THE EFFECT OF EMOTIONAL STIMULUS INTENSITY ON THE SELECTION
AND IMPLEMENTATION OF DISTRACTION AND REAPPRAISAL AS EMOTION
REGULATION STRATEGIES

A DISSERTATION IN
Psychology

Presented to the Faculty of the University of
Missouri- Kansas City in partial fulfillment of
the requirements for the degree

DOCTOR OF PHILOSOPHY

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2015
Emotion regulation is an important coping mechanism for handling emotional situations and stimuli in day-to-day life. More effective emotion regulation is linked to better mental and physical health. The present study investigated the effects that the intensity of emotional stimuli may play in influencing which emotion regulation strategy people choose, and the impact of that choice on how emotional stimuli are attended, experienced, and remembered. Participants were asked to view a series of high and low intensity negatively valenced pictures. Prior to each picture, participants were instructed to view the picture naturally or to use distraction or reappraisal to reduce their emotional response to the picture. In a second phase, participants were asked to choose to use either distraction or reappraisal when viewing a second series of pictures. While participants viewed the pictures, eye-tracking quantified the amount of time that participants spent viewing the high emotion area of each picture while corrugator, skin conductance, and
ratings of picture valence and arousal were obtained. At the completion of the study, memory for picture details was assessed. Overall, results of the current study revealed that when distraction was chosen as the strategy for regulating emotional responses to high intensity negative pictures, the negative pictures were perceived as more negative (ratings data), experienced as more arousing (skin conductance data), and remembered less accurately (memory data). The results also replicated the findings of Sheppes et al. (2011) indicating that participants chose the strategy of distraction significantly more often than reappraisal when viewing high intensity pictures. The current results, together with those of Sheppes et al. (2011), suggest that distraction is the emotion regulation strategy that people choose most frequently when faced with high intensity stimuli, and that there are negative consequences of that choice. These results highlight the need for further research on the relative costs and benefits of distraction as an emotion regulation strategy. The results also suggest the need for future research to investigate other factors that may affect the probability of distraction being implemented and also to investigate possible ways to offset or reduce the negative impact of the distraction strategy.
The faculty listed below, appointed by the Dean of the College of Arts and Sciences have examined a thesis titled “The Effect of Emotion Stimulus Intensity on the selection and Implementation of Distraction and Reappraisal as Emotion Regulation Strategies ” presented by Stacia N. Gessner, candidate for the Doctor of Philosophy degree, and certify in their opinion it is worth of acceptance.

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ACKNOWLEDGEMENTS

I’d like to acknowledge and thank all of the people that have aided me in my journey to earning my doctoral degree in Clinical Psychology. This includes immense gratitude to my mentor, Diane Filion. Without her aid, I could not have completed this process. Chris Lovelace, who aided me early in my graduate career, and taught me invaluable lessons in the laboratory with psychophysiology measurement. My family and friends who have supported me in this process, even when they did not completely understand it – my wonderful brother Kip, my sister Marybeth, my mother and father, my best friends – Alisha, Michelle, Olen, Kobi, and Mindy. A very special thank you to my step-father Al, who had confidence in me every step of the way, I wish you could be here for this moment. I also feel the need to acknowledge the special people that I have met along the way that have worked alongside me during this process (in no specific order): Bill, Lora, Denisse, Sofie, Mark, Bryan, Liz, and Laura (and now I am sure that I forgot someone, sorry!). A special thanks to my loyal cat, Piccolo, for her supervisory role, and knowing when I needed a break. Thanks to every one of you for understanding how important this process has been for me and providing much needed support!
CHAPTER 1
OVERVIEW

Emotion regulation refers to strategies that people employ in order to control their emotional experiences; that is, what emotions they have, when they have them, and how they experience and express these emotions (Gross, 1998). This process helps with goal achievement, emotion expression, and experience. More effective emotion regulation is often tied to better mental and physical health (Gross & John, 2003; Kubzansky, Park, Peterson, Vokonas, & Sparrow, 2011). Emotion regulation strategies lead to improved mood and reduced physiological reactivity in response to emotional stimuli (Boden et al., 2013; Denson, Moulds, & Grisham, 2012). Certain types of cognitive reappraisal, an emotional regulation strategy, are positively correlated with better mood and greater overall health (Gross & John, 2003; Kubzansky, et al. 2011; Mauss, Cook, Cheng, & Gross, 2007). Cognitive reappraisal occurs when an individual cognitively reframes their experience as it occurs. Studies indicate decreased physiological reactivity in response to emotional stimuli when people use cognitive reappraisal when compared to other emotion regulation strategies (Goldin, McRae, Ramel, & Gross, 2008). Attentional deployment is another type of emotion regulation strategy. Attentional deployment occurs when an individual concentrates on one part of an emotional situation as it occurs or concentrates on something other than what is occurring. Attentional deployment has been found to lead to improved mood and reduced physiological reactivity in response to emotional stimuli when compared to other emotion regulation strategies.

Recent research indicates that attentional deployment and cognitive reappraisal may be complementary processes that influence one another and result in similar
behavioral patterns. Eye-tracking has been used in order to track visual attention of participants using different emotion regulation strategies. Research using this method suggests that emotional stimuli are viewed differently depending on the emotion regulation strategy a person is using, either increasing or decreasing viewing time of the most emotionally salient parts of the stimuli presented (Bebko, Franconeri, Ochsner, & Chiao, 2011). Specifically, this research has shown that the amount of time a person spends viewing the emotional components of a picture versus the non-emotional components seems to vary depending on the emotion regulation strategy the person is using. Because research suggests that both reappraisal and attention deployment can be beneficial emotion regulation strategies, it is important to understand how visual attention is deployed when these strategies are used.

Sheppes, Scheibe, Suri, and Gross (2011) found that one important factor is stimulus intensity. They found that, when presented with high intensity negative pictures, people self-reported the choice of distraction over reappraisal. The emotion regulation strategy of choice with lower intensity negative pictures was reappraisal. Given that reappraisal is a widely taught strategy for coping with high intensity emotional situations, it seems important to better understand the relationship between stimulus intensity and emotion regulation strategy selection and also to investigate the impact of the selected strategy on the processing of the emotional stimuli. Therefore, the purpose of the present study was to replicate the Sheppes et al. (2011) study to investigate the effect of stimulus intensity on the selection of emotion regulation strategies and to extend their work by also investigating the impact of the strategy selected. The current study included eye-tracking methodology to assess what parts of emotional stimuli the participant is
attending to and will include physiological measures of arousal (e.g., skin conductance and corrugator electromyography) to measure the intensity of the emotional response to each stimulus. Based on the results of Sheppes et al. (2011), it was hypothesized that participants would report choosing distraction more frequently than reappraisal for high intensity stimuli. Based on the attentional deployment literature, it was also hypothesized that participants using/choosing distraction would spend greater viewing time in the periphery of the pictures relative to the emotional areas of the pictures, and that participants using/choosing distraction would show reduced emotional responses to the pictures as measured by skin conductance and corrugator compared to participants choosing/using reappraisal. Lastly, it was anticipated that memory for emotional content of pictures presented when participants choose distraction would be impaired when compared to memory for emotional content of pictures when participants choose reappraisal.

The results of our study supported the findings of Sheppes et al. (2011) that participants chose distraction more often than reappraisal with high intensity stimulus and chose reappraisal more often with low intensity pictures. The second hypothesis was also supported, that participants using or choosing distraction looked at the high emotion areas of presented stimuli for a shorter amount of time when compared to reappraisal. Contrary to prediction, physiological responding was not found to be lower the distraction condition relative to reappraisal and in fact showed the opposite effect for high intensity pictures, with distraction resulting in higher skin conductance responses than reappraisal. Lastly, we found as predicted, that memory accuracy for the pictures was better for participants who chose reappraisal over distraction.
The results of this study suggest that the use of distraction may have deleterious effects when implemented for high intensity stimuli. The data provide evidence that the memory accuracy of the participant is decreased, there is greater arousal as indexed by skin conductance, and the participant viewed the high emotion area of the stimuli less. In addition, valence and arousal ratings of the high intensity pictures indicated that they were perceived more negatively and more arousing in the strategy of distraction was selected compared to reappraisal.

Future research will be necessary in order to determine whether the short-term deleterious effects observed in the current study have any long-term consequences. Most importantly, it will be important to investigate the selection and effects of emotion regulation strategy on those who are confronted with high intensity stimuli on a regular basis, such as first responders, and to determine if there are emotion regulation training interventions that could be protective for them. Future research should also explore what factors may predict the selection of emotion regulation strategy, especially factors related to personality or emotional states or traits such as anxiety, or depression.
CHAPTER 2
LITERATURE REVIEW

Emotion Regulation

Emotion regulation refers to strategies that people employ in order to control their emotional experiences; that is, what emotions they have, when they have them, and how they experience and express these emotions (Gross, 1998). Gross (1998) and Thompson (1994) highlight the need for daily emotion regulation in order for people to achieve goals as well as express and experience emotions. Tamir (2009) suggests that this process is not always a pleasant one, as sometimes experiencing unpleasant emotions can aid in long-term goal attainment. There is also literature tying emotion regulation to both adaptive and maladaptive behavior (Sloan & Kring, 2007). Overall, however, there is a large literature demonstrating a connection between better emotion regulation ability and better physical and mental health.

In terms of physical health, more effective emotion regulation ability has been found to be associated with a reduced risk for coronary heart disease (Kubzansky, et al. 2011). Poor emotion regulation is associated with increased risk for hypertension (Vögele & Steptoe, 1993), gastrointestinal disorders (Lackner, Quigley, & Blanchard, 2004; Gross, 1998), pain (Keefe, Lumley, Anderson, Lynch, & Carson, 2001), and immune deficiencies (Salovey, Rothman, Detweiler, & Steward, 2000). Similar research provided evidence that inflammation often associated with cardiovascular disease is reduced when emotion regulation strategies are engaged (Appleton, Buka, Loucks, Gilman, & Kubzansky, 2013).
In terms of mental health, poor emotion regulation skills have been found to be associated with post-traumatic stress disorder, trichotillomania, substance abuse, and borderline personality disorder (Boulanger, Hayes, & Pistorello, 2010). Emotion regulation strategies are often taught to individuals experiencing symptoms of depression (Lynch, Morse, Mendelson, & Robins, 2003), binge eating (Clyne & Blampied, 2004), post-traumatic stress disorder (Cloitre, Koenen, Cohen, & Han, 2002), and generalized anxiety disorder (Mennin, Heimberg, Turk, & Fresco, 2002). These skills are offered in therapy to individuals diagnosed with these disorders in order to help reduce symptoms.

These links to physical and mental health highlight the need for people to have the ability to successfully regulate their emotions. Research on the topic of emotion regulation has grown significantly over the past two decades (See Figure 1, Gross, 2013) most likely due to the evidence that mental and physical health appear to have an impact on one another.
How do people regulate their emotions?

Gross developed one of the most extensive models of emotion regulation (2006). Gross took into account previous literature such as psychological defenses, stress and coping, attachment theory, and emotion theory when considering his current theory of emotion regulation (2006). Gross (2006) states his preference to define emotion regulation as referring to “the heterogeneous set of processes by which emotions are themselves regulated” (p. 7). Due to the complex nature of emotions, there are a variety of ways that emotion regulation can impact their intensity, duration, rise, and/or physiological effects. These changes may decrease, increase, or simply maintain emotional experiences. His model endeavors to explain the methods that people use in order to influence their own emotional experience, specifically, what they will allow themselves to experience emotionally, how they will express these emotions and when

*Figure 1: Graph from Gross (2013).*

*Figure 1.* Number of publications containing the exact phrase “emotion regulation” in GOOGLE SCHOLAR from 1990–2012. Note that this is *not* a cumulative plot—each point represents the citation count for that single year.
emotional expression takes place. The process of emotion regulation may be conscious (explicit) or unconscious (implicit) and differs from coping because it concerns the alteration of all emotional experience, not just negative emotional experiences (Gyurak, Gross, & Etkin, 2011). When emotion regulation is explicit, it is effortful, contains a level of monitoring as it occurs, and is associated with awareness. Alternately, when emotion regulation is unconscious or automatic, without monitoring, it is said to be implicit emotion regulation.

Gross (1998) further defines emotion regulation as consisting of both antecedent and response focused processes. Antecedent processes are the things a person does before emotions occur that alter the person’s behavioral and physiological response (see Figure 2). Antecedent processes include situation selection, situation modification, attentional deployment, and cognitive change. According to Gross’s model, after situation selection (i.e., choosing to have dinner with a friend instead of eating alone), we can alter the situation’s emotional impact (situation modification, i.e., making a choice to not discuss an unpleasant topic while at dinner). The part of the situation that you concentrate on reflects attentional deployment. Gross (1998) identifies distraction, concentration, and rumination as types of attentional deployment. Distraction happens when an individual shifts attention from one aspect of the situation (goal or center) to a different aspect of the situation or perhaps shifts attention away altogether (e.g., if during dinner you considered your schedule for the next day). Concentration involves a greater level of cognitive energy directed within a situation (e.g., listening to your friend as they discuss their relationship). Rumination occurs when attention is directed inward toward selected emotions and the consequences of those feelings (e.g., thinking about an
argument that you had with your boss today at work). Depending on their use, these attentional deployment strategies are considered both adaptive and maladaptive in the emotional regulation process (Wadlinger & Isaacowitz, 2011). The last antecedent process discussed by Gross (1998) is cognitive change, also known as cognitive reappraisal (or reappraisal), where an individual may cognitively reframe their experience as the experience occurs (e.g., receiving the wrong order and allowing yourself to be excited over the new item). Lastly, in contrast to these antecedent processes of emotion regulation, response focused processes refer to the approaches taken after an emotion is already underway to alter the emotional experience in order to increase or decrease expressive behavior. Expressive suppression, one response focus behavior, occurs when an individual inhibits ongoing emotion-expressive behavior, (i.e., blaming the restaurant for your horrible experience).

Figure 2. The process model of emotion regulation (Gross & Thompson, 2007)

The impact of emotion regulation

There is research suggesting that implementation of different emotion regulation strategies impacts experience, behavior, and physiology. For instance, a study by Boden et al. (2013) compared self-reported emotion regulation strategies in veterans before and after Group Cognitive Processing Therapy (GCPT). Veterans were part of inpatient residential treatment and participated in 14 weeks of GCPT. Participants were assessed
both before and after treatment with the Emotion Regulation Questionnaire (ERQ) to determine self-reported suppression and reappraisal strategies and the Post-Traumatic Stress Disorder Checklist – Modified (PCL-M) to determine PTSD symptoms. Results indicated that use of reappraisal increased from before to after treatment and was positively correlated with less severe symptoms of PTSD. Therefore, it suggests that when individuals are able to cognitively reframe their experience, their symptoms of PTSD are decreased. Alternately, the self-reported use of suppression was positively correlated with more severe symptoms of PTSD both before and after treatment. This would indicate that when individuals are not able to cognitively reframe their experience and instead inhibit their emotional expression they display increased symptomology of PTSD. This suggests that implementation of different emotion regulation strategies can impact a person’s experience and behavior in both a positive and negative manner, depending on the strategy used.

Denson et al. (2012) investigated different emotion regulation strategies to see how well they helped people to cope with the experience of anger. Participants were instructed to recall an autobiographical event that caused them anger. Measurements were taken of initial mood and feelings of anger. Participants then were instructed to write about this event in four different manners: rumination, reappraisal, distraction, and spontaneous regulation. Spontaneous regulation included writing about whatever was on the individual’s mind at the moment. It was hypothesized that rumination would extend the time that participants maintained anger. Analysis of writing and mood measurements revealed that reappraisal, distraction, and spontaneous regulation conditions showed decreases in anger, but rumination appeared to maintain participants’ angry mood.
In a similar experiment, humorous distraction was used in order to see if it impacted evaluation of negative pictures (Strick, Holland, van Baaren, & Knippenberg, 2009). Participants viewed neutral and negative pictures on a monitor. One group of participants saw a positive picture after presentation of a negative picture; the other group saw a humorous picture after presentation of a negative picture. After viewing the picture sequence, participants rated how unpleasant they felt. In the results, participants who viewed a humorous picture after a negative picture felt less unpleasant when compared to participants who viewed a positive picture after a negative picture. This suggests that humorous distraction can aid with negative feelings when viewing negative stimuli.

Overall, the studies reviewed above suggest a wide range of behavioral, mood, and physiological effects when participants are instructed to use, or self-report using, different emotional regulation strategies. Depending on the strategy used, there is evidence for a lessening of negative mood and greater success at regulating negative emotion.

Are some emotion regulation strategies more effective than others?

Of the emotion regulation strategies identified in Gross’ model, the two that have been studied the greatest are reappraisal and suppression. In Gross’ model, reappraisal is an antecedent strategy and suppression is a response-focused strategy. The following section will review studies of reappraisal and suppression; this literature suggests that reappraisal is more beneficial than suppression at reducing negative emotional arousal.

A study by Garnefski, van den Kommer et al. (2002b) provided evidence for the benefits of reappraisal relative to other emotion regulation strategies by measuring
reappraisal strategies used in a clinical and non-clinical samples. These authors surveyed an adult clinical population with matched controls to assess self-reported use of emotion regulation strategies and symptomology. The clinical population was recruited from adults who self-reported above average anxiety and depression symptomology on the Symptom Checklist 90 (SCL-90). Results showed that use of self-blame, catastrophizing, and positive reappraisal were significantly different between the clinical and non-clinical sample. The non-clinical sample reported greater use of positive reappraisal when compared to the clinical sample and also reported less use of self-blame and catastrophizing.

Gross and John (2003) performed a study to determine convergent and discriminant validity for the Emotion Regulation Questionnaire (ERQ). The ERQ was designed to measure levels of self-reported suppression and reappraisal. Gross and John (2003) found that self-reported reappraisal on the ERQ was positively correlated with self-reported positive emotion and negatively correlated with self-reported negative emotion as measured by the Positive and Negative Affect Scale (PANAS). Reappraisal was also linked positively to sharing emotion with others (both positive and negative), having social supports (peer rated), and likeability (peer rated). Additionally, reappraisal was positively correlated with extraversion, openness, agreeableness, and conscientiousness. Conversely, reappraisal was negatively correlated with neuroticism as measured by the Big Five Personality Scale. Participants additionally completed self-report measures of depression symptoms, life satisfaction, optimism, and well-being. Reappraisal was negatively correlated with depression [as measured by the Beck Depression Inventory (BDI), Center for Epidemiological Studies Depression Scale (CES-
D), and the Self-Rating Depression Scale] and positively correlated with life satisfaction, self-esteem, optimism, and well-being. The results of this study suggest that cognitive reappraisal is positively correlated with better mental health (e.g., evidence of less depressive symptoms), quality of life, and well-being. Well-being and positive affect are frequently linked to better health outcomes (Cohen, Alper, Doyle, Treanor, & Turner, 2006; Cohen, Doyle, Turner, Alper, & Skoner, 2003; Janicki-Deverts, Cohen, Doyle, Turner, & Treanor, 2007) and longer life (Danner, Snowdon, & Friesen, 2001).

An investigation of suppression by Richards and Gross (1999) suggests negative outcomes when individuals are instructed to suppress their emotional response to negative pictures. Participants viewed pictures of people who had been injured, then they were given fictional information about that individual, including name, occupation, and type of accident. Some pictures showed people who appeared healthy and participants were informed that their accident had occurred in the past. Viewers were asked to either view pictures naturally or view pictures and actively suppress negative emotion in a manner such that no one could tell what they were feeling. A memory test was given after picture viewing. One result from this study indicated that memory of negative stimuli was impaired for the group that was instructed to suppress their outward emotional response. When this study was extended to add the physiological measures of heart rate, interbeat interval, finger temperature and skin conductance, the findings of memory impairment were replicated. Further, individuals suppressing their emotional expression had increased sympathetic activation as indexed by the physiological measures of blood pressure and finger temperature. In a similar study, individuals who self-reported using suppression more frequently were also found to experience difficulty
with memory on lab-based memory tasks and also on self-reported memory for day-to-day events (Richards & Gross, 2000).

Garnefski and Kraaij (2009) investigated reappraisal strategies and depressive symptoms using a survey distributed to adults. Emotion regulation strategies and depressive symptoms were measured as participants reported on their most negative life event. Results of this study revealed strong positive correlations between self-blame, rumination, catastrophizing, and depressive symptomology, whereas positive reappraisal was negatively correlated with depressive symptomology. This study concluded that positive reappraisal is an adaptive emotion regulation strategy while rumination, catastrophizing, and self-blame are maladaptive.

Joorman and Gotlib (2010) compared suppression and reappraisal in individuals diagnosed with depression. Participants for this study included individuals classified as never depressed, formerly depressed, and clinically depressed. The Structured Clinical Interview for the DSM-IV (SCID) was administered during the first session of the study to assess symptoms and to ensure that formerly depressed patients were in remission. Participants completed the BDI, Rumination Scales, and ERQ. The ERQ was used to determine each participant’s self-reported use of the emotion regulation strategies of suppression and reappraisal. Participants completed a negative priming task in which pairs of words were presented on a computer screen. Each pair consisted of a target word in blue ink and a distracter word in red. Participants were told to attend to the blue word presented on the screen and decide as quickly and accurately as possible if the word was positively or negatively valenced. They were told to ignore the word in red. In the negative priming condition, distractors used were related to words previously used as
targets. Results from this study suggest that when participants experienced difficulty inhibiting negative words that it was related to increased self-reported suppression and less self-reported reappraisal. For the entire sample less inhibition of negative stimuli was positively correlated with suppression and negatively correlated with reappraisal. Individuals in the formerly depressed group used suppression more, less reappraisal and had greater depressive symptoms when compared to the other groups. This finding suggests that the emotion regulation strategy of suppression is associated with greater inaccuracy when identifying negative targets.

Goldin et al. (2008) studied suppression and reappraisal differences in brain activation. Participants were instructed to watch, reappraise, or suppress neutral or negative pictorial and film stimuli while in an Functional Magnetic Resonance Imaging (fMRI) scanner. Facial expressions of the participants were recorded throughout the experiment, as were affective ratings for each film. A direct comparison between the suppression and reappraisal conditions revealed that reappraisal and suppression both led to greater down regulation of self-reported negative emotional experience, but suppression produced the greatest reduction of negative facial expression (specifically with disgust). Activation in the brain suggested that reappraisal resulted in early cortical activity (following stimulus presentation) and suppression involved later cortical responses (following stimulus presentation).

Further examining the relationship between reappraisal and suppression, van Oyen, Witvliet, DeYoung, Hofelich and DeYoung (2011) instructed students to use these strategies while thinking about a past real-life offense. Baseline physiological measures were taken prior to participants talking about the past offense, and throughout the session
the participant was instructed to alternately ruminate about the event, implement reappraisal (focus on mercy or compassion towards the individual who had offended them previously), and implement suppression (not become emotional about the experience). Self-report measures included valence (positive or negative emotion), perceived control and extent of specific emotions experienced (anger, forgiveness, etc.). Covert facial muscle activity was recorded throughout the experiment (zygomaticus, orbicularis oculi, and corrugator supercilii) that was considered be relevant to emotional states (smiling, concentration, and negative emotion). Electrocardiographic information was also recorded in order to calculate heart rate variability (HRV). Heart rate variability is considered to be indicative of the interaction between the sympathetic and parasympathetic divisions of the nervous system and better HRV allows for more adaptive responding to changes in the environment. Compassionate reappraisal was positively correlated with increased self-reported positive emotion and with the physiological index of smiling. Compassionate reappraisal and suppression were both positively correlated with slower heart rate and better HRV. This finding contradicts other findings that suggest that suppression is positively correlated with an increase in sympathetic arousal. Van Oyen et al. (2011) do not offer an explanation for the similarity of sympathetic arousal, but speculate that the consequence of using suppression over time is the negative impact on mental health.

Denson, Grisham, and Moulds (2011) also measured HRV while they compared reappraisal and suppression in undergraduates who viewed a speech designed to provoke anger. Participants were given three topics and questions were asked to assess how strongly the participant felt about them. This information was used in order to present a
video-taped speech given on the topic about which they felt the strongest, but presenting the opposite of the participant’s opinion of that topic. While viewing the speech, participants in this between groups design were instructed to watch the speech, reappraise the speech, or suppress their emotional reaction to the speech. Results revealed that the participants who used cognitive reappraisal displayed increases in HRV when compared to the suppression and view conditions. This research suggests that emotion regulation strategies aid with an adaptive physiological response that could be helpful in an aversive situation.

Another study used an anger manipulation paradigm with people who self-reported having high or low reappraisal on the ERQ in order to examine differences in mood and physiological responding (Mauss, et al., 2007). Participants’ heart rate and other cardiac measures were assessed during a five-minute neutrally valenced movie. Participants then reported their mood. Following this, a researcher led them through another task, while speaking to the participant in a condescending manner and telling the participant that he/she was moving too much for accurate physiological recording. Afterwards, the participant’s mood was assessed. Results indicated that high reappraisers (based on the initial self-report measure) experienced less anger, negative emotion, and greater positive emotion when compared to low reappraisers. Additionally, more adaptive cardiac response was demonstrated in high reappraisers when compared to individuals who reported low reappraisal. This adaptive response in people who self-reported high reappraisal was demonstrated by having greater cardiac output and ventricular contractility, in combination with lower total peripheral resistance, while the reverse was true for people who self-reported low reappraisal. This study suggests that
people who self-report greater levels of reappraisal may be able to better adapt to challenging emotional situations.

Overall, the literature reviewed in this section provides evidence that reappraisal is a beneficial strategy that not only contributes to better mental health, but has physiological benefits as well that may allow for more adaptive responses when faced with day-to-day emotional events.

**Is reappraisal always the best emotion regulation strategy?**

The literature reviewed above suggests that reappraisal has many advantages, however, there is also evidence that some specific types of reappraisal are more beneficial than others (Garnefski & Kraaij, 2007). For example, Garnefski and Kraaij (2007) suggest five different types of reappraisal: acceptance, refocus on planning (detachment), positive reappraisal, putting into perspective, and catastrophizing. They view acceptance, refocus on planning, positive reappraisal, and putting into perspective as adaptive strategies and view catastrophizing as maladaptive. Acceptance refers to the acceptance of thoughts you are experiencing and what has occurred. Refocus-on-planning refers to thinking about what steps to take/how to handle the event. Positive reappraisal is when a positive meaning is created to attach to the event in terms of personal growth. Putting-into-perspective means comparing the event to others for severity/seriousness. Catastrophizing refers to thinking that emphasizes or increases the severity of experience (e.g., “worst case scenario”). An example of how catastrophizing can be maladaptive is a study by Granot and Goldstein (2005) showing that greater thoughts of catastrophizing were associated with higher levels of postoperative pain. Additionally, the tendency to catastrophize is also identified as a common behavior of
individuals diagnosed with Generalized Anxiety Disorder (GAD; Barlow, 2007). Literature suggests that positive reappraisal is often reported as a primary emotion regulation strategy in people who are not diagnosed with a mental disorder and that catastrophizing is more frequently reported in people who are diagnosed with a mental disorder (Garnefski, van den Kommer et al., 2002). There is also literature suggesting that catastrophizing is positively correlated with depressive symptoms, while positive reappraisal is negatively correlated with them (Garnefski & Kraaij, 2009). Together, these correlational studies provide evidence that certain types of reappraisal are more helpful and adaptive than others.

Experimental studies have also demonstrated varying emotional and physical benefits of different forms of cognitive reappraisal. For instance, Shiota and Levenson (2009) recruited 144 adults from 20 to 69 years old to participate in an experiment of instructed emotion regulation in order to investigate the differences in emotional regulation engagement across age groups. Participants viewed six film clips that were described as neutral, sad, and disgusting. Initial viewing was uninstructed, but the last three trials were instructed. Participants were instructed to use either detached reappraisal or positive reappraisal strategies for the first two trials and instructed to suppress in the last trial. In the detached reappraisal condition, participants were instructed to view the movie objectively. In the positive reappraisal condition participants were instructed to focus on the positive aspects of the film. Participants reported their emotional experience and perceived success of following emotion regulation instructions after viewing each film clip. Physiological measurements were also taken during film viewing in addition to camera recording of facial expression.
Results indicated that older individuals experienced increased perceived success when instructed to regulate their emotions. Additionally older individuals also tended to display increases in their experience of the different emotions presented. Lastly, results revealed that younger adults experienced greater success with detached reappraisal instructions, but physiologically, no significant differences were observed when reappraisal conditions were compared to uninstructed viewing conditions.

In a study using a similar population, Shiota and Levenson (2012) found evidence that detached reappraisal reduced overall emotional intensity when compared to positive reappraisal and produced self-reports of less intense emotional experience. Additionally, when comparing types of reappraisal, no significant physiological differences were noted in men, but women’s cardiac reactivity (interbeat interval) was reduced when using detached reappraisal compared to the positive reappraisal condition. The results from these two studies suggest that reappraisal has benefits for emotional perception and may result in some physiological differences experienced between men and women.

Overall, the literature reviewed in this section provides evidence that positive reappraisal and detached reappraisal can be beneficial reappraisal strategies for regulating negative emotion. Specifically, use of detached reappraisal produced reduced overall emotional intensity and experience when compared to positive reappraisal. Physiologically, results indicated that detached reappraisal produced reduced cardiac reactivity in women.

Implicit Emotion Regulation

The preceding section reviewed studies that instructed participants to use a specific reappraisal or suppression strategy. This instructed use of strategy is also
referred to as explicit emotion regulation. Other studies have begun to investigate implicit emotion regulation processes. In these studies, participants complete assessments that ask about their typical approach to emotional situations in order to identify people as high reappraisers or high suppressors, and then they assess how those people respond to emotional stimuli in the laboratory when they are not given any explicit instructions, i.e., how they respond naturally (implicitly). The goal of these studies is to determine if patterns of affective and physiological responding are similar in uninstructed conditions (implicit conditions) and instructed conditions (explicit conditions). For example, if an individual reports that he/she uses reappraisal strategies in emotional situations, will he/she respond in the same fashion to emotional stimuli presented in the laboratory as do individuals explicitly instructed to reappraise?

In one of the first studies to address this issue, Egloff, Schmukle, Burns, and Schwerdtfeger (2006) evaluated implicit emotion regulation strategies while participants gave a speech. Undergraduate participants were asked to discuss a controversial topic knowing they would be evaluated on it. Their presentation was videotaped in order to record outward facial expression; two judges were trained to observe for expressions of anxiety present in the participants facial expressions (e.g., lip biting, mouth twitches, and pressing of the lips). Participants reported on their personal experience of anxiety and negative affect. Next, they were surveyed about emotion regulation strategy used. Finger pulse, finger temperature, skin conductance, and heart rate were measured throughout the task as indices of arousal. The results revealed that people who self-reported greater use of reappraisal strategies also displayed a lower level of anxious facial activity as evidenced through videotape and negative emotion as measured by self-report.
Data suggested that when participants reported use of the emotion regulation strategy of suppression a greater physiological response occurred when compared to the reported use of the emotion regulation strategy of reappraisal.

In a more recent study, implicit reappraisal and suppression differences were examined by Ehring, Tushen-Caffier, Schnulle, Fischer, and Gross (2010) in a group of non-depressed undergraduate students. Approximately 40% of the group had experienced a previous depressive episode (as assessed by the SCID), but all were found to not be experiencing a current depressive episode by this measure in addition to having a score of less than 10 on the BDI at the time of testing (reflecting low symptoms of depression, e.g., sadness, sleep changes, etc). Participants completed measures of emotion regulation [ERQ and Difficulties in Emotion Regulation Scale (DERS)] and state emotion regulation. The PANAS was used to assess mood at varying points during the experimental process. Participants were first instructed to simply observe a film clip to invoke sadness. Next participants were instructed to either suppress or reappraise emotions during another emotional film clip. Results indicated that individuals who were recovered from depression reported using suppression strategies more frequently than the non-depressed controls. However, there were no differences in mood between groups during the instructed condition. This suggests that when formerly depressed individuals are not instructed to reappraise while viewing emotional stimuli that they tend to use suppression instead of reappraisal.

Volokhov and Demaree (2010) examined the implicit use of suppression and reappraisal while measuring respiratory sinus arrhythmia (RSA) in response to negatively valenced film clips. This measure, RSA, has been linked to good outcomes when it is
high (increased self-regulation, flexibility, adaptability) and bad outcomes when it is low (depression, GAD, PTSD, cardiovascular disease and death). Since many of the outcomes mentioned are also noted as potential outcomes of good and bad emotion regulation, RSA is an appropriate measure. High scores of self-reported reappraisal were positively correlated with greater RSA during negative film viewing.

Carlson and Mujica-Parodi (2010) examined implicit use of reappraisal in anticipatory anxiety, the anxiety that occurs prior to stimulus presentation. The study was specifically focused on the impact of implicit reappraisal on the insula, a brain area associated with anticipatory anxiety. It was hypothesized that if an individual self-reported greater use of reappraisal then there would be less activity in the insula, since it is associated with anticipatory anxiety. Twenty adults were screened with the SCID and completed the ERQ and a trait anxiety questionnaire. While in an fMRI scanner, participants viewed 10 neutral and 10 aversive pictures. Prior to picture presentation a symbol appeared to indicate if the picture would be neutral or aversive. Following individual picture presentation, the participant indicated the extent of anxiety exhibited during the moments prior to picture presentation after the symbol appeared. Results provide evidence for activation in the insula during aversive anticipation and additionally that variability in the insula related to reappraisal as reported on the ERQ. This finding provides evidence that participants who self-reported using reappraisal had reduced activation in the insula during aversive anticipatory anxiety. This finding is similar to how participants respond when they are instructed to reappraise negative stimuli.

Together, the studies reviewed in this section provide evidence that people who implicitly use reappraisal as their primary emotion regulation strategy appear to
experience similar mood, affect, and physiological responses when faced with emotional stimuli, as do individuals who are explicitly instructed to use reappraisal strategies. Overall, the literature reviewed indicates that reappraisal is a highly beneficial emotion regulation strategy and appears to have a consistent impact on mood and behavior in both (explicit) instructed and (implicit) uninstructed conditions.

**Attentional Deployment as an emotion regulation strategy.**

In addition to the evidence reviewed, which documents the effectiveness of reappraisal as an emotion regulation strategy, there is growing evidence that attentional deployment may also be a beneficial strategy, and maybe even more beneficial than reappraisal. Those studies will be reviewed below.

Attentional deployment occurs after situation selection and concerns the part of the situation that one concentrates on (Gross, 1998). Gross identified *distraction*, *concentration*, and *rumination* as different types of this process. Mixed evidence is provided for the helpfulness of different attentional deployment strategies. For instance, if you are distracting yourself with a positive thought, it may be more effective than distracting yourself with a negative one. A study of a sample that included both depressed and non-depressed college students were instructed to use rumination or distraction (Nolen-Hoeksema & Morrow, 1993). Results suggested that use of distraction in college undergraduates who were diagnosed with depression displayed fewer symptoms of depression when compared to college undergraduates instructed to ruminate. Rumination performed in a “self-distanced” manner was found to be productive in processing negative emotions when compared to performing rumination in a “self-
immersed” fashion, suggesting that the manner rumination is practiced could be adaptive (Kross, Ayduk, & Mischel, 2005).

The use of concentration has been found to be effective with individuals experienced in meditation (Brefczynski-Lewis, Lutz, Schaefer, Levinson, & Davidson, 2007). Specifically, when experienced meditators were compared to non-experienced meditators, results showed that experienced meditators displayed greater activation in regions related to response inhibition and attention when distracter sounds were played as they meditated. This evidence reveals that successful concentration can aid with maintaining focus without succumbing to unnecessary parts of the environment.

The results from the aforementioned studies suggest that the use of attentional deployment can be both helpful and not helpful, depending on the type of attentional deployment strategy used. Positive distraction, concentration, and “self-distanced” rumination have been found to be helpful and adaptive methods of coping with negative events.

There have also been studies that have directly compared one specific form of attention deployment, distraction, to reappraisal. McRae, Hughes, Chopra, Gabrieli, Gross, and Ochsner (2009) trained participants to view, reappraise or use distraction while in an fMRI viewing negatively and neutrally valenced pictures in this within groups experiment. Distraction included presentation of a six-letter string presented prior to picture presentation that participants knew they would be tested on after picture presentation. After picture presentation, a letter appeared and the participant reported if it had been part of the string of letters presented prior to picture presentation. Next, the participant reported on the level of negative affect they were currently experiencing.
Results indicated that reappraisal produced a greater reduction in negative affect when compared to distraction, although both distraction and reappraisal were successful in down-regulating negative emotion. While similar areas were activated in the brain as participants used distraction and reappraisal, there were distinct differences noted. Reappraisal activated areas of the brain associated with the process of affective meaning (medial prefrontal cortex and ventral lateral prefrontal cortex), while distraction activated additional areas associated with attention (right prefrontal and parietal regions). Interestingly, it was also noted that use of distraction appeared to down-regulate the amygdala to a greater extent than reappraisal.

In a follow-up study designed to replicate and extend the findings of McRae et al. (2009), Kanske, Heissler, Schonfelder, Bongers, and Wessa (2010) added arithmetic tasks for distraction and added positive pictures to the stimulus set. Their results replicated the findings of McCrae et al. (2009) and revealed that both strategies were successful in down-regulating negative emotion (Kanske et al., 2010). Similar to McRae et al. (2009), there was down-regulation in the amygdala when participants used distraction, and increased activity in the orbitofrontal cortex when reappraisal was used (Kanske et al., 2010).

Overall, the studies directly comparing distraction to reappraisal suggest that distraction and reappraisal can be helpful strategies to down-regulate negative emotion. Additional evidence indicates that distraction has a greater impact on the amygdala when it is compared to reappraisal.
The Relationship between Cognitive Reappraisal and Attentional Deployment

Although the studies just mentioned compare distraction and reappraisal as though they are independent strategies, others have hypothesized that they may be actually used together. Specifically, in Gross’ model (1998), attentional deployment occurs earlier in the timeline of the emotion regulation process than reappraisal does. The thinking is that due to the timing of the processes, the strategies may influence one another and result in similar behavioral patterns. For example, if a person’s strategy for regulating their response to a negative event is to reappraise, that may require them to begin with attention deployment processes (e.g. use distraction or concentration) in order to more successfully reappraise the situation. Research into the relationship between attention deployment and reappraisal employs eye-tracking methodology in order to measure the aspects of an emotional stimulus to which a participant is attending. Specifically, this research examines how attention is deployed towards different aspects of an emotional scene when a person uses reappraisal.

In 2007, Van Reekum et al. conducted a study to determine if attentional deployment and reappraisal were independent strategies or if they were used together. Brain activation and gaze patterns were studied while participants implemented different reappraisal strategies while viewing negative and neutral pictures. Participants were instructed to increase negative affect by imagining that the scene involved a loved one, decrease negative affect by imagining the scene wasn’t real, or to just view naturally the negative pictures naturally while they were in an fMRI scanner. Trained assistants selected the areas of emotional content of the pictures presented that provided affective
meaning to the scene. Then through analysis, viewing time of affective areas was compared to viewing times of areas considered to be not part of the affective meaning of the picture (specifically areas of the picture that did not provide information to the emotional meaning of the picture). When comparing conditions, it was observed that in the decrease condition, time spent viewing the image and emotion-relevant parts was less than in the increase and view naturally conditions. These results suggest that overt attention patterns changed depending on the reappraisal strategy used.

To determine if instructions to reappraise could result in emotion regulation when attention was held constant, Urry (2010) instructed a sample of undergraduates in two reappraisal techniques in order to increase or decrease their emotional response. When increasing, they were instructed to reappraise the picture, imagining the worst-case scenario; when decreasing, they were instructed to positively reappraise the picture in order to experience less negative emotion. In addition to these two conditions, participants were also instructed to just view the pictures naturally. Pictures were neutral and unpleasant, matched for valence and arousal in both categories. By fading out portions of the pictures halfway through each picture presentation, the participant’s gaze was directed to either the most emotionally arousing area or to a neutral area of the picture. This was done for both neutral and negative pictures. Corrugator response was measured as an indicator of facial expressive behavior throughout the experiment. Heart rate was recorded for indicators of sympathetic and parasympathetic activity. Electrodermal activity was taken as an indicator of arousal. Results revealed that reappraisal affected physiological responses even when attention to emotional picture content was equivalent across reappraisal conditions. However, when comparing
increase and decrease conditions to the view only condition, significant physiological differences emerged. Specifically, in the increase condition, greater EDA, HR, and corrugator activity were observed in addition to increased ratings of subjective emotional intensity. The decrease reappraisal condition led to lower subjective ratings of emotional intensity and decreased corrugator activity compared to the view condition. These results indicate that reappraisal and not attentional deployment have an impact on emotion regulation, as gaze was constrained in the experiment across all conditions. The results from this study indicate that attentional deployment aids with reappraisal but does not seem to be the main component in successful emotion regulation.

In another study employing similar methodology, Bebko et al. (2011) instructed college students to either reappraise or suppress negative emotion while viewing negative pictures and having their gaze tracked. Participants were given examples of the assigned strategy before stimulus presentation. Instructions were to either inhibit their outward response so that others could not tell what they were feeling while viewing (suppression condition) or to decrease their negative emotional experience by positively reappraising the event portrayed (reappraisal condition). Prior to the experiment, a pilot study was done on pictures used for this study to determine the emotional areas of interest (eAOI’s) of all negative pictures. The variable of interest was the amount of time the participant spent looking at the eAOIs under the two different emotion regulation instructions. The results from this study indicated that participants who were instructed to use reappraisal spent more time viewing the eAOI than participants instructed to use suppression. Reappraisers also self-reported feeling less negative when compared to the suppressors.
This study provides evidence that individuals who are instructed to use reappraisal deploy their attention toward the emotionally arousing parts of negative pictures.

Building on those findings, Platzek (2011) examined differences in attentional deployment when undergraduates were instructed to alternately view, use detached reappraisal, or positively reappraise negative pictures of people. She hypothesized that if participants were instructed to use detached reappraisal they would spend a greater amount of time viewing the negative areas of the emotional stimuli when compared to the positive reappraisal condition. Her rationale was that participants need to engage to a greater degree with the negative components of the stimuli in order to be able to successfully use detached reappraisal to successfully reduce negative emotion. She also believed that detached reappraisal would be more effective in this population for a decrease in mood. Participants were instructed to decrease negative emotions by either reappraising the picture with a positive outcome or by being detached, an “unattached observer.” The participants indicated mood at beginning, middle, and end of each set of pictures. Results indicated that when detached reappraisal was used there was a greater amount of time spent viewing the emotional content of the picture when compared to other conditions. Conversely, when positive reappraisal instructions were given, less time was spent viewing the emotional content in the pictures than in the detached or just view conditions. Lastly, both detached and positive reappraisal instructions appeared to help participants successfully regulate negative emotion when compared to the view condition. No differences were noted in mood between the two reappraisal instructed conditions.
This research provides evidence that attentional deployment and reappraisal are separate but related strategies, and that attentional deployment to emotional stimuli varies depending on the type of emotion regulation strategy implemented (suppression, reappraisal, or type of reappraisal). In the studies reviewed, however, attentional deployment was not specifically manipulated. It was simply measured as a function of which other regulation strategy the participant was told to use. To more fully investigate the relationship between attentional deployment and reappraisal, it seems important to specifically manipulate both. The next section will review two studies that specifically compare the attentional deployment strategy of distraction with reappraisal.

**Reappraisal versus Distraction**

Sheppes et al. (2011) examined differences between attention deployment and reappraisal in a series of experiments in order to determine the effectiveness of strategy implementation on low to highly arousing negative stimuli. Specifically, in three separate experiments, undergraduates were trained to use either distraction or reappraisal when confronted with negative pictures or electric shock. The pictures were classified as “low intensity” or “high intensity” depending on arousal and valence level. The electric shocks were also classified as “high” and “low” intensity. “High” intensity shocks were perceived as strong, unpleasant and required effort to tolerate, while “low” intensity shocks were perceived as mild, slightly unpleasant and required little effort to tolerate. Participants were instructed to use either distraction or reappraisal during initial exposure to stimuli. On final trials participants were allowed to choose what strategy they would implement. They were encouraged to discuss the strategy out loud with the experimenter as stimulus presentation occurred. Verbal report of the selected strategy for each picture
was the dependent variable measured. Results of these three studies indicate that participants chose to use reappraisal more often with low intensity stimuli and chose to use distraction more often with high intensity stimuli. Additionally, in the second experiment, use of distraction was found to impair memory of the stimuli presented. This research suggests that emotion regulation strategy implementation may be dependent on the intensity level of stimuli presented.

Similar work by Sheppes, Catran, and Meiran (2009) examined differences in physiological responses in reappraisal and distraction strategies with unexpected results. Participants were instructed to view and reappraise, or view and use distraction while watching a negatively valenced film. Viewing was underway when instructions were given. Researchers operationalize the timing of reappraisal and distraction instructions as “late engagement.” Participants’ physiological arousal was measured by skin conductance and mood by self-report. The results of this study indicate that both distraction and reappraisal aided with less negative mood via self-report measures. Physiological measurements indicated that implementation of reappraisal increased physiological arousal, but distraction did not. This differs from other research previously discussed. This may be in part due to the manner that individuals in this study used distraction or that the lack of engagement with the stimuli presented resulted in less arousal than when reappraisal was used. Sheppes et al. (2009) concluded that reappraisal involved a greater physiological impact and stated that when this strategy is implemented “late” or as an emotion is forming, it involves a physical cost, while distraction does not.

This research reveals benefits of using distraction when viewing negative emotional stimuli, notably, less physiological arousal and a decrease in negative mood.
However, it also shows differences in the engagement of distraction and reappraisal depending on the intensity level of the stimulus viewed.

**Influences on Emotion Regulation processes.**

Recent research explored for factors that influence emotional regulation processes. Studies have found evidence to suggest that motivation, cognitive ability, and affect have a part in the emotion regulation process (Sheppes & Levin, 2013). Mather and Sutherland (2011) reviewed literature that suggests arousal can both enhance and impair memory of events. Research suggests that affect impacts emotion regulation choices, either through attentional deployment (specifically to choose between positive or negative) or due to difficulty with emotion processing (i.e., depression, anxiety, bipolar disorder, etc.; Hay, Sheppes, Gross, & Gruber, 2014; Opitz, Gross, & Suri, 2012; Suri & Sheppes, 2013).

Sheppes et al. (2014) reports on several studies that highlighted how affect, motivation, and cognition impact emotion regulation choices. Specifically, even with a monetary incentive, participants maintained the tendency to choose to implement the emotion regulation strategy of reappraisal with stimuli described as lower intensity and implemented distraction with stimuli described as high intensity. In these studies, cognitive effort was reduced by providing a reappraisal strategy (scenario written out), resulting in participants choosing reappraisal more frequently than distraction. Lastly by having participants concentrate on long-term goals instead of short-term goals, participants utilized reappraisal more than distraction. These studies highlight the impact of motivation, cognitive load, and affect on emotion regulation choice.
Literature highlights the impact of optimizing cognitive resources in order to implement successful emotion regulation (Opitz, Gross, & Urry, 2012). Opitz, Lee, Gross, & Urry, (2014) found that higher fluid cognitive ability, as measured by perceptual reasoning, working memory, and processing speed, was associated with greater emotion regulation success. Thiruchselvam, Hajcak, & Gross (2012) conducted a study that suggests emotional responding can change based upon the emotional interpretation that occurs in working memory. This provides some support for the idea that emotion regulation that occurs at a later time point in the emotion regulation process requires a greater amount of cognitive load (i.e, the emotion regulation strategy of distraction is “simpler” to engage than the emotion regulation strategy of distraction; Sheppes & Levin, 2013). This research highlights how affect, cognitive ability, and motivation influence emotion regulation strategy implementation ability and success.

**Summary of Literature Review and Purpose of Study**

The literature reviewed indicates that emotion regulation is important for physical and mental health and that reappraisal is generally viewed as the most beneficial emotion regulation strategy. However, the study by Sheppes et al. (2011) suggests that people are less likely to use reappraisal when an emotional stimulus is intense. They found instead that people chose more frequently to use distraction when faced with an intense negative stimulus. Considering the widespread use of reappraisal training based on the assumption that reappraisal is the optimal emotion regulation strategy, it seems critical to replicate the Sheppes’ et al. (2011) finding and further investigate the emotion regulation strategies people use when processing emotional stimuli of varying intensities. Gross (2013) recently stated:
“One challenge for the future is clarifying the circumstances under which it is helpful to invoke the notion of emotion regulation (as opposed to emotion alone). In addition, much remains to be done to clarify boundary conditions. When, for example, are ostensibly ‘unhelpful’ forms of emotion regulation actually helpful? When are ostensibly ‘helpful’ forms of emotion regulation actually unhelpful?”

(p. 363)

Consistent with the goal of identifying these boundary conditions, the purpose of the current study was to clarify the relative roles of reappraisal and distraction in the processing of high and low intensity emotional stimuli by replicating and extending the work of Sheppes et al. (2011). Specifically, the proposed study included a replication of the Sheppes et al. (2011) methods with the addition of eye-tracking as an objective measure of attentional deployment, and the addition of skin conductance and corrugator electromyography as objective measures of emotion. In the current study, participants were trained in how to use distraction and reappraisal strategies. They were then instructed to use reappraisal or distraction when viewing low and high intensity negative pictures. Lastly, they viewed another set of low and high intensity pictures and were asked to choose to use either distraction or reappraisal as a strategy for viewing each picture. Eye tracking and measures of arousal were recorded throughout the picture viewing tasks.

**Hypotheses**

1. Sheppes et al. (2011) found that people chose distraction over reappraisal strategies when presented with high intensity negative stimuli. It was hypothesized that the results of the current study would replicate the Sheppes et al.
finding: when participants are asked to choose between distraction and reappraisal implementation, distraction will be chosen more frequently than reappraisal with high intensity stimuli and reappraisal will be chosen more frequently than distraction with low intensity stimuli.

2. Previous studies measuring gaze during the viewing of emotional images have found that when using reappraisal strategies, people view the emotional areas of picture stimuli to a greater degree than the periphery of the picture (Bebko et al., 2011; Platzek, 2011; van Reekum et al., 2007). For the current study, it was hypothesized that when participants implement reappraisal, viewing time would increase in emotionally relevant areas of negative pictures relative to the periphery. Alternatively, it was hypothesized that when participants implement distraction, gaze patterns would indicate increased viewing time in the periphery of negative pictures relative to the emotionally relevant areas. This was predicted to be true for both the instructed and uninstructed conditions.

3. Previous studies in which participants were instructed to use distraction when viewing emotional images have found that those instructions result in a reduced emotional response to those pictures, as indexed by skin conductance (Sheppes et al. 2009). For the current study, it was hypothesized that in the instructed condition, when participants used distraction, they would have a reduced physiological response to the negative pictures, as indexed by corrugator and skin conductance responses, relative to when they use reappraisal. No hypotheses were made about physiological responses in the uninstructed condition because if Hypothesis 1 was supported and the results replicate the findings of Sheppes et al.
(2011), the strategy selected would be confounded with picture intensity. However, I anticipated that if sufficient data existed, I would examine the physiological responses in all four conditions (low intensity picture / participant chooses distraction, low intensity picture / participant chooses reappraisal, high intensity picture / participant chooses distraction, high intensity picture / participant chooses reappraisal).

4. Sheppes et al. (2011) indicated impaired memory for emotional content when distraction was chosen relative to reappraisal. It was hypothesized that, in the current study, memory of emotional content for negative pictures presented would be impaired following the choice of distraction, relative to the choice of reappraisal.
CHAPTER 3

METHOD

Participants

Participants were recruited from the undergraduate psychology classes at the University of Missouri-Kansas City (UMKC). Undergraduate students enrolled in psychology courses had the opportunity to register for the department’s online subject pool and receive extra credit for research participation. Using this system, undergraduates had the opportunity to voluntarily schedule an appointment to participate in the current study, which was described as a study investigating emotion regulation strategies. The final sample consisted of 92 participants; 12 participants were removed from the data set due to missing data. Two of these participants were removed from the sample due to self-report of taking multiple medications (specifically benzodiazepines that may impact gaze tracking in addition to medication for diabetes, which may impact skin conductance response). The resulting sample was 75% female, with a mean age of 24 (SD = 7.11). The ethnicity of the sample was comprised of 53.75% Caucasians, 23.75% African Americans, 8.75% Asian Americans, 3.75 % Hispanic Americans, and the remaining 10% stated other or multiple ethnicities.

Procedure

When participants arrived at the laboratory for the study, they were given informed consent forms and a brief overview of tasks. Any questions that they had about the procedures and tasks were answered. Participants then completed the PANAS, to
assess current mood. Next, participants were led to the sound-attenuating testing booth and prepared for electromyography (EMG) and skin conductance recording. The skin on the forehead was cleansed with an alcohol swab to prepare for corrugator recording (Fridlund & Cacioppo, 1986). Skin conductance was recorded by attaching an electrode to the volar side of the index and ring fingers on the non-dominant hand in accordance with published guidelines (Boucsein et al., 2012; Fridlund & Cacioppo, 1986). All physiological recordings were completed using a BIOPAC MP150 system. Stimuli were presented through GazeTracker (Eye Response Technologies, Charlottesville, VA) software and physiological data were collected using Acknowledge (BIOPAC, 2004). Eye movement was recorded throughout the experiment with an Applied Science Laboratories Eye-Trac 6000. The eye tracker was controlled by a PC, which recorded stimulus event codes into Acknowledge that provided a means for time-locking the gaze and physiological measures.

Next, participants were trained to regulate their emotional response to negative pictures using distraction or reappraisal as outlined in Sheppes et al. (2011). Participants viewed a series of negative pictures from the International Affective Picture System (IAPS). They were instructed to look at each picture and either think about something emotionally neutral (i.e., use distraction) or think about the picture in a way that reduces its negative meaning (i.e., use reappraisal). Once participants had practiced these strategies with the researcher, they were asked to view nine numbered dots on the screen in order to perform a calibration of the eye-tracking equipment. Following the calibration procedure, the next phase of the study was the “instructed” phase. In the instructed phase, participants viewed a series of pictures from the IAPS that will replicate those in the
Sheppes et al. (2011) study (see Appendix A for picture information). These pictures are described as low-intensity (as indicated by IAPS arousal/valence rating) and high intensity (as indicated by IAPS arousal/valence rating). Participants completed 24 trials and were instructed to distract, reappraise, or view (eight trials for each instruction, four trials for each intensity) while gaze patterns were tracked and physiological responses recorded. Participants were instructed to watch the screen for the instruction cue that would present on the screen that preceded each picture (the word will present on the screen for 3500ms). They were told to focus on the crosshair that follows the instruction (crosshair will be present for 2000ms). They were told that once the picture appears they could look at any aspect of the picture or screen they wanted to but that they must keep their eyes within the red line that surrounded the frame of the picture presented so that their eyes may be tracked during the study. Each picture was presented with a black frame surrounding it in order to create a periphery around the picture (please see Figure 3 for a sample image and illustration of presentation order). This was done to ensure that participants viewed the screen prior to and during picture presentation. Pictures were shown for 12000ms followed by a blank slide for 5000ms prior to the next instruction. The pictures were randomized into two pseudo-random presentation orders. One presentation order began with a low intensity (or low arousal) picture and the other presentation order began with a high intensity (or high arousal) picture. The beginning picture was chosen at random by intensity (arousal) rating. Next, both intensity pictures were combined and chosen at random to determine order. This procedure was repeated to determine a second presentation order. After the instructed phase was complete, participants viewed 32 additional pictures of low and high intensity (16 of each intensity)
in a random sequence and were asked to choose to implement either distraction or reappraisal while viewing them. In order to determine this sequence, pictures of both intensities were mixed and chosen at random for order of presentation. This was the “choice” phase of the study. Prior to viewing, participants were instructed to use either distraction or reappraisal while they viewed each picture and reported their choice by selecting the “R” key on the keyboard for “reappraise” or the “D” key on the keyboard for “distract” after viewing was complete (options were visually presented on the screen after stimulus presentation). Eye-tracking and physiological responses were also recorded during these trials.

Figure 3. Presentation of stimuli in instructed condition. Instruction (view, distract, or reappraise), followed by fixation cross, then presentation of high or low intensity picture.

The final phase of the study was the picture rating and memory test phase. Participants were given a memory test for pictures presented in the choice phase. Sixty
pictures were presented, 30 were pictures that were presented in the choice phase of the experiment and 30 were foils. Foils were chosen that had similar content to pictures presented in the choice phase of the study. (See Figure 4 for an example of an original picture and it’s foil.) Next, participants viewed all pictures previously presented (except for foils). They rated the valence and arousal properties of each picture. At the completion of the session, electrodes were removed and participants were taken out of the booth to complete the surveys described below that assessed a range of affect and emotion regulation variables. Lastly, participants were debriefed, thanked for their time and excused.

Figure 4. Example of a memory “pairs” (original picture presented and its foil). Pictures were matched for content as close as possible to situation and picture content. Picture to the left was originally presented picture and picture to the right was the accompanying foil in the memory test. Foils and original pictures were presented individually. Participants were asked to identify if the picture had been previously presented to them (old or “O” on the keyboard) or new (or “N” on the keyboard).

Measures

Cognitive Emotion Regulation Questionnaire (CERQ). The CERQ is a 36-item, self-report questionnaire, which assesses the use of cognitive reappraisal strategies that are considered to be both adaptive and maladaptive after experiencing threatening or stressful events (Garnefski, Kraij, Spinhoven, & DATEC, 2002; Garnefski & Kraaij,
This was given to participants in order to better understand the methods of reappraisal they regularly use. The CERQ takes approximately 10-minutes to complete and contains nine sub-scales for cognitive coping strategies that include: self-blame, acceptance, rumination, positive refocusing, refocus on planning, positive reappraisal, putting into perspective, catastrophizing, and other-blame (Garnefski & Kraaij, 2007).

Participants responded to statements on a five-point Likert scale that ranges from 1 – 5, where 1 = never, 2 = sometimes, 3 = regularly, 4 = often, and 5 = (almost) always. Each 4-item subscale can range from 4 (never used) to 20 (almost/always used). Acceptance, positive refocusing, refocus on planning, positive reappraisal, and putting into perspective are considered adaptive strategies while self-blame, rumination, catastrophizing, and other blame are considered to be maladaptive strategies. Examples of statements on the questionnaire are, “I think that I cannot change anything about it” and “I feel that others are to blame for it.” The CERQ sub-scales have a Cronbach’s $\alpha$ that ranges from .75 - .86 for English-speaking adults, and test retest reliability ranging from $\alpha = .48 - .65$ (Garnefski, Kraaj et al., 2002). This measure was normed on a European sample ranging from 18 – 65 years of age, who were 60% female, with a mean age of $M = 41.92$ years old ($SD = 11.51$). See Appendix B to see the full measure.

**Depression, Anxiety, Stress Scale (DASS-21).** The Depression, Anxiety, Stress Scale (DASS-21) is the shortened form of Lovibond and Lovibond’s (1995) extended measure. This is a 21-item scale used to assess normative to extremely severe levels of depression, anxiety, and stress. This information was used in order to better understand the mental health of our participants. This scale has statements such as “I found it hard to ‘wind down.’” Participants then had four response options, 0 = did not apply to me at all,
1 = applied to me to some degree or for some of the time, 2 = applied to me to a considerable degree or for a good part of time, and 3 = applied to me very much or most of the time. Data collected from a sample of 1,794 adults living in the UK (approximately 55% female, $M = 41$ years old, $SD = 15.9$) had an internal reliability in a non-clinical sample of $\alpha = .88$ for the Depression scale, $\alpha = .82$ for the Anxiety Scale, $\alpha = .90$ for the Stress Scale, and $\alpha = .93$ for the total scale (Henry & Crawford, 2005). The scores for the sample were: depression $M = 3.28$, $SD = 3.46$; anxiety $M = 4.34$, $SD = 3.49$; and stress $M = 6.81$, $SD = 4.47$. The scores for this sample fell within normal limits (Depression = 0 – 9, Anxiety = 0 – 7, Stress = 0 – 14).

**Emotion Regulation Questionnaire (ERQ).** The Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) is a 10-item questionnaire that measures reappraisal and suppression. The ERQ takes approximately five minutes to complete. This questionnaire helped describe the regular emotion regulation strategies used by our sample. Participants ranked statements on a 7-point Likert scale that ranges from 1 = strongly disagree, 4 = neutral, and 7 = strongly agree. The questionnaire was normed on four college samples (ranging in sample size from 116 – 791 participants) that had an average age of 20 years. Internal consistency of reappraisal ranged from $\alpha = .75-.82$ across five samples; for suppression, $\alpha = .68-.76$. The test retest reliability was $\alpha = .69$ for both sub-scales. The results for the previous study did not suggest consistent gender differences in the reappraisal scale, however, in the suppression scale, men consistently scored higher than women. Suppression normative values were $M = 3.64$ ($SD = 1.11$) for men and $M = 3.14$ ($SD = 1.18$) for women. Reappraisal normative values were $M = 4.60$ ($SD = 0.94$) for men and $M = 4.61$ ($SD = 1.02$) for women. Minority groups did not have
significant differences in emotion regulation styles when compared to other groups, but when the entire minority sample was compared to European Americans, significant differences were noted, specifically that European Americans used suppression to a lesser degree as an emotion regulation strategy when compared to all other ethnicities. No significant differences were noted for ethnicity in reappraisal. Full details for this measure can be found in Appendix C.

**Picture Ratings and Memory Test.** After viewing, participants were asked to rate each picture on two dimensions. First, they were asked to rate the picture on valence (how positive or negative they found the picture) on a scale of 1 – 9 (1 = negative, 5 = neutral, 9 = positive). Secondly, they were asked to rate the picture on how scary/exciting they found the picture on a scale of 1 – 9 (1 = not scary/exciting, 5 = neutral, 9 = very scary/exciting). Our sample rated the pictures in the low intensity range with a valence of $M = 4.19$, $SD = .72$ and arousal of $M = 3.17$, $SD = 1.28$; the pictures in the high intensity range with a valence of $M = 2.172$, $SD = 1.72$ and arousal of $M = 6.35$, $SD = 1.72$.

The memory test consisted of combining pictures presented during the “choice” phase of the study. Each picture presented in the choice phase had a foil that was presented, that was similar in content to the original. (Please see Figure 4 for description.) Participants received one point per correct response. Thirty pairs were analyzed; our participants correctly identified original low intensity pictures 94.1% of the time ($SD = 15\%$) and foils of low intensity pictures as being new pictures 84.91% of the time ($SD = 14\%$). Participants correctly identified original high intensity pictures 87.25%
of the time ($SD = 13\%$) and foils of high intensity pictures as being new pictures $81.25\%$
of the time ($SD = 15.7\%$).

**Positive and Negative Affect Scale (PANAS).** The PANAS was developed to
assess the degree of positive and negative affect present in an individual “in the moment,”
“today,” “for the past few days,” “past few weeks,” “current year,” or “in general”
(Watson, Clark & Tellegen, 1988). Participants rated 20 words such as “excited” or
“irritable” on a 5-point Likert scale where $1 = $ very slightly or not at all, $2 = $ a little, $3 =$
moderately, $4 = $ quite a bit, and $5 = $ extremely. Greater amounts of positive affect reflect
higher levels of enthusiasm, pleasurable engagement, and high energy. Greater amounts
of negative affect reflect high levels of distress, non-pleasurable engagement, and
aversive moods such as anger, fear, or guilt. For the purposes of this study, we used
directions to assess the participant’s positive and negative affect “in the moment” and “in
general” in order to better understand the current and overall mood of our participants.
Affect for state and trait was assessed before the beginning of the study. After
participants completed the study, state affect was again assessed.

This measure has exhibited a test-retest reliability ranges from $\alpha = .39-.71$ for
both state and trait Positive and Negative Affect (Watson et al., 1988). College student
normative values for state Positive Affect are $M = 29.7, SD = 7.9$ and state Negative
Affect are $M = 14.8, SD = 5.4$. Normative values for a similar population are $M = 35.0,$
$SD = 6.4$ for trait Positive Affect and $M = 18.1, SD = 5.9$ for trait Negative Affect.

**Emotional Expression: Corrugator Activation.** In order to assess negative
affect, we measured activity of the corrugator muscle, also known as the “frown muscle,”
using an electromyographic recording (EMG). Raw corrugator EMG data was collected
using two electrodes placed above the medial portion of the left eyebrow (Fridlund & Cacioppo, 1986). A third electrode was placed in the center of the forehead and used as a ground. Corrugator data were continuously recorded throughout each trial using AcqKnowledge software, version 3.8.1 (Biopac Systems, 2004) with a BIOPAC MP150 bioamplifier (Biopac Systems, Inc., Camino Goleta, CA) using a sampling rate of 1000 Hz. A 10 Hz high pass and a 500 Hz low-pass filter was applied (Ray, McRae, Ochsner, & Gross, 2010) and the signal was rectified and integrated (Bradley, Cuthbert, & Lang, 1990).

**Sympathetic Nervous System Activation: Skin Conductance Response (SCR).**

Skin conductance was used as a measure of sympathetic activation of the autonomic nervous system. Research suggests that viewing of negatively valenced stimuli produces larger skin conductance responses when compared with neutrally valenced stimuli (Bradley, Miccoli, Escrig, & Lang, 2008). Skin conductance was recorded by attaching an electrode to the volar phalanges of the index and ring fingers on the non-dominant hand (Boucsein et al., 2012). Electrodes were filled with EDA-cream. The signal was recorded continuously through the trial by a BIOPAC MP150 system using a 1 kHz low pass filter and recording with a sampling rate of 250 Hz.

**Gaze patterns during picture viewing.** In order to assess the time spent viewing emotional areas, eye-tracking data was used. Eye-tracking is a non-invasive method of measuring what the participant is visually attending. The Applied Science Laboratories Eye-Trac 6000 was used to record gaze patterns. The eye-tracker continuously tracks eye position 60 times per second with an accuracy rating of 0.5° visual angle. A red line was on the outermost edge of this border. Participants were instructed to keep their eyes
inside this red line. For analysis, all pictures presented were analyzed using a consistent-sized box inside the picture that was centered on the portion of the picture that was considered the high emotional area. This box was not visible to the participant during stimulus presentation (only used or visible during data analyses). This box was a consistent size of 257,631 pixels (112.45mm x 166.16 mm). The area in this box was referred to as the high emotional area as it was considered the area of the picture with the greatest emotional content. Stimulus presentation was marked by event codes and recorded simultaneously into Acknowledge software in order to ascertain when stimulus presentation occurred for all psychophysiological measures used for this study. A 9-point calibration was performed prior to experiment onset for each participant, in order to ensure eye-tracking accuracy. Pictures were presented on a 17” LCD monitor. Data were recorded using GazeTracker software (Eye Response Technologies, Charlottesville, VA).

Stimuli

**International Affective Picture System (IAPS).** The IAPS is a collection of emotionally evocative digitized images collected to study emotion and attention by researchers at University of Florida (Lang, Bradley, & Cuthbert, 1997) in the National Institute of Mental Health (NIMH) Center for the Study of Emotion and Attention (CSEA). The picture set includes pictures that are positive (i.e., ice cream, money), negative (i.e., accident victims, toilets, roaches), and neutral (i.e., chair, vase) in valence. These pictures have been normed with ratings of dominance, arousal, and positive/negative valence, and the ratings have been shown to exhibit both within- and between-subject reliability, $r = .94$ and $r = .94$, respectively. Only negative pictures were
used for the current study. For additional details on ratings of valence and arousal of this sample, see “Picture Ratings and Memory Test.”

**Data Scoring**

**Physiological data**

**Corrugator.** EMG data were sampled at 1000 Hz, then responses were rectified and integrated using a time constant of 5ms with a 500 Hz filter. Corrugator data were expressed as the average change in the 5.5s interval after stimulus presentation from the 5.5s baseline immediately preceding it, similar to the scoring procedures of Jackson, Malmstadt, Larson, and Davidson (2000). Data were averaged for the instructed (reappraisal, distraction and view; both high and low intensity) and choice phases (reappraisal and distraction; both high and low intensity) in preparation for analyses.

**Skin Conductance Response.** A baseline (1s prior to stimulus presentation) was subtracted from the maximum value between 1 and 4s after stimulus onset. Averages for each emotion regulation strategy (instruction or choice) for both high and low intensity were calculated for final analyses.

**EyeGaze.** The gazetracker provided information regarding the amount of time in seconds that the participant viewed each picture. Times were broken into areas that were high in emotional content (as denoted by analysis box of consistent size: 257,631 pixels or 112.45mm x 166.16 mm) or remaining area (any area not in this box). These times were noted for each participant and divided into instructed and choice trials, then further divided in each condition by the intensity of the picture presented (high or low).

In addition to analyzing the total amount of time that participants spent viewing the high emotion areas of the pictures, we were interested in also examining the number
of times the participant's gaze entered the high emotion area. We felt that the number of "visits" to the high emotion area may provide information about how the strategies of reappraisal and distraction impact stimulus processing." In order to assess this variable, we created a "visits" score for each participant for each instruction condition and picture intensity.
CHAPTER 4
RESULTS

Prior to testing the specific hypotheses of the study, we analyzed results from the self-report measures of affect to assess comparability of our sample with other published studies of emotion regulation. Descriptive statistics for the following measures are shown in Table 1: Trait and State Affect, as assessed by the PANAS before and after the session; depression, anxiety, and stress, as assessed by the DASS; and emotion regulation use as assessed by the ERQ and CERQ. Scores for the PANAS were comparable to published normative values. Scores for the DASS fell within published normal limits for Depression (0-9), Anxiety (0-7), and Stress (0-14). Scores for the ERQ for Suppression and Reappraisal were slightly higher than Gross and John’s (2003) original study, but are similar in range to more recently published findings for a similar college aged population (Melka, Lancaster, Bryant, & Rodriguez, 2011). In Melka et al. (2011) study females averaged 13.12 (SD= 4.99) for suppression and 28.92 (SD=6.27) for reappraisal, men averaged 14.91 (SD=4.67) for suppression and 28.48 (SD=6.29) for reappraisal, which are more in line with the averages of our sample. There are no published normative values for the CERQ, but the scores provide insight into how our current sample uses specific emotion regulation strategies. Overall, the survey data from the current study suggest that our sample did not have any unusual characteristics that may have impacted results of the study.
Table 1

*Participant information as captured by survey data.*

<table>
<thead>
<tr>
<th>Survey</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASS Depression</td>
<td>3.28</td>
<td>3.46</td>
</tr>
<tr>
<td>DASS Anxiety</td>
<td>4.34</td>
<td>3.49</td>
</tr>
<tr>
<td>DASS Stress</td>
<td>6.81</td>
<td>4.47</td>
</tr>
<tr>
<td>ERQ Reappraisal</td>
<td>26.51</td>
<td>5.00</td>
</tr>
<tr>
<td>ERQ Suppression</td>
<td>14.88</td>
<td>4.96</td>
</tr>
<tr>
<td>PANAS Trait positive affect</td>
<td>34.66</td>
<td>7.08</td>
</tr>
<tr>
<td>PANAS Trait negative affect</td>
<td>15.76</td>
<td>4.48</td>
</tr>
<tr>
<td>PANAS State positive affect</td>
<td>29.20</td>
<td>7.70</td>
</tr>
<tr>
<td>PANAS State negative affect</td>
<td>12.70</td>
<td>2.74</td>
</tr>
<tr>
<td>PANAS Post-State positive affect</td>
<td>24.60</td>
<td>7.93</td>
</tr>
<tr>
<td>PANAS Post-State negative affect</td>
<td>17.04</td>
<td>6.23</td>
</tr>
<tr>
<td>CERQ Self-Blame</td>
<td>10.31</td>
<td>3.33</td>
</tr>
<tr>
<td>CERQ Acceptance</td>
<td>13.21</td>
<td>3.12</td>
</tr>
<tr>
<td>CERQ Rumination</td>
<td>12.06</td>
<td>3.48</td>
</tr>
<tr>
<td>CERQ Positive Refocus</td>
<td>10.98</td>
<td>3.83</td>
</tr>
<tr>
<td>CERQ Refocus on Planning</td>
<td>14.15</td>
<td>3.07</td>
</tr>
<tr>
<td>CERQ Positive Reappraisal</td>
<td>14.55</td>
<td>3.52</td>
</tr>
<tr>
<td>CERQ Putting into Perspective</td>
<td>13.38</td>
<td>3.35</td>
</tr>
<tr>
<td>CERQ Catastrophizing</td>
<td>7.53</td>
<td>2.90</td>
</tr>
<tr>
<td>CERQ Other Blame</td>
<td>7.29</td>
<td>2.51</td>
</tr>
</tbody>
</table>

Another important category of self-report data in the current study is the picture-rating data. Participants were asked to rate each picture immediately after viewing it along the dimensions of valence and arousal. Valence ratings (how positive or negative they found the picture) were on a scale from 1 – 9 (1 = negative, 5 = neutral, 9 = positive). Arousal ratings (how scary/exciting they found the picture) were on a scale from 1 – 9 (1= not scary/exciting, 5 = neutral, 9 = very scary/exciting). Valence and arousal ratings were analyzed separately as a function of emotion regulation condition and picture.
intensity for both the instructed and choice phases of the study. Participants with incomplete ratings data were excluded from this analysis. To test the ratings in the instructed condition, valence data were averaged for each emotion regulation instruction (viewing, reappraisal, and distraction) and picture intensity (high and low) and were submitted to a 3 (instruction: view, reappraise, distract) x 2 (picture intensity: low, high) repeated measures ANOVA. Results revealed a main effect of instruction and picture intensity (Please see Table 2 for complete statistics). This suggests that overall, higher intensity pictures were rated as more negatively valenced than lower intensity pictures and that instruction had an impact on how pictures were rated. The interaction of instruction and picture intensity was also significant. Follow up t-tests indicate significant differences (after a Bonferonni correction of .0083) in most conditions by intensity. These valence data suggest that in the low intensity instructed condition people rated pictures the most negatively in the distraction and view conditions, followed by reappraisal. Alternately, in the high intensity condition, results suggest that pictures in the view and reappraisal conditions were rated most negatively, with ratings significantly less negative in the distraction condition. Follow up t-tests also reveal significance (after a Bonferonni correction of .0167) across intensity. This indicated that high intensity pictures were rated more negatively across all emotion regulation instructed conditions. (Please see Figure 5a for comparison by picture intensity and Figure 5b for a comparison by emotion regulation instruction.)
Figure 5a. Instructed condition: Valence as a function of emotion regulation instruction and picture intensity. Error bars represent standard error for each measure. Valence scores have been reverse scored for this graph, 9 = negative, 5 = neutral, 1 = positive. Within the low and high picture intensity, valence for each strategy condition differed significantly from the two other conditions, except in the low intensity condition for distraction and view condition.

Figure 4b. This graph is the same as above but compared by emotion regulation strategy. Valence scores have been reverse scored for this graph, 9 = negative, 5 = neutral, 1 = positive. In the high intensity condition reappraisal and view did not differ. Within each regulation strategy, all conditions differed significantly across picture intensity conditions for valence ratings.
Table 2
*Instructed condition: Self-reported valence ratings by emotion regulation strategy and picture intensity.*

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Sig²</th>
<th>observed power</th>
<th>t-test</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>3.74 (.91)</td>
<td>2.39 (1.1)</td>
<td>.001</td>
<td>18.23</td>
<td>72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>4.54 (.94)</td>
<td>1.86 (.98)</td>
<td>.001</td>
<td>11.02</td>
<td>72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>View</td>
<td>3.83 (1.1)</td>
<td>1.87 (1.1)</td>
<td>.001</td>
<td>12.84</td>
<td>72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Intensity                     | 350                     | .001                     | 1.0    | 144  |
Emotion Regulation Strategy   | 10.89                   | .001                     | .99    | 144  |
Emotion Regulation Strategy x Intensity | 34.43       | .001                     | 1.0    | 144  |

Low Intensity: Distraction vs. Reappraisal | .001 | 7.43 | 72 |
Low Intensity: Reappraisal vs. View      | .001 | 5.68 | 72 |
Low Intensity: Distraction vs. View      | .44  | -0.78| 72 |
High Intensity: Distraction vs. Reappraisal | .001 | -4.68| 72 |
High Intensity: Reappraisal vs. View      | .868 | -0.17| 72 |
High Intensity: Distraction vs. View      | .001 | -4.49| 72 |

*Scores on scale: 1 = negative, 5 = neutral, 9 = positive.*
Ratings of picture valence in the choice condition were analyzed using averages for each chosen strategy (reappraisal and distraction) and as a function of picture intensity (high and low) and submitted to a 2 (choice: reappraisal, distraction) x 2 (picture intensity: low, high) repeated measures ANOVA. This revealed a main effect of choice and intensity, but no interaction of choice and intensity. (Please see Table 3 for further statistical information.) These data suggest that people who chose reappraisal rated pictures less negatively in both the low and high intensity conditions. (Please see Figure 6a for a comparison by picture intensity and 6b for a comparison by emotion regulation strategy.)

Figure 6a. Choice condition: Valence as a function of selected emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Valence scores have been reverse scored for this graph: 9 = negative, 5 = neutral, 1 = positive. Within emotion regulation strategy choice and picture intensity, all conditions differed significantly.
Figure 6b. Choice condition: Valence as a function of selected emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Valence scores have been reverse scored for this graph: 9 = negative, 5 = neutral, 1 = positive. Within emotion regulation strategy choice and picture intensity, all conditions differed significantly.

Table 3
Choice condition: Self-reported valence ratings by emotion regulation strategy and picture intensity.
*Scores on scale, 1 = negative, 5 = neutral, 9 = positive.

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>3.25 (1.1)</td>
<td>1.8 (.68)</td>
<td>.001</td>
<td>18.23</td>
<td>72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>4.45 (.84)</td>
<td>3.19 (1.2)</td>
<td>.001</td>
<td>11.02</td>
<td>72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Intensity                  | 256 1.0                   | .001 72                    |
Emotion Regulation Strategy | 170 1.0                   | .001 72                    |
Emotion Regulation Strategy x Intensity | 1.19 19 | .28 72 |
Ratings of picture arousal were analyzed in the instruction condition using a parallel data analysis strategy. Arousal ratings were averaged for each emotion regulation instruction (viewing, reappraisal, and distraction) and picture intensity (high and low) and submitted to a 3 (instruction: view, reappraise, distract) x 2 (picture intensity: low, high) repeated measures ANOVA. Results revealed a main effect of intensity, but not for instruction. (Please see Table 4 for further statistics.) These data suggest that overall, higher intensity pictures were rated as more arousing than lower intensity pictures. The interaction between intensity and instruction was also significant. In the low intensity instructed condition people rated pictures as least arousing in the view and reappraisal conditions, followed by distraction. Alternately, in the high intensity condition, the view and distraction instructions led participants to rate pictures as least arousing, followed by reappraisal. (Please see Figure 7a for a comparison of valence by intensity and 7b for a comparison of valence by emotion regulation strategy.)
**Figure 7a.** Instructed condition: Arousal as a function of instructed emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Within each regulation strategy, all conditions differed significantly across picture intensity conditions for arousal ratings.

**Figure 7b.** Instructed condition: Arousal as a function of instructed emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Within the low intensity condition, both reappraisal vs. distraction and view vs. distraction showed differences. In the high intensity condition, only reappraisal vs. distraction revealed a significant difference.
Table 4

*Instructed condition: Self-reported arousal ratings by emotion regulation strategy and picture intensity.*

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>3.78 (1.7)</td>
<td>6.30 (1.9)</td>
<td>.001</td>
<td>12.91</td>
<td>72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>3.09 (1.6)</td>
<td>6.81 (1.9)</td>
<td>.001</td>
<td>14.64</td>
<td>72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>View</td>
<td>3.01 (1.5)</td>
<td>6.63 (2.1)</td>
<td>.001</td>
<td>15.37</td>
<td>72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Intensity | 293 | 1.0 | .001 | 138 |
| Emotion Regulation Strategy | 1.97 | .40 | .143 | 138 |
| Emotion Regulation Strategy x Intensity | 18.53 | 1.0 | .001 | 138 |

Low Intensity: Distraction vs. Reappraisal .001 -4.7 72
Low Intensity: Reappraisal vs. View .578 .56 72
Low Intensity: Distraction vs. View .001 -4.35 72
High Intensity: Distraction vs. Reappraisal .005 -2.93 72
High Intensity: Reappraisal vs. View .124 1.56 72
High Intensity: Distraction vs. View .05 2.01 72

*Score scale: 1 = not scary/exciting, 5 = neutral, 9 = very scary/exciting.

Ratings of picture arousal for the choice condition were analyzed using a 2 (choice: reappraisal, distraction) x 2 (intensity: low, high) repeated measures ANOVA. (See Table 5 for all statistics.) This analysis revealed significant main effects of choice and intensity but no interaction between the two. Participants rated high intensity pictures as more arousing.
than low intensity pictures and that pictures were rated as more arousing when distraction was used relative to reappraisal.

(See Figure 8a for a comparison by picture intensity and 8b for a comparison by emotion regulation strategy.)

Table 5
Choice condition: Self-reported arousal ratings by emotion regulation strategy and picture intensity.

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>4.00 (1.8)</td>
<td>6.49 (1.9)</td>
<td>.001</td>
<td>12.91</td>
<td>72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>3.03 (1.3)</td>
<td>5.29 (1.8)</td>
<td>.001</td>
<td>14.64</td>
<td>72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Intensity                    | 236                     | 1.0                      | .001 | 72             |
Emotion Regulation Strategy   | 59.61                   | 1.0                      | .001 | 72             |
Emotion Regulation Strategy x Intensity | .661 | .13 | .42 | 72 |

*Score scale: 1 = not scary/exciting, 5 = neutral, 9 = very scary/exciting.
Figure 8a. Choice condition: Arousal as a function of selected emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Within emotion regulation strategy choice and picture intensity, all conditions differed significantly.

Figure 8b. Choice condition: Arousal as a function of selected emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Within emotion regulation strategy choice and picture intensity, all conditions differed significantly.
After comparability of the sample was established and the picture rating data analyzed, the four hypotheses of the study were tested sequentially and are reported in the paragraphs below.

**Hypothesis 1.** Sheppes et al. (2011) found that people were more likely to choose distraction over reappraisal strategies when presented with high intensity negative stimuli. In the current study, it was hypothesized that when participants were asked to choose between distraction and reappraisal strategies, distraction would be chosen more frequently than reappraisal with high intensity stimuli whereas reappraisal would be chosen more frequently than distraction with low intensity stimuli. To test this hypothesis, a paired samples $t$-test compared the proportion of trials on which participants chose reappraisal over distraction when viewing high intensity pictures relative to the proportion of trials on which participants chose reappraisal over distraction when viewing low intensity pictures. Proportions were created using the number of times that a participant chose reappraisal for low intensity pictures out of all low intensity pictures presented and the number of times that a participant chose reappraisal for high intensity pictures out of all high intensity pictures presented. For this analysis, participants with missing data from other parts of the study (survey data, physiological data), or whose choice was not recorded because they accidentally pushed the space bar, were excluded. Consistent with my hypothesis, the results revealed a significant difference between the proportion scores by condition, $t\ (70) = -16.1, p < .001$, with means indicating that reappraisal was chosen more frequently with pictures of low intensity than pictures of high intensity (Please see Figure 9 for results.)
**Figure 9.** Choice condition: Proportion of emotion regulation strategy choice (distraction or reappraisal) by picture intensity (low or high).

**Hypothesis 2.** Previous studies measuring gaze during the viewing of emotional images have found that participants using reappraisal strategies spent more time viewing the high emotion areas of the pictures relative to the low emotion areas (Bebko et al., 2011; Platzek, 2011; van Reekum et al., 2007). Based on those studies, we hypothesized that when participants implemented reappraisal, gaze patterns would indicate increased viewing time in high emotion areas of the picture. Alternatively, when participants implemented distraction, we hypothesized that viewing time would increase in low emotion areas of negative pictures. This was predicted to be true for both the instructed and choice conditions, for both high and low intensity pictures. To test this hypothesis in the instructed condition, variables were computed to index the amount of time that participants spent viewing the high emotion area of the picture for each emotion regulation instruction (for viewing, reappraisal, and distraction) and picture intensity (high and low) and were submitted to a 3 (instruction: view, reappraise, distract) x 2
(picture intensity: low, high) repeated measures ANOVA. Results revealed a main effect of instruction and picture intensity (See Table 6 for statistics.). The main effect of instruction indicated that, regardless of intensity, viewing times in the high emotion area were greatest for the view instruction, followed by the reappraisal instruction, then the distraction instruction. The main effect of intensity indicates that, across instruction conditions, viewing time in the high emotion area was greater for high intensity than low intensity pictures. The repeated measures ANOVA also revealed an interaction between instruction and intensity. In order to examine the interaction, paired sample t-tests were computed comparing view times for each pair of instruction conditions separately for high and low intensity pictures. These tests indicate differences across all instructions for intensity of picture using a Bonferoni correction yielding a p-value of .0083. Instruction (view, reappraisal, and distraction) was also compared across intensity (low and high). The results indicate a significant difference in the distraction condition, but not for the reappraisal, or view condition. The difference in the distraction condition indicated that when picture intensity was high, participants spent less time viewing the high emotion areas than when the picture was low intensity. (Please see Figure 10a for results by picture intensity and Figure 10b for results by emotion regulation strategy.) Overall, results for the instructed condition support my hypothesis in that participants spent more time viewing high emotion areas when using the emotion regulation strategy of reappraisal and more time viewing low emotion areas when using distraction.
Figure 10a. Instructed condition: Viewing time as a function of emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Within each regulation strategy, only the distraction condition differed significantly across picture intensity conditions; there was no effect of picture intensity on the view times for the reappraisal or view conditions.

Figure 10b. Instructed condition: Viewing time as a function of emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Within each picture intensity, viewing time for each strategy condition differed significantly from the two other conditions.
Table 6

*Instructed condition:* Viewing time characteristics (in seconds) of high emotion area by instructed emotion regulation strategy and picture intensity.

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>4.17 (2.21)</td>
<td>3.5 (2.34)</td>
<td>.001</td>
<td>3.51</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>5.9 (2.13)</td>
<td>5.92 (2.26)</td>
<td>.09</td>
<td>-.13</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>View</td>
<td>6.78 (2.45)</td>
<td>6.59 (2.47)</td>
<td>.31</td>
<td>1.03</td>
<td>78</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Intensity

- Intensity: Distraction vs. Reappraisal
- Intensity: Reappraisal vs. View
- Intensity: View vs. Distraction

Emotion Regulation Strategy

- Emotion Regulation Strategy: 90.41 1.0 .001 156

Emotion Regulation Strategy x Intensity

- Emotion Regulation Strategy x Intensity: 5.13 .82 .01 156

Low Intensity: Distraction vs. Reappraisal
- .001 -7.13 78

Low Intensity: Reappraisal vs. View
- .001 -5.41 78

Low Intensity: View vs. Distraction
- .001 .10.45 78

High Intensity: Distraction vs. Reappraisal
- .001 -7.88 78

High Intensity: Reappraisal vs. View
- .001 -4.55 78

High Intensity: View vs. Distraction
- .001 9.76 78
In addition to analyzing the total amount of time that participants spent viewing the high emotion areas of the pictures, we were interested in also examining the number of times the participant's gaze entered the high emotion area. We felt that the number of "visits" to the high emotion area may provide unique information about how the strategies of reappraisal and distraction impact stimulus processing. In order to assess this variable, we created a "visits" score for each participant for each instruction condition and picture intensity. In order to assess visits of the high emotion area, a repeated measures ANOVA was performed to examine the effects of instruction (distraction, reappraisal, and view) and picture intensity (high vs. low). Results revealed a significant main effect of instruction, but not picture intensity (See Table 7 for further statistical information). The number of visits into the high emotion areas was greater when participants were instructed to use reappraisal compared to distraction, in both the high and low intensity picture conditions. No differences were observed between the reappraisal and view instructions. (Figure 11a shows visits in the high emotion area by picture intensity and Figure 11b shows visits in the high emotion area by emotion regulation strategy.)
Figure 11a. Instruction condition: Visits in the high emotion area as a function of emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. The main effect of strategy was significant between emotion regulation strategies for both high and low intensity picture conditions except view vs. reappraisal instruction.
Figure 11b. Instruction condition: Visits of the high emotion area as a function of emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. The main effect of strategy was significant between emotion regulation strategies for both high and low intensity picture conditions except view vs. reappraisal instruction.
Table 7

*Instructed condition: Visits of the high emotion area by emotion regulation strategy and picture intensity.*

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>6.63 (4.07)</td>
<td>6.11 (4.38)</td>
<td></td>
<td>.96</td>
<td>.16</td>
<td>.33</td>
<td>156</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>8.75 (4.02)</td>
<td>9.11 (3.71)</td>
<td></td>
<td>43.93</td>
<td>1.0</td>
<td>.001</td>
<td>156</td>
</tr>
<tr>
<td>View</td>
<td>9.02 (4.87)</td>
<td>8.57 (4.36)</td>
<td></td>
<td>2.45</td>
<td>.49</td>
<td>.09</td>
<td>156</td>
</tr>
</tbody>
</table>

Intensity

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy x Intensity</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Intensity: Distraction vs. Reappraisal</td>
<td>.001</td>
<td>-4.99</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Intensity: Reappraisal vs. View</td>
<td>.51</td>
<td>-.67</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Intensity: View vs. Distraction</td>
<td>.001</td>
<td>5.92</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Intensity: Distraction vs. Reappraisal</td>
<td>.001</td>
<td>-8.81</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Intensity: Reappraisal vs. View</td>
<td>.08</td>
<td>1.78</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Intensity: View vs. Distraction</td>
<td>.001</td>
<td>6.54</td>
<td>78</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The next set of analyses examined gaze time variables in the choice condition. First, a repeated measures ANOVA was performed to examine the effects of choice of emotion regulation strategy (reappraisal vs. distraction) and picture intensity (high vs. low) on total gaze time in the high emotion areas. Results revealed a significant impact of choice, but not of picture intensity. (For full statistics please look at Table 8.) The main effect of choice indicates that participants viewed high emotion areas of the pictures for longer periods of time than when they chose reappraisal. This analysis also indicated a significant interaction between choice and picture intensity. These data indicate that when a participant chose reappraisal as an emotional regulation strategy, they spent more time viewing the high emotion area when compared to the emotion regulation strategy of distraction. (Please see Figure 12a for results by picture intensity and Figure 12b for results by emotion regulation strategy.) The viewing time results for the high intensity pictures in choice condition provide support for my hypothesis in that people spent more time viewing the high emotion area of the pictures when they chose reappraisal.
Choice Condition: Viewing time compared by picture intensity and emotion regulation strategy

**Figure 12a.** Choice Condition: Viewing time as a function of emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Within each picture intensity, viewing time for each strategy condition differed significantly from the other.

Choice condition: Viewing time by emotion regulation strategy

**Figure 12b.** Choice Condition: Viewing time as a function of emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Within each emotion regulation strategy, viewing time for each strategy condition differed significantly across intensity.

Next, a 2 (picture intensity: high and low) x 2 (emotion regulation strategy: reappraisal and distraction) repeated measures ANOVA was conducted on the number of
visits into the high emotion areas in the choice condition. A main effect of emotion regulation choice and intensity were observed. (Please see Table 8 for statistical information.)

The same analysis was performed for visits in the high emotion area. It indicated that visits in the high emotion area were greater in the low intensity picture condition compared to the high intensity picture condition. The number of visits in the high emotion area was greater when participants chose to reappraise than when they chose to distract. (Please see Figure 13a for comparison of visits by picture intensity and Figure 13b for comparison of visits by emotion regulation strategy.)

**Choice Condition: Visits by picture intensity and emotion regulation strategy**

![Choice Condition: Visits by picture intensity and emotion regulation strategy](image)

*Figure 13a.* Choice condition: Visits in the high emotion area as a function of emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. The main effect of intensity showed that visits were greater in the low intensity picture condition than the high intensity picture condition. Visits in the high emotion area were greater when participants chose to use the emotion regulation strategy of reappraisal.
Figure 13b. Choice condition: Visits in the high emotion area as a function of emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. The main effect of intensity showed that visits were greater in the low intensity picture condition than the high intensity picture condition. Visits in the high emotion area were greater when participants chose to use the emotion regulation strategy of reappraisal.
Table 8
Choice condition: Viewing time characteristics (in seconds) of high emotion area by instructed emotion regulation strategy and picture intensity.

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>4.72 (2.79)</td>
<td>4.29 (2.04)</td>
<td>.08</td>
<td>-1.78</td>
<td>77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>7.12 (2.09)</td>
<td>7.98 (2.45)</td>
<td>.001</td>
<td>-7.13</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td>3.15 .42</td>
<td>.08</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotion Regulation Strategy</td>
<td>141.9 1.0</td>
<td>.001</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotion Regulation Strategy x Intensity</td>
<td>20.1 .99</td>
<td>.001</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Low Intensity: Distraction vs. Reappraisal
High Intensity: Distraction vs. Reappraisal

Choice condition: Visits in the high emotion area by emotion regulation strategy and picture intensity

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>7.27 (4.38)</td>
<td>6.3 (4.14)</td>
<td>54.55</td>
<td>1.0</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>9.8 (4.64)</td>
<td>8.96 (6.45)</td>
<td>7.17</td>
<td>.75</td>
<td>.01</td>
<td></td>
<td>68</td>
</tr>
<tr>
<td>Intensity</td>
<td>54.55 1.0</td>
<td>.001</td>
<td>68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotion Regulation Strategy</td>
<td>7.17 .75</td>
<td>.01</td>
<td>68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotion Regulation Strategy x Intensity</td>
<td>.07 .06</td>
<td>.79</td>
<td></td>
<td>68</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

76
**Hypothesis 3.** Previous studies in which participants were instructed to use distraction when viewing emotional pictures have found that those instructions result in a reduced emotional response to those pictures, as indexed by skin conductance (Sheppes et al. 2009). Based on those findings, it was hypothesized that when participants in the current study used distraction, they would have a reduced physiological response to the negative pictures, as indexed by corrugator and skin conductance responses, relative to when they used reappraisal. To test this hypothesis, corrugator and skin conductance responses were averaged for each instruction condition (view, reappraise, distract) and picture intensity (high, low).

**Skin Conductance.** In order to analyze the impact of emotion regulation instruction and picture intensity a repeated measures ANOVA was performed with skin conductance data from the instruction condition. This revealed a main effect of picture intensity, indicating that skin conductance responses were larger for pictures of high intensity. (Please see Table 9 for statistics.) Contrary to my hypothesis, there was no significant main effect or interaction involving the instruction variable, both $p > .05$. (See Figure 14a for results by picture intensity and 14b for results by emotion regulation strategy.)
Figure 14a. Instructed condition: Skin conductance magnitude as a function of emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Results indicated a main effect of picture intensity. Skin conductance magnitude was larger for pictures of high intensity.

Figure 14b. Instructed condition: Skin conductance magnitude as a function of emotion regulation strategy and picture intensity. Error bars represent standard error for each measure. Results indicated no main effect or interaction with emotion regulation strategy.

In order to test this hypothesis in the choice condition, a second repeated measures ANOVA was performed on data from that condition. This analysis revealed a
main effect of choice and picture intensity. (See Table 9 for statistics.) The main effect of choice indicated skin conductance was higher for distraction than reappraisal. The main effect of picture intensity indicated that skin conductance was higher for high intensity pictures when collapsed across strategy. The results also revealed a significant interaction of choice and picture intensity. This data indicate that when participants chose to use distraction when viewing high intensity pictures, skin conductance magnitude was higher. (Please see Figure 15a for results by picture intensity and 15b for results by emotion regulation strategy.) Contrary to my hypothesis, there was no significant difference in SCR magnitude between the two emotion regulation strategies in the low intensity picture condition.

Figure 15a. Choice condition: Skin conductance magnitude as a function of emotion regulation choice and picture intensity. Error bars represent standard error of measure. Skin conductance magnitude differed significantly in the high intensity picture condition. Skin conductance magnitude also differed significantly in the high intensity picture condition compared to low intensity picture condition.
Figure 15b. Choice condition: Skin conductance magnitude as a function of emotion regulation choice and picture intensity. Error bars represent standard error of measure. Within each picture intensity, skin conductance magnitude differed significantly in the high intensity picture condition.
Table 9

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>.129 (.176)</td>
<td>.162 (.243)</td>
<td>.23</td>
<td>-1.20</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>.136 (.191)</td>
<td>.182 (.273)</td>
<td>.08</td>
<td>-1.78</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>View</td>
<td>.144 (.230)</td>
<td>.161 (.254)</td>
<td>.48</td>
<td>-.72</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined Instruction</td>
<td>.137 (.148)</td>
<td>.168 (.213)</td>
<td>.03</td>
<td>-2.16</td>
<td>79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Intensity

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.67</td>
<td>.57</td>
<td>.05</td>
<td>158</td>
<td></td>
</tr>
</tbody>
</table>

Emotion Regulation Strategy

|                      | .20  | .08            | .82  | 158  |    |

Emotion Regulation Strategy x Intensity

|                      | .344 | .10            | .71  | 158  |    |

Choice condition: Skin conductance difference by instructed emotion regulation strategy and picture intensity.

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>.079 (.184)</td>
<td>.195 (.222)</td>
<td>.001</td>
<td>-4.81</td>
<td>77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>.076 (.115)</td>
<td>.119 (.252)</td>
<td>.14</td>
<td>1.49</td>
<td>79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Intensity

|                      | 13.15 | .95            | .001 | 77   |    |

Emotion Regulation Strategy

|                      | 6.51  | .71            | .01  | 77   |    |

Emotion Regulation Strategy x Intensity

|                      | 5.86  | .67            | .05  | 77   |    |

Low Intensity: Reappraisal vs. Distraction

|                      | .83   | -.22           | .77  |    |

High Intensity: Reappraisal vs. Distraction

|                      | .01   | -3.1           | .79  |    |
Corrugator. In order to test the hypothesis that use of the emotion regulation strategy of distraction would produce a reduced physiological response to the pictures when compared to the use of reappraisal, a repeated measures ANOVA was performed on the corrugator data from each condition. A main effect of picture intensity was revealed, but no main effect of instruction and no interaction of the two. (Please see Table 10 for statistical information.) Overall, corrugator activity was greater when picture intensity was high compared to low picture intensity, but contrary to my hypothesis, corrugator activity did not differ between the instructed conditions. (Please see Figure 16a for results by picture intensity and 16b for results by emotion regulation strategy.)

![Corrugator response by picture intensity and instructed emotion regulation strategy](image)

*Figure 16a.* Instructed condition: Corrugator mean difference as a function of emotion regulation choice and picture intensity. Error bars represent standard error for measure. Corrugator mean difference was greater for high picture intensity.
Figure 16b. Instructed condition: Corrugator mean difference as a function of emotion regulation choice and picture intensity. Error bars represent standard error for measure. Corrugator mean difference was greater for high picture intensity.

To test the hypothesis for the choice condition a parallel repeated measures ANOVA was performed. Contrary to my hypothesis, this analysis revealed no main effect of emotion regulation choice, or picture intensity, and no significant interaction between choice and intensity. (See Table 10 for statistical data.)
Table 10
*Instructed condition: Corrugator mean difference in μV by emotion regulation strategy and picture intensity.*

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>-.0818 (.048)</td>
<td>.1943 (.232)</td>
<td>.23</td>
<td>-1.18</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>-.2176 (.101)</td>
<td>.0702 (.096)</td>
<td>.05</td>
<td>-2.29</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>View</td>
<td>.0345 (.049)</td>
<td>.0749 (.075)</td>
<td>.77</td>
<td>-.30</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td></td>
<td></td>
<td>4.48</td>
<td>.55</td>
<td>.05</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Emotion Regulation Strategy</td>
<td></td>
<td></td>
<td>.73</td>
<td>.17</td>
<td>.48</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Emotion Regulation Strategy x Intensity</td>
<td></td>
<td></td>
<td>.851</td>
<td>.19</td>
<td>.43</td>
<td>150</td>
<td></td>
</tr>
</tbody>
</table>

*Choice condition: Corrugator mean difference by emotion regulation strategy and picture intensity.*

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>-.009 (.1)</td>
<td>.3557 (.3)</td>
<td>1.75</td>
<td>.26</td>
<td>.19</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>-.1279 (.4)</td>
<td>-.2047 (.2)</td>
<td>1.27</td>
<td>.20</td>
<td>.26</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td></td>
<td></td>
<td>1.75</td>
<td>.26</td>
<td>.19</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>Emotion Regulation Strategy</td>
<td></td>
<td></td>
<td>1.27</td>
<td>.20</td>
<td>.26</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>Emotion Regulation Strategy x Intensity</td>
<td></td>
<td></td>
<td>.69</td>
<td>.13</td>
<td>.41</td>
<td>77</td>
<td></td>
</tr>
</tbody>
</table>
**Hypothesis 4:** Sheppes et al. (2011) indicated impaired memory for emotional content when distraction was chosen relative to reappraisal. It was hypothesized that the current study would replicate this finding: memory for emotional content for negative pictures presented would be impaired following the choice of distraction, relative to the choice of reappraisal. To test this hypothesis, 30 picture pairs from the memory test were compared. The pairs consisted of an originally presented image and a foil, similar in content and emotional intensity. (As shown in Figure 4.) Fifteen picture pairs were high intensity and fifteen pairs were low intensity. For each participant, original pictures were divided into four categories: low intensity picture with distraction selected, low intensity picture with reappraisal selected, high intensity picture with distraction selected, high intensity picture with reappraisal selected. For the pictures in each category, the number of times that both the original picture and its foil were correctly identified was counted and the count was divided by the total number of pictures in the category to arrive at a percentage for the category. In order to compare conditions, the memory counts were then submitted to a 2 (emotion regulation choice) x 2 (intensity) ANOVA. (Please see Tables 11 and 12 for further details regarding statistics and averages of emotion regulation strategy selection by picture intensity.) There was a main effect for emotion regulation choice and intensity, indicating that when people chose distraction memory was not as accurate as when people chose reappraisal and that, collapsed across strategy, memory was better overall (regardless of emotion regulation strategy) for low intensity pictures than high intensity picture. The main effect of choice indicated better memory for the emotion regulation strategy of reappraisal. The ANOVA also revealed an
interaction between instruction and intensity. This would indicated that, memory accuracy was better for low intensity pictures when compared to high intensity picture accuracy. These results support my hypothesis that when people implement distraction memory accuracy decreases. (Please see Figure 17a for results by intensity and 17b for results by emotion regulation strategy.)

![Figure 17a.](image-url)

**Figure 17a.** Memory accuracy as a function of picture intensity and selected emotion regulation strategy. Memory accuracy is indexed by the percentage of pictures per category in which the participant correctly identified both the original picture and the foil. Within each picture intensity, memory accuracy differed significantly as a function of strategy.
Figure 17b. Memory accuracy as a function of picture intensity and selected emotion regulation strategy. Memory accuracy is indexed by the percentage of pictures per category in which the participant correctly identified both the original picture and the foil.
Table 11
Memory accuracy analysis, means and standard deviations for emotion regulation strategy selection in low and high intensity picture presentation.

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>4.39 (2.71)</td>
<td>10.12 (2.39)</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>11.54 (2.76)</td>
<td>5.77 (2.34)</td>
</tr>
</tbody>
</table>

Table 12
Memory accuracy as a function of selected strategy and picture intensity. Means shown reflect the percentage of trials on which the participant correctly identified both the original picture and the foil.

<table>
<thead>
<tr>
<th>Emotion Regulation Strategy</th>
<th>Low Intensity Mean (SD)</th>
<th>High Intensity Mean (SD)</th>
<th>F</th>
<th>Observed Power</th>
<th>Sig</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>.76 (.26)</td>
<td>.68 (.20)</td>
<td>.01</td>
<td>-2.81</td>
<td></td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>.80 (.22)</td>
<td>.80 (.22)</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

Intensity: Distraction vs. Reappraisal 9.04 .84 .001 71
Emotion Regulation Strategy 7.23 .76 .01 71
Emotion Regulation Strategy x Intensity 7.23 .76 .01 71

Low Intensity: Reappraisal vs. Distraction .22 1.25 71
High Intensity: Reappraisal vs. Distraction .001 4.79 76

* The correlation and t cannot be computed because the standard error of the difference is 0.
A primary goal of the current study was to replicate the findings of Sheppes et al. (2011), which found that when participants were asked to choose between reappraisal and distraction as strategies to regulate their emotional response to negative pictures, they were more likely to choose distraction for pictures of high intensity. Consistent with that finding, in the current study, participants chose distraction over reappraisal 64% of the time when viewing high-intensity, negative pictures. In contrast, participants viewing low-intensity, negative pictures chose distraction over reappraisal only 27% of the time. A second goal of the current study was to extend the work of Sheppes et al. (2011), investigating how the emotion regulation strategy used in picture viewing impacts how the pictures are processed, experienced, and remembered.

**Picture processing: View Time Results.** Differences in attentional deployment to the pictures was examined by comparing patterns of picture viewing associated with each emotion regulation strategy. Each of the major findings is summarized below.

The instruction phase of the study allowed us to compare attentional deployment patterns when participants were instructed to use a specific emotion regulation strategy versus to view the picture naturally. We found that participants spent more time viewing the high emotion areas of the pictures in the view naturally condition compared to either the distraction or reappraisal conditions. This finding suggests that when participants did not use an emotion regulation strategy they spent more time viewing the high emotion area of pictures presented.
In comparing the instructed reappraisal and instructed distraction conditions, we found that when people were instructed to use reappraisal, they spent more time viewing the high emotion area of pictures when compared to distraction. Additionally in the instructed condition, participants had more visits in the high emotion area when instructed to reappraise when compared to distraction. This finding suggests that people view high emotion areas longer and look at them more frequently when instructed to reappraise than when instructed to distract.

Lastly, when examining data from the choice phase of the study and comparing the selected reappraisal to the selected distraction trials, we found that when participants chose to use reappraisal, they viewed the high emotion area for a longer period of time and had more visits in the high emotion area, similar to the instructed condition. However, with visits in the high emotion area there was also an effect of picture intensity, indicating greater observations for high intensity pictures. This suggests that regardless of whether the emotion regulation strategy is chosen or instructed, attentional deployment in these strategies is similarly used.

**Picture Experience: Physiological Responses.** Differences in skin conductance and corrugator responses to the pictures was examined by comparing patterns of response associated with each emotion regulation strategy. Each of the major findings is summarized below.

Corrugator response, which is considered a measure of outward affect, was found to be higher for high-intensity pictures, but did not differ as a function of emotion regulation strategy.
Skin conductance response, which is considered a measure of autonomic arousal, was found to be higher for high-intensity pictures overall. In addition, results from the choice phase indicated that for high-intensity pictures, skin conductance responses to the pictures were higher when participants chose distraction than when they chose reappraisal. This suggests that high intensity pictures lead to increased physiological arousal. It also indicates that when a person chooses to use distraction with high intensity stimuli, their physiological arousal is higher than when compared to the choice of reappraisal. This suggests differences in autonomic response when emotion regulation strategy is instructed when compared to when emotion regulation strategy is chosen.

**Picture Experience: Picture Ratings.** Participants rated valence (negative or positive) and arousal (level of excitement) of pictures differently when instructed or choosing different emotion regulation strategies. When instructed, participants rated high intensity pictures as more negative than low intensity. Notably in the high intensity picture condition, participants rated the view and reappraisal conditions as similarly negative. The pattern for arousal indicated that high intensity pictures were rated as more arousing than low intensity pictures. However, within intensity, differences were only noted in the low intensity pictures for reappraisal vs. distraction, and view vs. distraction conditions. This suggests that in the low intensity condition, when people were instructed to use reappraisal and view, they self-reported rating pictures as less arousing than when they were instructed to distract. This pattern was different in the high intensity condition, as when people were instructed to use reappraisal they self-reported rating the pictures as more arousing than the distraction condition.
In the choice condition, data indicate that when participants chose to use reappraisal, they rated pictures as less negative and less arousing when compared to the choice of distraction. These data suggest differences in affectual experience as self-reported by valence and arousal between the instructed and choice conditions. The ratings data suggest that when reappraisal was used, participants found pictures presented as less negatively valenced and less arousing when compared to pictures where participants used distraction. This suggests the benefit of using reappraisal as an emotion regulation strategy as negatively valenced stimuli appears to be perceived differently than when distraction is implemented. However, it is important to note that although these differences in the ratings data were statistically significant, the differences were extremely small and likely do not indicate clinically significant differences in our sample.

**Picture memory.** To examine the impact of emotion regulation strategy on memory, we constructed a memory test using pictures from the choice phase of the study and a set of foils that were similar in content. Memory accuracy was indexed by the percentage trials in which both members of a picture pair (presented and foil) were correctly identified. We found that memory accuracy was higher when people chose to use reappraisal. The reverse was true for memory accuracy when people chose distraction. This finding suggests that the use of reappraisal results in improved memory accuracy.

**Conclusions.** Together, the findings of the current study suggest that the intensity of an emotional stimulus impacts the strategy chosen for regulating the emotional response to that stimulus, consistent with the work of Sheppes et al. (2011). The results also suggest that the strategies of reappraisal and distraction have different consequences.
in terms of how emotional stimuli are processed, experienced, and remembered. In the current study, when reappraisal was instructed or selected, it resulted in increased viewing of high emotion area of stimuli presented (view time pattern), more observations of the high emotion area, and better memory accuracy (memory result). When instructed to use either reappraisal or distraction, the strategy had no impact on the physiological response to the pictures, for either the skin conductance or corrugator measures. However, when participants were allowed to select their strategy, selection of reappraisal resulted in a reduced skin conductance response to high intensity pictures compared to distraction, but did not affect the corrugator response to the pictures. Processing as measured by viewing time is similar to previous research findings that when reappraisal is used, participants view high emotional areas for a longer time (Bebko et al., 2011). When distraction was instructed or selected, it resulted in decreased viewing of high emotion area of stimuli presented and decreased memory accuracy. The finding that skin conductance responses were higher when participants chose to use distraction to process high intensity pictures suggests that this strategy was not effective in reducing the physiological impact of the picture.

Figures 18a and 18b show the overall pattern of results for each of the independent variables in this study as a function of selected emotion regulation strategy. Figure 18a shows the overall pattern for the high intensity picture condition and Figure 18b shows the pattern for the low intensity picture condition.
**Figure 18a.** A summary of results for significant independent variables as a function of selected emotion regulation strategy in the high intensity picture condition.
Figure 18b. A summary of results for independent variables as a function of selected emotion regulation strategy in the low intensity picture condition.

The results of our ratings data suggest differences in how people experienced the pictures presented them depending on both condition and strategy. Interestingly, the ratings are consistent when emotion regulation strategy is chosen, but not when the strategy is instructed. When people chose to use reappraisal, they self-rated their experience as less negative and less arousing compared to the choice of distraction. This suggests that when people choose to use the emotion regulation strategy of reappraisal, their experience of it is not as negative as when they choose to use the strategy of distraction. When our participants viewed high intensity pictures in the choice condition, and they chose to use distraction, it increased autonomic arousal. This suggests that when distraction is chosen to be implemented, people experience higher arousal.
physiologically, and experience the pictures as being more negative and more arousing when compared to the choice of reappraisal.

While the processing and memory data observed in the current study are consistent with other studies (Bebko et al., 2011; Sheppes et al., 2011), the current study’s findings with regard to physiological experiences are not. For example, Sheppes et al. (2009) reported greater skin conductance response when reappraisal was used as compared to distraction. The reverse was observed in the current study. Previous research also suggests that when emotion regulation strategies are instructed there is a clearer outward affectual response depending on the strategy used, as measured by corrugator (Urry, 2010). However, this was not the case in the current study. We found only that high intensity pictures were associated with a higher response than lower intensity pictures. While this finding makes sense, specifically higher intensity negative stimuli impacting outward facial affect, it does not explain our result. It may have to do with the training that we provided our participants not being similar enough to the other studies presented or possible differences in the categories of stimuli presented. In the current study our picture categories were negatively valenced and participants were given instructions to use distraction or reappraisal whereas in many other published studies of emotion regulation, emotion regulation instructions were different (e.g. reappraisal, suppression) and stimuli were mixed (e.g. neutral, negative).

Early research on emotion regulation reported that the emotion regulation strategy of reappraisal was positively correlated to better mental health, quality of life, and well being (Gross & John, 2003). Similarly, our study highlighted better memory accuracy, processing, and reduced experience of valence, arousal, and autonomic responding
through the use of reappraisal when compared to distraction. Along the same lines, previous research often compared different emotion regulation strategies to reappraisal and provided evidence that reappraisal aided people better in the moment and long-term, resulting in better mood, less activation in the body, and improved health (Denson et al., 2011; Garnefski & Kraaij, 2009; Gross & John, 2003; Joorman & Gotlib, 2010; Mauss et al., 2007; Richards & Gross, 1999; Richards & Gross, 2000; Shiota & Levenson, 2009; Shiota & Levenson, 2011; vanOyen et al., 2011). In fact, it has been indicated that positive reappraisal is often reported as a primary emotion regulation strategy in people who are not diagnosed with a mental disorder (Garnefski, van den Kommer et al., 2002). This emotion regulation strategy is an integral component of Cognitive Behavior Therapy (CBT), a therapy recommended widely as the most efficacious treatment for mental health diagnoses such as Major Depressive Disorder (MDD) and Generalized Anxiety Disorder [(GAD); Barlow, 2007]. The act of reappraising has been found to be such an important coping mechanism for mood disorders, that CBT has expanded into other, more specific treatments including Cognitive Processing Therapy (CPT), a treatment provided at most Veterans Affairs Hospitals for Post Traumatic Stress Disorder (PTSD), CBT for insomnia, and CBT- for chronic pain (Barlow, 2007). All of these treatments include the element of examining thought patterns in order to challenge thinking with the goal of teaching the patient to positively reappraise (or not so negatively evaluate) thoughts regarding events in their life. In contrast, other research has reported benefits of attentional deployment strategies, specifically distraction (Kanske et al., 2010; Nolen-Hoeksema & Morrow, 1993; McRae et al., 2009; Sheppes et al., 2009) that include improved mood and less physiological response when compared to reappraisal. Recent
research suggests that choosing distraction over reappraisal when faced with high intensity stimuli is an adaptive coping mechanism and was positively associated with fireman experiencing decreased PTSD symptoms (Levy-Gigi et al., 2015), calling this preference as “regulatory choice flexibility.” Similar research suggests “regulatory choice flexibility” is positively correlated with well-being in an older population when presented with high intensity stimuli (Scheibe, Sheppes, & Staudinger, 2015). This study also notes the preference to choose distraction over reappraisal is negatively associated with cognitive resources in both an older and younger population. This recent research suggests an alternate viewpoint of distraction, suggesting significant benefits of this strategy when compared to reappraisal.

The current study indicates that distraction is more often chosen with high intensity negative stimuli. The data also suggest that using distraction increases memory inaccuracy and leads people to rate situations as more arousing and negative. Additionally, when people are exposed to high intensity negative stimuli (when people are more likely to chose distraction), they experience greater physiological arousal. None of the aforementioned appear to be a long term benefit of the use of this attentional deployment strategy for emotion regulation. Recent research suggests that choosing distraction over reappraisal for high intensity stimuli is adaptive. However, for individuals such as first responders, soldiers, or medical workers, who are more frequently exposed to high intensity negative events, knowledge of the possible consequences becomes important. It is these individuals, in addition to people exposed to traumatic events, who stand to suffer due to the possible development of mood disorders because of these traumatic events. Data from the current study suggest greater
physiological arousal, decrease in memory accuracy, and an increase in negative perception of high intensity negative stimuli. Soldiers in the military do not always appropriately recover from traumatic events and develop PTSD, as do some women and men who are victims of rape, violent crimes, or disasters. Not surprisingly, these individuals often have difficulties with memories of the event and will avoid situations or thoughts relating to the event, symptoms that perpetuate PTSD (American Psychiatric Association, 2013). Further research would be necessary in order to examine if “regulatory choice flexibility” has increased benefits in spite of the negative consequences the data from this study suggests. Further examination of emotion regulation choices are important in order to better understand the benefits and detriments of all emotion regulation strategies.

**Strengths of the current study.** This study included a condition in which participants were allowed to select which emotion regulation strategy to implement, which allowed us to compare the effects of a participant-selected strategy to an experimenter-instructed one. The choice condition may reveal a more natural response pattern similar to what occurs in everyday life. In addition, by using a combination of self-report (affect and picture ratings), behavioral (memory performance) and physiological (corrugator and skin conductance) measures we were able to assess multiple aspects of emotional processing and emotion regulation.

**Limitations.** A major limitation of the current study is that only two emotion regulation strategies were compared. Thus, participants were forced to use one of those two strategies, when many more strategies are available, limiting the scope of our study. We did not ask participants if they may have used additional strategies or check to make
sure they used the strategy they were instructed to or chose. Participants may have responded with demand characteristics due to initially being instructed to reduce the negative emotion that they experienced to stimuli presented with the use or choice of reappraisal or distraction. However, this does not appear likely, as our data indicated different responses in ratings depending on strategy and whether the strategy was instructed or chosen.

This study does not take into account motivation, cognitive ability, or affect, all of which have been indicated to impact successful emotion regulation (Mather & Sutherland, 2014; Opitz et al., 2012; Opitz et al., 2014; Sheppes & Levin, 2013). Motivation of participants most likely varied between the instructed and choice conditions, explaining some of the different patterns that emerged between them. Specifically, the experience of emotion regulation strategy as measured by rated affect (valence and arousal) and skin conductance response. Selecting a strategy, as opposed to being told which strategy to implement, requires different effort, which, in turn, may be impacted by motivation, current mood of the participant, or cognitive ability.

Our study also does not take into account personality characteristics that may play a role in emotion regulation. For example, would personality factors predict viewing patterns, specifically what people look at when presented with negative stimuli? Would anxiety or depression predict how someone chooses to implement emotion regulation when presented with negative stimuli? Is curiosity or information seeking behavior an advantage to reappraising negative stimuli? These personality characteristics may influence a person’s approach to negative stimuli and determine how they process these events day-to-day.
Final summary. This study replicates the findings of Sheppes et al. (2011), that people chose distraction more often with high-intensity stimuli, resulting in decreased memory accuracy for those stimuli. The current results also indicate that when people chose to implement distraction when viewing high intensity stimuli they exhibited higher autonomic arousal. Additionally, it suggests that when people chose to use distraction they experienced the negative pictures as more negative and more arousing than when they chose reappraisal. These findings suggest that the strategy of distraction has consequences, that are not helpful for processing negative events when compared to the use of reappraisal. However, the finding that distraction is implemented more often with high intensity events, suggests the need for future research on how to improve the rate of implementation of reappraisal or on how to reduce the negative consequences (memory, physiological arousal, perceived affect: valence and arousal) of the use of distraction. Future research should consider these elements in addition to mood, motivation, and cognitive ability of the sample. Additionally, considering the differences noted in some processes (i.e., autonomic, affectual ratings), consideration should be given to the experimental paradigm, allowing individuals to choose between strategies in order to assess the process in a more natural manner. Individuals such as first responders, medical workers, and soldiers who are confronted with negative events with greater frequency could benefit from this research, in addition to individuals who suffer from traumatic events, due to possible negative consequences that may result in difficulty remembering the event and increased experience (both affectually and autonomic) of the event.
APPENDIX A

*IAPS Pictures from Sheppes, et al., 2011*

**Low Intensity:** 1301, 2278, 2312, 2490, 2691, 2700, 6010, 6190, 6836, 7360, 9102, 9120, 9160, 9440, 9470.

**High Intensity:** 2053, 2800, 3000, 3068, 3140, 3150, 3180, 3230, 3261, 3530, 6831, 9181, 9252, 9410, 9420.
APPENDIX B

CERQ
© Garnefski, Kraaij & Spinhoven, 2001

How do you cope with events?
Everyone gets confronted with negative or unpleasant events now and then and everyone responds to them in his or her own way. By the following questions you are asked to indicate what you generally think, when you experience negative or unpleasant events.

1. I feel that I am the one to blame for it
2. I think that I have to accept that this has happened
3. I often think about how I feel about what I have experienced
4. I think of nicer things than what I have experienced
5. I think of what I can do best
6. I think I can learn something from the situation
7. I think that it all could have been much worse
8. I often think that what I have experienced is much worse than what others have experienced
9. I feel that others are to blame for it
10. I feel that I am the one who is responsible for what has happened

(1) almost never (2) sometimes (3) regularly (4) often (5) almost always
<p>| | | | | | |</p>
<table>
<thead>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>11. I think that I have to accept the situation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. I am preoccupied with what I think and feel about what I have experienced</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. I think of pleasant things that have nothing to do with it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. I think about how I can best cope with the situation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. I think that I can become a stronger person as a result of what has happened</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16. I think that other people go through much worse experiences</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17. I keep thinking about how terrible it is what I have experienced</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18. I feel that others are responsible for what has happened</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19. I think about the mistakes I have made in this matter</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20. I think that I cannot change anything about it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21. I want to understand why I feel the way I do about what I have experienced</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22. I think of something nice instead of what has happened</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23. I think about how to change the situation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24. I think that the situation also has its positive sides</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>25. I think that it hasn’t been too bad compared to other things</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>26. I often think that what I have experienced is the worst that can happen to a person</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>27. I think about the mistakes others have made in this matter</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>28. I think that basically the cause must lie within myself</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>29. I think that I must learn to live with it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
30. I dwell upon the feelings the situation has evoked in me 1 2 3 4 5
31. I think about pleasant experiences 1 2 3 4 5
32. I think about a plan of what I can do best 1 2 3 4 5
33. I look for the positive sides to the matter 1 2 3 4 5
34. I tell myself that there are worse things in life 1 2 3 4 5
35. I continually think how horrible the situation has been 1 2 3 4 5
36. I feel that basically the cause lies with others 1 2 3 4 5

Thank you for filling out the questionnaire!
APPENDIX C

Emotion Regulation Questionnaire (ERQ)

Gross & John  9/03

The Emotion Regulation Questionnaire is designed to assess individual differences in the habitual use of two emotion regulation strategies: cognitive reappraisal and expressive suppression.

Instructions and Items

We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale:

1-----------2-----------3-------------4-------------5-------------6------------7
strongly disagree neutral strongly agree

1. _____ When I want to feel more positive emotion (such as joy or amusement), I change what I’m thinking about.

2. _____ I keep my emotions to myself.

3. _____ When I want to feel less negative emotion (such as sadness or anger), I change what I’m thinking about.

4. _____ When I am feeling positive emotions, I am careful not to express them.

5. _____ When I’m faced with a stressful situation, I make myself think about it in a way that helps me stay calm.
6. _____ I control my emotions by *not expressing them*.

7. _____ When I want to feel more *positive* emotion, I *change the way I’m thinking* about the situation.

8. _____ I control my emotions by *changing the way I think* about the situation I’m in.

9. _____ When I am feeling *negative* emotions, I make sure not to express them.

10. _____ When I want to feel less *negative* emotion, I *change the way I’m thinking* about the situation.

**Note**

Do not change item order, as items 1 and 3 at the beginning of the questionnaire define the terms “positive emotion” and “negative emotion”.

**Scoring (no reversals)**

Reappraisal Items: 1, 3, 5, 7, 8, 10; Suppression Items: 2, 4, 6, 9.

**Citation**

REFERENCES


doi:10.1073/pnas.0606552104


doi:10.1097/01.psy.0000245867.92364.3c


Ehring, T., Tuschen-Caffier, B., Schnulle, J., Fischer, S., & Gross, J. J. (2010) Emotion regulation and vulnerability to depression: Spontaneous versus instructed use of


VITA

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Ms. Gessner is a member of the Society for Psychophysiological Research and will aid with the Women In Science Luncheon at the upcoming conference in late August of 2015.