his/her chosen strategy (5000 msec). After implementing the strategy on Preview and Choice trials, participants rated how negative they felt on a scale from 1 (not at all negative) to 9 (very much negative).[1] Watch trials always directly preceded Choice trials, with different images shown on each trial and with image arousal varying randomly across trials. There were 20 (10 high-intensity, 10 low-intensity) Preview trials and 30 (15 high-intensity, 15 low-intensity) Watch trials. Order of Watch→Choice and Preview trials were randomized within a single block (see Figure 1 for illustrations of trial types). Of the total trials, on average 26.25% of the trials were low-intensity Watch trials followed by low-intensity Choice trials, 23.75% were low-intensity Watch trials followed by high-intensity Choice trials, 26.67% were high-intensity

[1] We collected these ratings of participants' negative feelings to maintain consistent procedures with previous work. Because our pre-registered predictions pertained only to participants' choices of strategies, we do not report below any inferential analyses of participants' ratings of negative feelings. For descriptive purposes, we provide in Supplementary Table 1 the means and standard deviations of participants' ratings of negative feelings in Experiments 1 and 2.

Watch trials followed by low Choice trials, and 23.33% were high-intensity Watch trials followed by high Choice trials. There were 50 high- and 50 low-intensity images, selected for presentation randomly without replacement. Each image was presented only once for each participant. For further information about the images, see https://osf.io/x39tv/?view_only=cdaf040903d74be7943d0ae6d7e5f5c9.

Results

On Watch→Choice trials (when making an emotion-regulation choice without knowing what the next image would be), there was a higher ratio of distraction relative to reappraisal choices following high-intensity images (M= .5569, SE= .0348) than following low-intensity images (M= .393, SE= .0341), t (47) = 4.652, p < .0001, d= .6674, 95% CI [.0930, .2348]. Replicating Sheppes and colleagues (2011), on Preview trials (when making choices for regulating responses to specific images), there was a higher ratio of distraction relative to reappraisal choices for high-intensity images (M= .675, SE= .0282) than for low-intensity images (M= .244, SE= .0306), t (47) = 11.82, p < .0001, d= 1.1618, 95% CI [.3579, .5046]. See Figure 3 for graphical depiction of choice data.

Discussion

These findings make several contributions to understanding the determinants of emotion-regulation choice. Replicating Sheppes and colleagues (2011), we found a robust effect of image intensity on choices for previewed images. As in previous work, when making informed decisions about regulating their emotional responses to previewed images, participants most often selected distraction for high-intensity images but reappraisal for low-intensity images. Most relevant to our novel claims, we found emotionally intense stimuli to impact participants' choices for regulating their emotional responses for upcoming, unknown stimuli. Participants

were more likely to choose to implement distraction (rather than reappraisal) on the next trial when the previous image they had seen was high-intensity (rather than low-intensity), even without knowing whether they would be implementing their choice on a high- or low-intensity image.

Experiment 2

Everyday life presents a vast array of emotional stimuli via different sensory channels (i.e. auditory, visual etc.). More specifically, whereas we regulate our emotions to negatively valenced visual stimuli (i.e. negative images, Experiment 1) we also regulate our emotional responses to noises (e.g., Panksepp & Bernatzky, 2002), romantic rejection (e.g., Fisher, Brown, Aron, Strong, & Mashek, 2010), negative feedback (e.g., Audia & Locke, 2003), and temptations (e.g., sexual or dietary; e.g., Mischel & Mischel, 1987). If, as we have hypothesized, the findings of Experiment 1 reflect a general effect of emotional cues on strategic preferences, then similar findings should emerge irrespective of whether current and anticipated emotional cues are drawn from the same modality. Accordingly, Experiment 2 included not only visual stimuli but also auditory stimuli.

Because emotion-regulation choice research has not to our knowledge examined people's choices of reappraisal vs distraction for regulating their emotional responses to acoustic stimuli, we tested whether the intensity of aversive stimuli would affect choice of reappraisal versus distraction for previewed sounds. Most relevant to our aims, we also tested whether the emotional intensity of an experience in one modality (viewing images) would affect preference of regulatory strategy in another modality (listening to sounds). Participants sometimes were informed of the precise sound they would hear during emotion regulation (conceptually replicating Sheppes et al.'s, 2011 design). Other times, participants were exposed briefly to an

emotional image and then decided how to regulate their emotional responses to an upcoming (not-yet-heard) sound. Finding that participants select distraction (rather than reappraisal) more often for high-intensity (than for low-intensity) aversive sounds would conceptually replicate Sheppes' and colleagues' findings on emotion-regulation choice for previewed stimuli in other modalities (such as images and shocks). Most importantly, we also expected to find cross-modality effects of stimulus intensity on choice, such that viewing high-intensity negative images would facilitate choosing distraction on the subsequent sound, before participants were aware of which particular sound would be presented.

Methods

Participants

Sixty-three undergraduates from Stony Brook University participated in exchange for course credit. We settled on this sample size through a statistical power analysis, which indicated that a minimum of 55 participants was required to realize statistical power of .95, with $\alpha = .05$ and effect size *f* of 0.45, for this within-subjects design. We based our effect size estimation partly on the effect size found for Experiment 1. However, given the present investigation of a cross-modality effect (relative to a within-modality effect in Experiment 1), we anticipated a somewhat smaller effect size in Experiment 2 than in Experiment 1. We posted more than 55 timeslots (given that timeslots don't all always fill up), and we stopped running the study when all the participants that had signed up had participated. This study was approved by the Stony Brook Institutional Review Board. All participants gave written informed consent.

Procedure

As in Experiment 1, participants were told the same cover story that the study examined physiological responses to emotional stimuli. Aligned with this stated aim, two electrodes were taped to the participant's skin and appeared to be connected to signal amplifiers, and a camera purportedly measuring the participant's pupil dilation was placed atop the computer monitor (the electrodes and camera in fact record no data). After providing informed consent, participants were seated in a room with a desktop computer for a four-trial training phase and a six-trial practice session. In the training phase, participants listened to negative sounds (from the International Affective Digital Sounds database, IADS; Bradley, & Lang, 2007). They were instructed either to think about something emotionally neutral (distraction) or to think about the sound in a way that reduces its negative meaning (reappraisal; adapted from Sheppes et al., 2014). Practice consisted of six trials in which emotion-regulation strategies were predetermined and two in which they were chosen by the participant. Throughout the training and practice phases, participants verbalized aloud the strategies they used and were corrected by the experimenter when needed. Order of strategy training and response-mapping of button presses were counterbalanced across participants. The remainder of the experiment, in which participants performed the modified emotion-regulation task (described in detail below), took place in a darkened, sound-attenuating chamber, in which participants sat in a large cushioned chair approximately 90 cm from the CRT monitor (running at 75 MHz refresh rate, with 1200 x 800 pixel resolution) on which experimental stimuli were presented. During the actual paradigm they also experienced negative pictures (from the IAPS database; Lang, Bradley, & Cuthbert, 2008). Holding a keyboard in their laps, participants responded using the left and right shift button.

Modified Emotion Regulation Task

Participants learned about three trial types: Preview, Watch, and Choice. During Preview trials, participants were informed of emotion-regulation decisions by choosing a strategy to implement for the specific sounds they had just previewed. A Preview trial began with a cue ("preview"; 2000 msec) followed by a sound (600 msec). Participants then saw two options of strategies (rethink and distract), which they chose between via a button press. They were then reminded of the strategy they had just chosen (2000 msec) before listening to the same sound and implementing their strategy (6000 msec). On Watch trials, participants were instructed to "allow [their] natural thoughts and feelings to arise while viewing the picture" and to "simply view to the pictures and think about the emotional message they portray" without using any strategies. A Watch trial began with a cue ("watch"; 2000 msec) followed by a high-intensity negative image or low-intensity negative image (5000 msec). On Choice trials, participants choose which strategy, distract or reappraise, to use for a new, unknown sound they would hear next. Upon making the decision to distract or reappraise, a reminder cue of the choice made was shown (2000 msec), followed by a high- or low-intensity sound (randomized), and the participant then implemented his/her chosen strategy (5000 msec). After implementing the strategy on a Preview or Choice trials, participants rated how negative they felt on a scale from 1 (not at all negative) to 9 (very negative).

To investigate informed regulatory preferences for high and low-intensity negative sounds, sound files were trimmed to the first 600 msec of the full-length sound file. The stimuli were piloted to assess which trimmed stimuli adequately represented the high and low-intensity negative complete sound files. In a pilot study, 71 participants listened to and rated the trimmed sound files on valence and arousal dimensions using the self- assessment manikins (SAM; Lang,

1980). Based on results of the pilot study, the 20 stimuli for which the trimmed and full files were judged most similarly were chosen for Experiment 2.

Preview and Choice trials always used sounds, whereas Watch trials always used images. Watch trials always directly proceeded Choice trials, with different images shown on each trial and with image arousal varying randomly across trials. There were 40 (20 high-intensity, 20 low-intensity) Watch trials that directly preceded Choice trials and 20 (10 high-intensity, 10 low-intensity) Preview trials. Order of Watch→Choice and Preview trials was fully randomized within a single block (see Figure 2 for illustrations of trial types). For Watch→ Choice trials, there were 25 high- and 25 low-intensity images and 25 high- and 25 low-intensity sounds. Of the total trials, on average 24.00% of the trials were low-intensity Watch trials followed by low-intensity Choice trials, 25.66% were low-intensity Watch trials followed by high-intensity Choice trials, 24.97% were high-intensity Watch trials followed by low-intensity Choice trials, and 25.38% were high-intensity Watch trials followed by high-intensity Choice trials. Images and sounds were selected for presentation randomly without replacement. Each image and sound was presented only once for each participant. For further information about the stimuli, see https://osf.io/5y2sn/?view_only=bae80b3e30fd4e44a1e933cf0697c773.

Results

On Watch→Choice trials (when making an emotion-regulation choice without knowing what the next sound would be), there was a higher ratio of distraction relative to reappraisal choices following high-intensity images (M= .5764, SE= .0322) than following low-intensity images (M= .4874, SE= .0348), t (62) = 2.979, p < .004, d= .3627, 95% CI [.0293, .1488]. On Preview trials (when making choices for regulating responses to specific sounds), there was a higher ratio of distraction relative to reappraisal choices for high-intensity sounds (M= .599, SE=

.0317) than for low-intensity sounds (M= .4076, SE= .0302), t (62) = 4.208, p < .0001, d= .7189, 95% CI [.1005, .2822]. See Figure 3 for graphical depiction of choice data.

Discussion

Previous studies of emotion-regulation choice have focused predominantly on visual stimuli (e.g., Sheppes et al., 2011, Sheppes et al., 2014). One study examined shocks, although in that study participants were informed verbally (through a written description) of whether to expect high or low-intensity shocks (Sheppes et al., 2011). Our study did not include any verbal descriptions of stimulus intensity, relying instead on participants' own experiences of the cues, and it is the first of which we are aware to examine the intensity-choice prediction in the auditory domain. We found the same intensity-choice pattern that has been found previously for images and shocks (increased choice of distraction for high-intensity sounds and increased choice of reappraisal for low-intensity sounds). This finding strongly supports the claim that people prefer distraction for regulating responses to highly intense negative experiences but reappraisal for regulating responses to less-intense negative experiences (Sheppes et al., 2011). Turning to our cross-modality effects, viewing high-intensity (relative to low-intensity) negative-valence images facilitated selecting distraction rather than reappraisal to regulate emotional responses to upcoming sounds. Considering costs and benefits of emotion regulation is not possible for not-yet-encountered stimuli. Accordingly, this effect of perceiving visual cues on selecting strategies for regulating responses to sounds suggests a general effect of emotional experience on strategic preferences of emotion regulation.

General Discussion

In two experiments, exposure to emotional cues impacted participants' choices for regulating their responses to upcoming, not-yet-seen emotional stimuli. We interpret these findings to reflect general impacts of emotional experience on strategic preferences of disengagement (via distraction) relative to engagement (via reappraisal). Using a cross-modality design, Experiment 2 helped address potential alternative explanations involving procedural learning or episodic-retrieval based processes, by which people might base their planned strategy for a future trial on specific aspects of their experiences on a current trial, such as where in a visual image to allocate attention. Demonstrating effects of exposure to visual stimuli on choices for regulating responses to auditory stimuli, Experiment 2's findings do not appear attributable to procedural or episodic-retrieval processes, for two reasons. First, participants were not instructed to practice or apply emotion-regulation strategies to visual stimuli during any part of Experiment 2, which greatly limits the possibility that participants decided how to respond to upcoming auditory cues based on how they had responded to visual cues. Second, if any participants spontaneously chose to regulate their responses to the visual cues (despite instructions to simply experience the visual cues), any specific responses, such as those pertaining to where in the visual field to allocate attention, would not likely be pertinent to processing auditory cues.

Extensive evidence from a variety of domains indicates that emotional experiences influence decision making through multiple mechanisms that include deliberative reasoning but also associative processes (for review, see Lerner et al., 2015). In previous studies of emotion-regulation choice, however, there has not yet been evidence that one's emotional experience can directly impact one's strategic preference for engagement vs. disengagement. In one study, participants chose distraction more often than reappraisal for regulating their responses to erotic visual images (Sheppes et al., 2014). That finding may be interpreted as counter to the prediction

of a direct impact of emotional experience on emotion-regulation choice, given that erotica can be considered a high-intensity positive stimulus, and yet it did not appear to facilitate engagement (via reappraisal) rather than disengagement (via distraction). However, it is important to note that this experiment presented sexualized images in the high-intensity condition only. Viewing sexually arousing images correlates with psychophysiological responses distinct from more general effects of valence and arousal (Briggs & Martin, 2008, 2009) and can have unique emotional effects, such as dampening disgust responses to sex-related laboratory behaviors (Borg & de Jong, 2012). Moreover, physiological and subjective responses to erotica are moderated by self-consciousness and guilt (Morokoff, 1985) and by the co-presence of others (Lopez & George, 1995). Given these complexities, this single earlier study has left somewhat unresolved whether emotional experiences can directly impact strategic preferences for emotion regulation. Findings from the presently reported studies have addressed this gap by testing how exposure to an emotional cue impacts emotion-regulation choice for unrelated emotional cues. As noted above, this approach has yielded the first evidence that exposure to high-intensity negatively valenced stimuli facilitates selecting distraction rather than reappraisal for yet-to-be-encountered stimuli. Future work remains needed, however, to further examine emotion regulation in response to high-intensity positive stimuli apart from erotica. Brief exposure to salient food cues when hungry (cf. Ditto, Pizarro, Epstein, Jacobson, & Macdonald, 2006), for example, may provide a promising context for examining potential effects of emotion-regulation choice decisions for unrelated stimuli.

Our findings also may help contribute to growing efforts to identify contextual influences on emotion-regulation choice. In a recent study, Murphy and Young (2017) used Sheppes and colleagues (e.g., 2011) emotion-regulation-choice paradigm and statistically analyzed sequential

effects across trials. They found that the intensity of negative-valence images predicted subsequent choice, such that higher intensity was associated with lower odds of choosing distraction on the next trial. The authors accounted for this finding via a perceptual contrast model that proposes that the intensity of a previous image provides a reference point against which the intensity of the next stimulus was judged; accordingly, the higher the intensity of the previous stimulus, the lower the present stimulus's intensity would be evaluated to be, thereby impacting emotion-regulation choice. A critical difference between that study and the presently reported ones is that participants in our studies made their critical emotion-regulation-choice decisions before any exposure to the upcoming cues, which rules out the possibility of a perceptual contrast process transpiring in the present work. Future work may attempt to integrate the presently pursued action-tendency perspective with a perceptual contrast perspective. Emotion regulation enacted in response to an initial stimulus could be expected to influence the overall intensity of one's affective response to it, thereby affecting the degree of perceptual contrast upon encountering the subsequent stimulus. Moreover, there is evidence that emotion-elicited action tendencies decrease in potency once they are acted upon (Maitner, Mackie, & Smith, 2006). Accordingly, varying whether participants regulate responses to consecutively presented stimuli or instead passively view an initial stimulus and then regulate their emotional response to the subsequent image may help further elucidate the roles of perceptual contrast and action tendencies in sequential examinations of emotion-regulation choice.

Our findings also have important limitations. One limitation of this work is that it did not assess psychological processes underlying emotion-regulation choice, given that physiological and neural responses were not measured. In addition, as in other emotion-regulation-choice

studies, participants were forced to choose between only two emotion-regulation strategies in a forced-choice paradigm; in contrast, people in naturalistic environments often have a diverse repertoire of coping strategies (Aldao & NolenHoeksema, 2012). Future research should continue to develop methods to assess how people choose strategies among a larger array of strategies that exist in their coping repertoire. In addition, the timing of the trial parts across the two conditions were not parallel given that images during the Watch trial portion were displayed for a longer duration than previewed images in the Preview trial portion to ensure that the image indeed evoked an emotional response. Future work can investigate the effects of the timing of the emotional experience on subsequent choice in order to better understand whether it's the same mechanism underlying the effect of emotion regulation choice even in Preview trials given the similar choice pattern.

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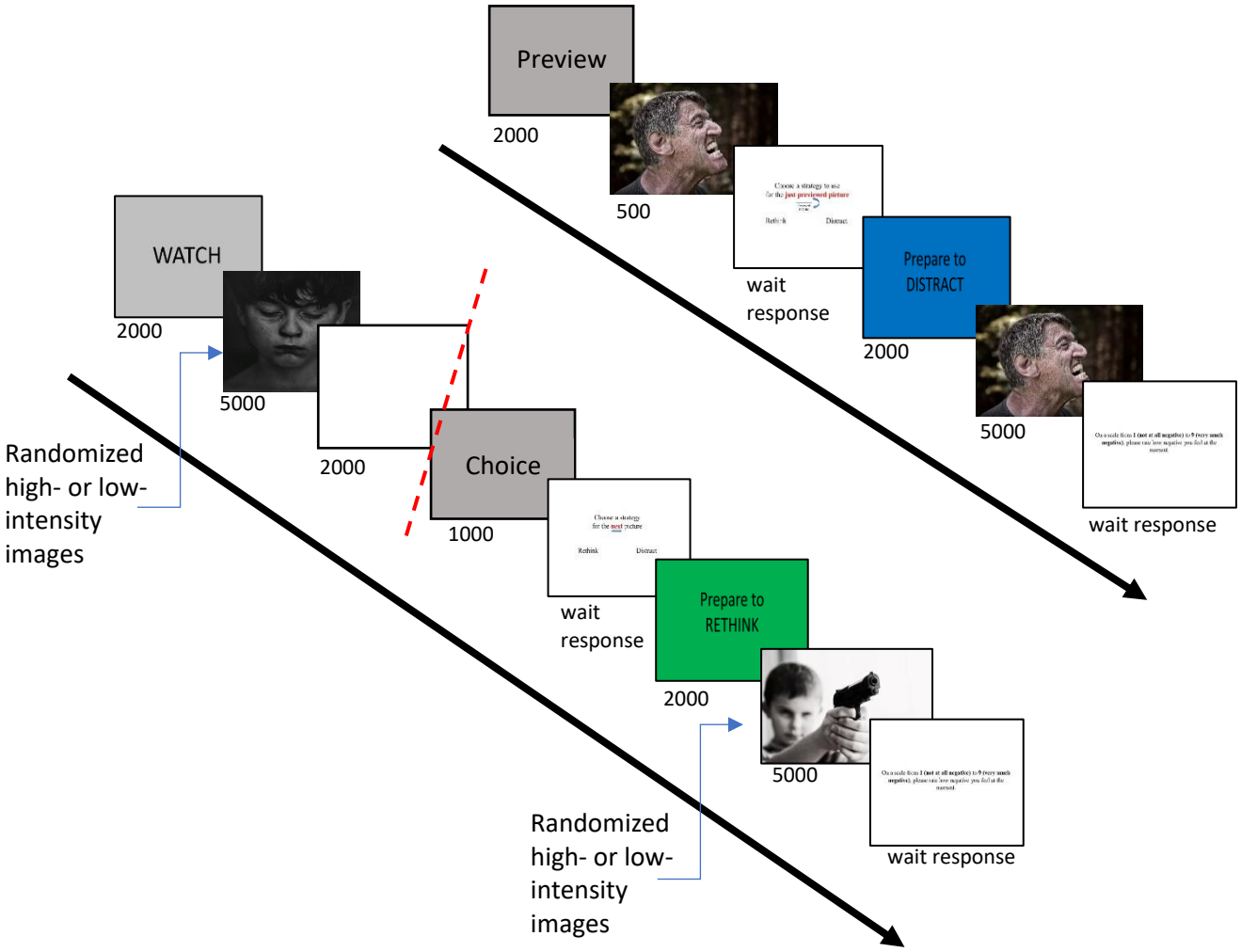

Figure 1. The two trial types (Preview and Watch→ Choice) of Experiment 1, with time in milliseconds. The order of Watch→Choice and Preview trials was randomized. To avoid copyright violation, this figure displays pictures that were downloaded from the internet (www.pexels.com).

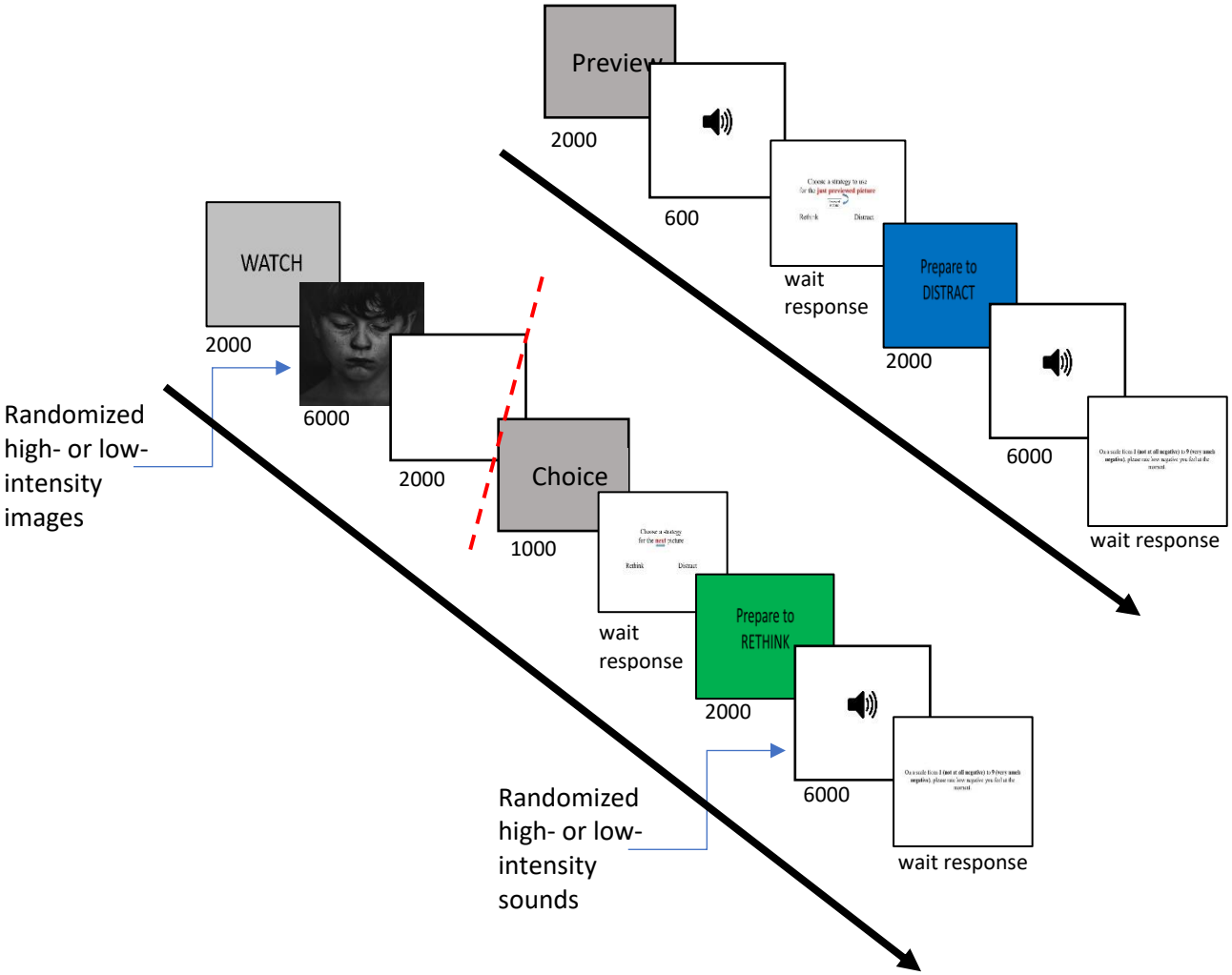

Figure 2. The two trial types (Preview and Watch→ Choice) of Experiment 2, with time in milliseconds. The order of Watch→Choice and Preview trials was randomized. To avoid copyright violation, this figure displays pictures that were downloaded from the internet (www.pexels.com).

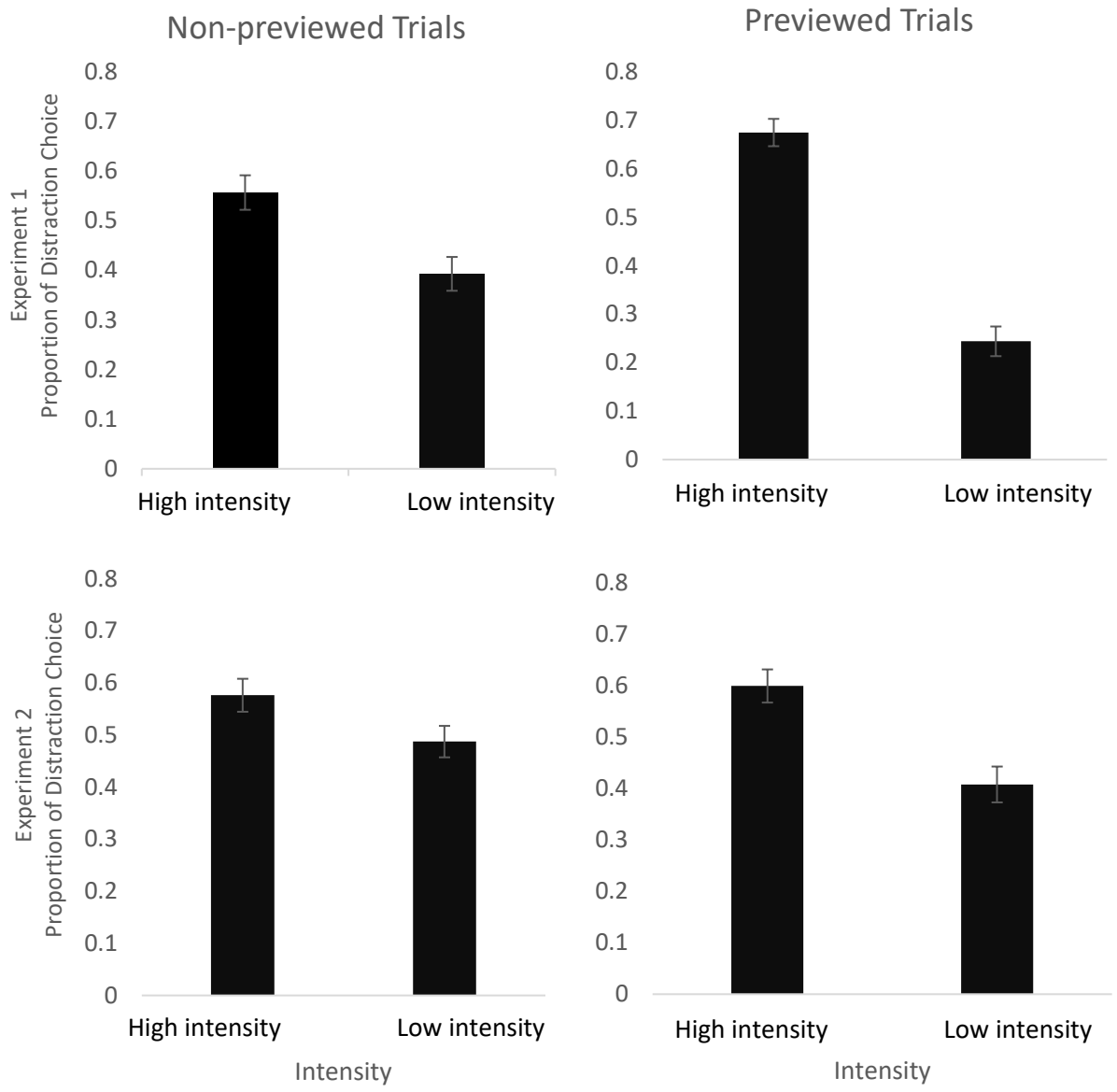

Figure 3. Proportion of distraction choice for Non-previewed trials and Previewed trials in Experiment 1 (top) and Experiment 2 (bottom). Previewed trials in Experiment 1 used images from the IAPS database. Previewed trials in Experiment 2 used audio files from the IADS database. Non-previewed trials were choices for upcoming images (Experiment 1) and sounds (Experiment 2) following passive viewing of images. Error bars represent ±1 standard error of the mean.