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Turn that Frown Upside-down! The Effectiveness of Opposite Action in Changing Emotion

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Turn that Frown Upside-down! The Effectiveness of Opposite Action in Changing Emotion

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Abstract

While research demonstrates that opposite action (OA) impacts emotion (Rizvi & Linehan, 2005), we lack an understanding of the mechanisms by which it produces opposite emotions. The current study dismantled emotion regulation skill components by comparing tasks with different combinations of cognitive, emotive and behavioral components. I predicted that the OA condition would be the most effective in altering negative emotion. University students (n = 194) completed a sadness induction and were randomly assigned to either a (1) control, (2) low arousal positive imagery (3) high arousal positive imagery, or (4) OA plus high arousal positive imagery condition. The control condition experienced the smallest changes in emotion in the predicted directions across most emotion outcomes, followed by the low arousal positive imagery condition and last, the OA and high arousal positive imagery conditions, which did not tend to differ from each other. Using opposite emotion (valence and arousal) was effective in changing sadness; however, the behavioral component did not change emotion above and beyond the cognitive and emotive components tested. Study conditions were not different in the time they spent persisting on a distressing task. The behavioral component of OA might not be important for emotion change; however, it seems likely that self-reported levels of discomfort and vividness in mental imagery experienced by the OA condition hindered the effectiveness of the behavioral component. This finding could shed light on the importance of building therapeutic rapport to increase comfortability engaging in OA prior to introducing it in psychotherapy.

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Introduction

Carlos is having difficulties pursuing his long-term career goals due to severe bouts of sadness that trigger crying spells and days spent in his bed. After years of unsuccessful attempts to cope with these symptoms on his own and an increase in distress following a recent break-up, he calls a psychological clinic to help him reach his goals. His therapist, Charli, turns to Dialectical Behavior Therapy (DBT; Linehan, 1993) in search for a skill that would be effective for Carlos. Charli searches for empirical evidence supporting a skill called "opposite to emotion action," a commonly used skill for changing strong negative emotions. However, she is disappointed to find very little empirical support. Although clinicians have a wide variety of strategies at their disposal, there is not sufficient research to decipher which skills work in changing unhelpful emotional experiences.

Opposite to emotion action (hereinafter, "opposite action") is an emotion regulation skill. The user of this skill carries out an action that is associated with an opposing emotional experience (Linehan, 2015). In using opposite action, individuals are asked to first identify their current emotional state, then to identify their natural action tendencies triggered by this emotion, and finally, to determine and engage in the opposite physical actions associated with the natural tendencies (Rizvi & Linehan, 2005). For example, when Carlos feels especially sad, his body gets heavier and he tends to sink into his couch, weep and withdraw from whatever he is doing. Charli has asked him to use opposite action when this happens, by identifying his current emotional state (sadness) and the associated action tendencies (staying home, slumping down into his couch in a contractive posture, avoiding company and crying). He would then identify the emotional experience that is opposite to sadness (happiness) and the action tendencies associated with happiness (be around others, get active, smile, laugh) and engage in those

behaviors. Note however that opposite action does not include the denial or suppression of emotion. Opposite action directs its users to acknowledge their emotional experience and to acknowledge the actions they *want* to take but to choose to act in the opposite manner anyway.

To understand if opposite action is effective, there are several questions to be addressed. First, how does one determine the emotion the opposite action should be associated with? What does it mean to be "opposite" to a given emotion? Second, are the physical movements involved in the opposite action responsible for key changes in emotion? Or alternatively, third, is simply the use of opposite *emotion* effective in altering emotional experience? Is the action piece necessary? And are changes in emotion as a function of the components of the task predictive of persistence on an emotional task requiring self-control?

What is Opposite Emotion?

Among the variety of existing emotion conceptualizations, Russell's (2003) core affect model plots emotions along two dimensions (valence and arousal), where the basic emotions tend to form a circle. See *Figure 1*. Within this framework, each emotion has a corresponding opposite emotion, which is opposite in both valence and arousal. For example, *Figure 1* shows that excitement, which is high in both valence and arousal, corresponds with the opposite feeling of sluggishness, a low valence and arousal emotion. To the contrary, nervousness (low valence, high arousal) corresponds with an opposite feeling of relaxation (high valence, low arousal). Previous research suggests that using opposite valence significantly changes emotion when using skills such as positive imagery (Holmes, Mathews, Dalgleish, & Mackintosh, 2006), exposure therapy (Barlow, 1988), behavioral activation (Lejuez, Hopko, LePage, Hopko, & McNeil, 2001) and incongruent attention allocation (Schwager & Rothermund, 2014), however less research examines the effects of using opposite arousal to change emotion. Viewing emotion through the

lens of the core affect model, I ask whether using both opposite valence *and* arousal increases emotion change (increases in positive or pleasant emotions, decreases in negative affect, and increases in subjective physiological arousal) above and beyond using valence alone.

Action Tendencies

Opposite action requires that its users identify action tendencies (i.e. conditioned behavioral patterns; Chambers, Gullone, & Allen, 2009) associated with their current emotions as well as those associated with an emotion that is opposite to their current experience. Each emotion that we experience is associated with urges to carry out specific actions (Frijda, 2010; Wiers, Reinout, Rinck, Kordts, 2010), which may lead to behaviors such as running away from a tiger when scared or yelling at someone when angry. Happiness brings an urge to approach an object or situation. When feelings of happiness are triggered, some associated natural action tendencies are laughing, smiling, initiating eye-contact, dancing, and expanding into an opened posture. On the other hand, natural action tendencies associated with sadness are isolation and avoidance of social interaction (Yadegarfard, Meinhold-Bergmann, & Ho, 2014; Rizvi & Linehan, 2005) as well as frowning, maintaining an enclosed or contractive posture, and avoiding eye contact.

In fact, theories supporting opposite action rely on the concept of action tendency. Specifically, previous research suggests that there may be a bidirectional causal relationship between emotions and their action tendencies such that emotions trigger action tendencies as well as enhance our emotional experience or prompt new emotions (Barlow, 1988; Linehan, 2015). This conceptualization suggests that someone can interrupt an emotional cycle *and* reverse it by engaging in a behavior that opposes the natural action tendency (opposite to emotion action; Linehan, 1993). When reversing the cycle in this way, the associated opposite

action theoretically blocks the natural tendency and a new relationship between action and emotion is developed and strengthened.

As evidence for the idea that actions can cause emotion, recent work on "Power Posing" supports the theory behind opposite action (Carney, Cuddy, & Yap, 2010; Carney, Cuddy, & Yap, 2015; Dimberg & Soderkvist, 2011). In one study, individuals were instructed to hold one of two postures for two minutes - an open and expansive posture associated with power (i.e. the power posing posture) or a closed and contractive posture associated with powerlessness (Carney et al., 2010). Results of this indicated that the power posing posture caused neuroendocrine and behavioral changes consistent with power (increases in testosterone, decreases in cortisol, and increased feelings of power and tolerance for risk), whereas those instructed to hold the posture associated with powerlessness triggered the opposite effect - feelings of powerlessness ($N = 42$). A recent meta-analysis (Carney, Cuddy, & Yap, 2015) analyzed 33 studies examining the effects of power-posing and found that subjective feelings of power were higher for those adopting expansive, powerful postures in comparison to those adopting contractive, powerless postures in all of the studies. However, they did not find consistent evidence for neuroendocrine differences between the groups. This suggests that if power-posing does cause changes in emotion, it influences subjective feelings. Simmons and Simonsohn (2017) conducted a selective reporting p-curve analysis on all 33 studies to correct for selective reporting and concluded that the current empirical data is too weak to suggest that people should engage in power-posing to improve their lives; however, Carney et al. (2015) posit that there may be certain circumstances in which the effects of power-posing are more robust, suggest that the hypothesis should still be explored.

The Facial Feedback Hypothesis (Strack, Miller, & Stepper, 1988) also supports the idea that behaviors associated with a desired emotion can shift emotions in that direction. The Facial

Feedback Hypothesis proposes that facial expressions (e.g. smiles and frowns) can initiate the respective associated emotions (e.g. happiness and sadness). For example, in one study, participants were instructed to lift their cheeks (smile condition) or contract their eyebrows (frown condition) when exposed to positive stimuli (happy faces or flowers) and negative stimuli (angry faces or snakes; Dimberg & Soderkvist, 2011). Results of this study indicate that participants in the smile condition rated pictures as more pleasant and as less unpleasant than those in the frown condition. In fact, the participant ratings did not change even after a time period of 4 minutes lapsed from the action. This result pattern suggests that these non-verbal displays do indeed interrupt the cycle between emotion and action. In theory and based on this evidence, engaging in an action tendency linked to one's opposite emotion should weaken the vicious cycle between the undesired emotion and the action tendency. Of note, the findings of the original study in support of the Facial Feedback Hypothesis (Strack et al., 1988) failed to be replicated (Wagenmakers, Beek, Dijkhoff, & Gronau, in press), however there are indications that the hypothesis should still be explored. For example, a stronger manipulation than the one used by Strack and his colleagues may have shown significant change in emotion. Also, it may be that there are important moderators, such as attention to emotion that influence the effects of the manipulation (Dzokoto, Wallace, Peters, & Bentsi-Enchill, 2014).

Positive Imagery: A Cognitive Process

Opposite action theoretically uses both action and emotion to modify emotional experiences. The outline of findings above begs the following questions: are the physical movements involved in the opposite action responsible for key changes in emotion? Or is it just the use of opposite *emotion* a more effective pathway leading to the opposite experience? And if

the emotional component is critical, is using an emotion that is opposite in both valence *and* arousal (as defined by Russell's 2-dimensional model) more efficient than using valence alone?

The behavioral component of opposite action distinguishes this skill from other methods that change emotion, such as those changing emotion via cognitive processes. For example, positive mental imagery is another method of eliciting emotion, consisting of a cognitive but not a behavioral component. Mental imagery is a mental activity naturally practiced by most people on a daily basis (Holmes et al., 2006) that can maintain, enhance or change one's current emotional experience. Mental imagery is a cognitive process (conceptualized as thoughts by the elaborated intrusion theory of desire; May, Kavanagh, & Andrade, 2015) that can be defined as an indirect experience of any type of sensory information (sound, sight, touch, taste or smell) when the direct sensory stimulation does not exist (Pictet & Holmes, 2013). Although mental imagery is not inherently an emotion regulation strategy, it can be harnessed in treatment (e.g. imaginal exposure as used in CBT) to promote and enhance specific emotional experiences. This mental process is able to produce emotion change through a strong connection to the amygdala and prefrontal cortex, which become activated while engaging in imagery (Decety, 1996; Frewen, Dozois, Neufeld, Lane, Densmore, Stevens & Lanius, 2010).

There is a long history of research showing the powerful impact of mental imagery on emotion change (Holmes, Lang, Moulds, & Steele, 2008; Holmes, Lang, & Shah, 2009; Holmes & Mathews, 2010; Holmes et al., 2006; Zikmund, 1972) and on a broad variety of mental illnesses (e.g. phobias, depression, generalized anxiety disorders, post-traumatic stress disorder, obsessive-compulsive disorder, stuttering, acute and chronic pain; Pictet & Holmes, 2013; Fernald, 1912). Holmes and colleagues (2009) used a cognitive bias modification for interpretation (CBM-I) task, to show that positive imagery increased positive emotion more than

verbalizing the same positive situation. This evidence supports the idea that imagery is an emotionally evocative tool to increase positive emotion and decrease negative emotion.

Comparing the emotion change elicited by opposite action to that of imagery would allow us to learn whether the action component of opposite action adds anything to other (e.g., cognitive) methods of emotion elicitation.

Are *Both* Valence *and* Arousal Important for Emotion Change?

Past work shows that positive and negative imagery are effective at changing emotion, but we are lacking an understanding of the comparative effects of valence and arousal. We know that valence of imagery is important, as previous studies show positive imagery is more effective than neutral or negative imagery in increasing tolerance to discomfort (Remer, Watson, & Brinly, 1978), in increasing motor performance (Woolfolk, Parrish, & Murphy, 1985), and in changing emotion (Holmes et al., 2006). However, less is known about the impact of the arousal of emotive imagery. If it is truly *opposite* emotion (as defined by Russell's 2-dimensional model) that is at the heart of opposite action, then using an emotion that is associated with the opposite level of arousal should be more effective in changing emotion than merely an emotion different in valence.

Effects of Emotion Change on Goal-Directed Behavior

We also know that emotion regulation impacts goal-directed behavior and self-regulatory efforts (Baumeister, Heatherton & Tice, 1994). Difficulties regulating emotions seen in a variety of disorders has been linked to functional impairment, whereas emotion regulation abilities have been associated with greater achievement (Mennin & Farach, 2007). More specifically, certain emotional experiences seem to mitigate efforts towards accomplishing goals, while others can help cultivate self-regulation and goal-directed behavior (Ratneshwar, Mick & Huffman, 2003).

Tamir (2016) reviewed several studies suggesting that people regulate their emotions in ways that will facilitate goal achievement, even when doing so means they will need to experience unpleasant emotions. For example, participants who were asked to play an aggressive game were motivated to experience unpleasant feelings of anger to facilitate their performance (Tamir, Mitchell, & Gross, 2008). In addition, certain emotional experiences have been linked to greater efforts on tasks requiring self-regulation. For example, strong negative affect may lead to disengagement from goal directed behavior (Carver, Lawrence & Scheier, 1996). One study found that the use of adaptive emotion regulation strategies improved motor performance (quicker reaction time and improved performance accuracy) in comparison to maladaptive emotion regulation strategies (Beatty Fawver, Hancock, & Janelle, 2014); however we don't know whether these differences in goal-directed behavior are a function of emotion change or whether these effects would be seen in other types of goal-directed behavior, specifically and emotion-oriented task requiring self-regulation.

Based on theory and previous research analyzing the role of emotion in pursuing goals, it would make sense that greater increases in positive emotion and decreases in negative emotion (such as should be created via the components of opposite action) would positively influence goal-directed behavior and self-regulatory efforts. Understanding the influence of changes in positive and negative affect as a function of opposite action components on goal-pursuit may elucidate helpful targets to improve deficits in self-regulation for those who need it most.

Current Study

The present study tested the effectiveness of opposite action in changing momentary emotion (increasing subjective valence, arousal, and joviality, while decreasing subjective sadness) as well as the effects of emotion change resulting from opposite action components on

goal-directed behavior. To do this, I compared the effectiveness of a combination of cognitive, emotive and behavioral mechanisms together (opposite action) against that of cognitive and emotive mechanisms (positive imagery) and cognitive components alone (neutral imagery; control condition) in interfering with unwanted emotions (sadness). In addition, there were two positive imagery conditions, one using imagery scenarios that elicit *high* arousal positive emotions and one eliciting *low* arousal positive emotions, allowing us to understand whether arousal is an important component for changing emotion. I predicted that those in the three emotion regulation task conditions would experience greater reductions in subjective sadness and increases in subjective valence, arousal and joviality than the control condition, which does not contain cognitive, behavioral or emotive mechanisms. In addition, it would make sense that the *high* arousal positive imagery condition and the opposite action plus imagery condition (which used the *high* arousal scenarios) would experience greater increases in subjective arousal and joviality and decreases in sadness than those in the *low* arousal positive imagery condition, because the level of arousal that is opposite to the arousal associated with sadness (the anticipated emotional experience at the time of 4 tasks) were induced. I also hypothesized that those in the opposite action (behavioral action plus positive cognitive imagery) condition would experience the greatest reduction in subjective sadness and increase in subjective valence, arousal, and joviality in comparison to the high arousal positive imagery condition because opposite action included a behavioral component to exacerbate the effects of the cognitive and emotive mechanisms. Lastly, I predict that goal-directed behavior would improve as a function of emotion change, such that greater decreases in sadness and increases in valence as a result of each opposite action component would be associated with better performance on a task requiring self-regulation.

Method

Power Analysis

Rizvi, Dimeff, Skutch, Carroll, and Linehan (2011) found a significant decrease in depression symptoms, as measured by the Beck-Depression Inventory after 10 to 14 days of opposite action treatment, $t(21) = 2.69$, $p = .014$, $d = .55$. This effect size of .55 was then converted into a cohen's *f* of .28. G*Power 3.1 software was utilized in order to conduct a power analysis for a one-way, fixed effects ANOVA, in the F tests family. The analysis determined that 144 participants were necessary in order to obtain an effect size of .28, with an alpha level of .05, power of .8, for this 4 groups design. To compensate for missing and invalid data, 194 participants were recruited.

Participants

One-hundred ninety-four male and female undergraduates of the University of Arkansas participated in the study, receiving course credit in an introductory psychology course. Participants with high levels of emotional reactivity in comparison to their peers were recruited in efforts to 1) increase the intensity and duration of emotional reactions to the sadness induction and 2) recruit people similar to those that opposite action was designed to treat (e.g. people with difficulties regulating emotions). Those with high levels of emotional reactivity are shown to be more sensitive to emotional stimuli, demonstrating stronger emotional reactions to a broader range of emotional stimuli that last a longer period of time (Nock, Wedig, Holmberg, & Hooley, 2008). All students in the University of Arkansas psychology subject pool had an opportunity to complete the department pre-screener, which included the Emotional Reactivity Scale (ERS; Nock et al, 2008). Previous work with college populations has typically used a cut-off Emotional Reactivity Scale total score of 30, with healthy controls demonstrating a mean composite ERS

score of 25 and those with a borderline personality disorder diagnosis with a mean composite score of 30 (Nock et al., 2008; Kuo, Fitzpatrick, Metcalfe, & McMain, 2016). In light of these findings, those scoring at or above a 30 were invited to participate in the study.

Measures

Individual Difference Measures.

Depression Anxiety Stress Scale-21. The Depression Anxiety Stress Scale-21 (DASS-21; Henry & Crawford, 2005) is a 21-item self-report measure that assesses depression, anxiety and overall psychological distress in the past week, using a 4-point Likert-type scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much or most of the time*). This version of the scale is shortened from the original 42-item Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995). The DASS-21 demonstrated strong internal consistencies for the Depression ($\alpha = .87$), Anxiety ($\alpha = .77$), and Stress ($\alpha = .81$) subscales and the Total (psychological distress) scale ($\alpha = .92$).

Short Difficulties in Emotion Regulation Scale. The Short Difficulties in Emotion Regulation Scale (SDERS; Bjureberg, Ljotsson, Tull, Hedman, Sahlin, Lundh, Bjarehed, DiLillo, Messman-Moore, Gumpert & Gratz, 2016) is a 16-item self-report measure consisting of six subscales assessing emotional clarity, limited access to emotion regulation strategies, lack of awareness, impulse control difficulties, difficulties engaging in goal-directed behavior, and non-acceptance of emotional responses. The DERS uses a 5-point Likert-type scale ranging from 1(*Almost Never*) to 5 (*Almost Always*). Higher scores indicate more problems regulating emotions. The current study supports previous work suggesting that the measure has strong internal consistency ($\alpha = .85$ for the Total scale)

Emotional Reactivity Scale. The Emotional Reactivity Scale (Nock et al., 2008) was used to measure the degree to which an individual is emotionally reactive for recruitment purposes. The 21-item scale consists of 3 components, assessing sensitivity (ease to which emotions are provoked; 8 items), arousal (the intensity of emotional experiences; 10 items), and persistence (the duration of emotional experiences before returning to baseline). The scale demonstrated strong internal consistency (Cronbach's α = .89) among all 21 items.

PANAS. The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) was used to measure individuals' tendency toward experiencing positive and negative affect. The measure was adapted to indicate levels of positive and negative affect experienced over the past few weeks, using a Likert-type scale ranging from 1 (*slightly or not at all*) to 5 (*extremely*). Both the Positive Affect (Cronbach's α = .89) and Negative Affect (Cronbach's α = .86) subscales demonstrate strong internal consistency in the current study.

State Emotion Measures.

Affect Grid. The present-moment affect grid (Russell, Weiss, & Mendelson, 1989) was used to quickly assess pleasure and arousal. This single item measure asked participants to indicate their present mood by marking one box on the grid, which provides separate pleasure and arousal scores on 9-point scales. Russell et al. (1989) asked participants to rate emotion words, facial expressions and mood in 3 different studies to obtain pleasure and arousal scores which demonstrated strong convergent and divergent validity.

PANAS-X Subscales. Five PANAS-X (Watson & Clark, 1999) subscales were used to measure the degree to which participants felt sad (sad, blue, downhearted, alone, lonely; 5 items; associated with low valence and arousal), jovial (happy, joyful, delighted, cheerful, excited, enthusiastic, lively, energetic; 8 items; associated with high valence and arousal), serene (calm,

relaxed, at ease; 3 items; associated with high valence and low arousal), hostile (angry, hostile, irritable, scornful, disgusted, loathing; 6 items; associated with low valence and high arousal), and fearful (afraid, scared, frightened, nervous, jittery, shaky; 6 items; associated with low valence and high arousal) in the present moment, using an 8-point likert scale, ranging from 0 (*not at all)* to 7 (*extremely)*. These particular emotions were chosen because measuring emotions with distinct levels of valence and arousal allowed us to understand the impact of each emotion regulation task on emotions associated with different combinations of valence and arousal. Across study time-points, the sadness (range for α= .77 - .85), joviality (range for α= .92 - .96; range = .88 to .94), serenity (range for α= .85 - .88), hostility (range for α= .75 - .88), and fear (range for α= .65 - .83) subscales demonstrate good to excellent internal consistency (except for fear at baseline) in the current study, which is similar in prior work (Watson & Clark, 1999). Alphas were lowest at baseline where participants demonstrated less variability in emotions.

Self-Regulation Measure.

Mirror Tracing Persistence Task. To measure goal-directed behavior (time spent persisting on a task that requires self-regulation to work towards a goal) participants completed a revised version of the Mirror Tracing Persistence Task (MTPT; Strong, Lejuez, Daughters, Marinello, Kahler, & Brown, 2003). They were given the goal to trace a star using a computer mouse without going outside of the star's outline on 4 different trials (1 low-difficulty, 1 medium difficulty, and 2 high-difficulty trials). The cursor moved in the opposite direction than the movement of the mouse; moving the mouse to the left caused the cursor to move to the right and moving it up caused the cursor to move downwards. When the cursor moved outside of the star's outline or was stalled for more than 2 seconds an obnoxiously loud buzzer sounded, and the participant had to start again from the beginning of the star. The thickness of the line being

traced will became thinner and thinner as participants move through the trials, making it more and more difficult to keep the cursor in the outline. The 4th trial was the key trial, because participants were given the option to quit; the amount of time until the participant quit was the central measure of distress tolerance in this task. Of note, the task ended after 5 minutes when participants did not choose to forfeit.

This task has received support for convergent validity as it has been shown to be correlated with another behavioral task designed to measure distress tolerance (Paced Auditory Serial Addition Task; Lejuez, Kahler, & Brown, 2003). This task has also received support for construct validity as it has demonstrated that it reliably induces distress (Bornovalova et al., 2008; Lejuez et al., 2003).

Emotion Regulation Task Manipulation Checks. At the end of each session all participants were asked questions to understand the degree to which they implemented the task. Each group was asked to rate their assigned task on a 5-point Likert-type scale, indicating how pleasant they experienced each portion the task to be (each scenario or portion of the day written about), how vivid their mental images were, and how engaged they were in the task, ranging from 1 (*extremely unpleasant [not vivid at all] completely disengaged*) to 5 (*extremely pleasant [extremely vivid] completely engaged*). They were also be asked, whether they maintained imagery and carried out the task at hand for the duration of the task (*yes or no*) and how comfortable they were in completing the task, ranging from 1 (*extremely uncomfortable*) to 5 (*extremely comfortable*).

Procedure

The University Institutional Review Board approved study procedures. Upon arrival to their individual session, the subjects read and signed the study's consent form. Following

consent, each participant was asked to act out a scenario described by the experimenter to 1) promote comfortability and engagement in the opposite action task completed by those in the opposite action plus positive imagery condition and 2) expedite the process of giving instructions for this task after an emotion induction (which is a time-sensitive time-point during the study). Participants listened to a recording, while acting out the overt behaviors italicized below.

> "You've just arrived home after staying late at work, you *open the refrigerator*, looking for something to eat. You *grab the carton of milk, sandwich bread and cheese and lunch meat packag*e. Then you *open up the cupboard* and *grab a cup and plate*. You *twist off the lid of the milk, fill the glass with milk* and *open the packages of bread, cheese and meat*. Next you *place the cheese and turkey on the bread*. You proceed to *drink the milk* and *eat the sandwich* while standing at the counter. It's late, so you make your way to the bathroom where you begin to *brush your teeth*. After you brush your teeth, you *wash your face*. You slip into you're overstuffed chair, *sinking down* into the chair like a rock. You *pick up the book* on the end table next to you. You *read*, relaxing before going to bed, *turning the page* every few minutes."

As a cover story, participants were told that our bodies and are minds are connected and this task will allow us to learn how arbitrary physical movements influence our physiology. Following this task, participants were provided blood oxygen levels using a fingertip pulse oximeter to support the cover story. Next, participants completed measures of depression and anxiety (DASS-21; Henry & Crawford, 2005), emotion dysregulation (DERS; Gratz & Roemer, 2004), distress tolerance (DTS; Simons & Gaher, 2005), and tendency towards experiencing positive and negative affect (PANAS; Watson et al., 1988) to control for the effects of these constructs on participants' changes in emotion. Following this, participants used the Affect Grid (Russell et al., 1989) and the selected PANAS-X (Watson & Clark, 1999) subscales to indicate their present emotional experience.

As a sadness induction, each participant then viewed 3 consecutive movie clips from "My Girl" (Grazer, Caracciolo, Friendly, & Zieff, 1991), "The Lion King" (Hahn, Minkoff, & Allers, 1994) and "The Champ" (Lovell & Zeffirelli, 1979), which have been shown to successfully

induce negative emotions (Gotlib, Traill, Montoya, Joormann, & Chang, 2005; Gross & Levenson,1995). To keep experimenters blind from the participant's condition up to this point, experimenters randomly assigned the participant to one of 4 conditions during the induction. Following the sadness induction, participants completed the Affect Grid (Russell et al., 1989) and PANAS-X (Watson & Clark, 1999) for a 2nd time. Next, participants completed the emotion regulation task they were randomly assigned to: either an opposite action plus positive imagery, high arousal positive imagery, low arousal positive imagery, or control condition (these tasks are described further in the next section). Following these tasks, all participants completed the PANAS-X (Watson & Clark, 1999) and the Affect Grid (Russell et al., 1989) for the 3rd time. Then participants were given instructions for completing the mirror tracing persistence task (MTPT; Strong et al., 2003) and completed the task independently. After the MTPT (Strong et al., 2003), all participants completed the state emotion measures (Affect Grid; Russell et al., 1989; PANAS-X; Watson & Clark, 1999) for the 4th and final time. Following this, all participants were asked the questions in the "Emotion Regulation Task Manipulation Check" section above. Finally, participants were fully debriefed. After each session, participants were granted 1 research credit to compensate them for their time. See *Figure 2* for an overview of the study timeline.

Control Condition. Participants assigned to the control condition received instructions to listen to and imagine 3 emotionally neutral imagery scenarios. These individuals imagined neutral scenarios that were recorded in the 1st person perspective, (previous research has demonstrated more robust effects with the use of 1st person in comparison to 3rd person in positive imagery; Holmes, Blackwell Raes, Renner & Raes, 2016). Participants in each condition were presented with the recorded scenarios via a computer using speakers, with recordings of the

positive events read in a female voice (clips last approximately 1 minute each). See *Table 1* for examples.

Low arousal positive imagery task. Participants assigned to the low arousal positive imagery condition received instructions to listen to descriptions of 3 imagery scenarios associated with *low* arousal, positive emotions (contentment/serenity), while imagining each recording. These individuals imagined positive *low* arousal scenarios. See *Table 1* for examples.

High arousal positive imagery task. 40 participants assigned to the high arousal positive imagery condition received instructions to listen to descriptions of 3 imagery scenarios associated with *high* arousal, positive emotions, while imagining each recording. These individuals then imagined positive *high* arousal scenarios, which were recorded in the 1st person perspective similar to the low arousal positive condition except designed to elicit excitement (high arousal). See *Table 1* for examples.

Opposite action plus positive imagery task: Procedure and materials. Participants assigned to the opposite action plus positive imagery condition received instructions to complete an opposite action task, while imagining the same 3 scenarios used in the high arousal imagery condition. Participants in this condition were instructed to imagine and act out the parts of each scenario that refer to overt behavior (the italicized words in the example below [e.g. such as sitting upright on the edge of their seat in anticipation and jumping up and down, while waving their hands back and forth]).

> "You bought 10 tickets for the power-ball lottery with high hopes of winning $1,000,000. Drawing day has arrived and you are sitting in front of the TV beside your best friend. *You are sitting on the edge of your seat excitedly waiting for the last number to be called*. The first 4 numbers have been called out and they match with your lottery ticket. *You smile and sit-up even higher in your seat.* The last number is called and it matches your ticket! *You begin jumping up and down. You continue jumping, waving your ticket back and forth.* Your best friend joins in, excitedly waving her ticket back and forth, while jumping up and down."

Results

Emotion Induction: Did it Cause Changes in Emotion?

Changes in valence and arousal. To understand effects of the emotion induction on emotional valence and arousal, I conducted two by four mixed factor ANOVAs, with time (baseline and pre-regulation task) as the within subjects factor and condition (control, PA-Low, PA-High and Opposite Action) as the between subjects factor. Although randomization to condition did not occur until after the induction, the function of including condition in these analyses was to confirm that conditions did not differ in their emotional responses to the induction. As predicted, the emotion induction caused significant changes in Valence, $F(1, 167) = 315.64$, $p < .001$, and Arousal, $F(1, 167) = 12.47$, $p = .001$, such that both Valence ($M_{T1} = 5.80$, $SD_{T1} = 1.86$; $M_{T2} = 3.07$, $SD_{T2} = 1.46$) and Arousal ($M_{T1} = 4.60$, $SD_{T1} = 1.71$; $M_{T2} = 4.08$, $SD_{T2} = 1.60$) decreased following the induction (see Figure 3). Because emotional experiences prior to the emotion regulation task likely play an important role in the effects of the emotion regulation task, it is important to understand whether there were differences in emotion across groups prior to the regulation task. Lack of differences in emotional valence and arousal following the induction would suggest that people were successfully randomly assigned to groups on these factors. As expected, there were not time by condition interactions for either Valence, $F(3, 167) = 1.74$, $p = .16$, or Arousal, $F(3, 167) = .40$, $p = .78$, suggesting that emotional valence and arousal after the induction were not different across groups and that randomization was successful.

Changes in specific emotions. To learn whether the emotion induction produced changes in specific emotions and to ensure that there were no differences in emotion based on randomization to groups, five additional two (time) X four (condition) mixed factor ANOVAs

were conducted. The emotion induction caused significant changes in Joviality, $F(1, 168) = 331.87$, $p < .001$], Serenity [$F(1, 168) = 206.37$, $p < .001$], Fear [$F(1, 168) = 6.13$, $p = .01$], Hostility [$F(1, 168) = 53.11$, $p < .001$] and Sadness [$F(1, 168) = 254.68$, $p < .001$]. Specifically, Joviality ($M_{T1} = 2.38$, $SD_{T1} = .89$; $M_{T2} = 1.37$, $SD_{T2} = .50$) and Serenity ($M_{T1} = 3.54$, $SD_{T1} = 1.03$; $M_{T2} = 2.41$, $SD_{T2} = .97$) decreased and Fear ($M_{T1} = 1.38$, $SD_{T1} = .43$; $M_{T2} = 1.48$, $SD_{T2} = .58$) Hostility ($M_{T1} = 1.20$, $SD_{T1} = .37$; $M_{T2} = 1.49$, $SD_{T2} = .60$) and Sadness ($M_{T1} = 1.58$, $SD_{T1} = .78$; $M_{T2} = 2.57$, $SD_{T2} = .80$) increased following the induction (pre-regulation task; see Figure 2). There were not time by condition interactions for Joviality [$F(3, 168) = 1.48$, $p = .22$], Serenity [$F(3, 168) = .39$, $p = .78$], Fear [$F(3, 168) = 1.89$, $p = .13$], Hostility [$F(3, 168) = 1.00$, $p = .40$] or Sadness [$F(3, 168) = .33$, $p = .81$], further suggesting that each condition experienced similar changes in emotion due to the emotion induction. See Figure 4 for pre- to post-induction changes in specific emotions.

Differences in Emotion Post-Emotion Regulation Tasks

Valence and arousal. To understand whether the emotion regulation tasks produced changes in emotional valence and arousal and to understand relative differences across conditions, two, time (pre- and post-emotion regulation task) by condition ANOVAs were conducted. Because the prior analyses confirmed that there were no differences in emotion following the induction (i.e., pre-regulation task), follow-up tests for significant interactions were conducted by comparing groups on emotional level following the emotion regulation task. This approach to follow-up testing allowed us to determine whether there were differences in post-regulation task emotion (in these cases, valence and arousal) to demonstrate whether emotional changes produced by the various emotion regulation tasks were different across groups.

Valence. A main effect for time was found for Valence [$F(1, 167) = 530.60$, $p < .001$, $\eta^2_p = .76$], such that Valence ($M_{T2} = 3.07$, $SD = 1.46$; $M_{T3} = 6.90$, $SD = 1.62$) increased after completing the emotion regulation tasks. There was also an interaction between condition and time for Valence, $F(3, 167) = 3.18$, $p = .03$, $\eta^2_p = .05$. Post-hoc tests comparing conditions for valence after the emotion regulation task revealed that the PA-High and PA-Low conditions experienced higher emotional valence post-regulation task than the control and the OA conditions. The control and OA conditions did not differ post-regulation task nor did the PA-high and PA-low conditions differ from each other post-regulation task.

Arousal. A main effect for time was also found for Arousal [$F(1, 167) = 38.19$, $p < .001$, $\eta^2_p = .19$], such that Arousal ($M_{T2} = 4.08$, $SD = 1.60$; $M_{T3} = 5.06$, $SD = 2.12$) increased after completing the emotion regulation tasks. There was an interaction between condition and time for Arousal, $F(3, 167) = 21.82$, $p < .001$, $\eta^2_p = .28$. Specifically, the PA-High and opposite action conditions, which did not differ from one another, reported higher arousal following emotion regulation task than the control and PA-Low conditions, which also did not differ from one another (see Figure 5).

Specific emotions. To understand whether the emotion regulation tasks produced changes in specific emotions and whether these changes were different across conditions, five time (pre- and post-regulation task) by condition ANOVAs were conducted. Significant interactions were followed up (using Bonferroni post-hoc tests) by looking at differences in post-regulation task emotions across conditions, because there were no differences in emotions prior to the task.

Joviality. A main effect for time was found for Joviality [$F(1, 168) = 299.53$, $p < .001$, $\eta^2_p = .64$], such that Joviality ($M_{T2} = 1.37$, $SD = .50$; $M_{T3} = 2.65$, $SD = 1.10$) increased after

completing the emotion regulation tasks. There was an interaction between condition and time for Joviality, $F(3, 168) = 11.41$, $p < .001$, $\eta^2_p = .19$. Specifically, Bonferroni post-hoc tests revealed that those in the PA-high condition had higher joviality post-regulation task than those in the PA-Low condition, which in turn had higher post-regulation task joviality than the control condition. Importantly, PA-High and Opposite Action did not differ in post-regulation task joviality (see Figure 4).

Serenity. A main effect for time was found for Serenity [$F(1, 168) = 105.07$, $p < .001$, $\eta^2_p = .39$]. Serenity ($M_{T2} = 2.41$, $SD = .97$; $M_{T3} = 3.16$, $SD = 1.13$) increased after completing the emotion regulation tasks. There was an interaction between condition and time for Serenity, $F(3, 146) = 28.27$, $p < .001$, $\eta^2_p = .37$. As predicted, those in the PA-Low condition experienced higher levels of serenity after the regulation task than all 3 other conditions. The control group, which had the second highest level of serenity, was higher in serenity than the PA-High condition, which was in turn higher than the opposite action condition (see Figure 4).

Fear. A main effect for time was found for Fear [$F(1, 168) = 26.61$, $p < .001$, $\eta^2_p = .14$], such that Fear ($M_{T2} = 1.48$, $SD = .58$; $M_{T3} = 1.27$, $SD = .39$) decreased after completing the emotion regulation tasks. There was an interaction between condition and time for Fear, $F(3, 146) = 4.29$, $p = .01$, $\eta^2_p = .08$. Following emotion regulation task, the opposite action condition experienced higher levels of fear than the PA-High condition, followed by the PA-Low and control conditions; the PA-Low and control conditions did not differ in self-reported post-regulation task fear (see Figure 4).

Hostility. A main effect for time was found for Hostility [$F(1, 168) = 93.82$, $p < .001$, $\eta^2_p = .36$], such that Hostility ($M_{T2} = 1.49$, $SD = .60$; $M_{T3} = 1.10$, $SD = .32$) decreased after

completing the emotion regulation tasks. There was not an interaction between condition and time for Hostility, $F(3, 168) = .58$, $p = .63$, $\eta^2_p = .01$(see Figure 4).

Sadness. A main effect for time was found for Sadness [$F(1, 168) = 557.02$, $p < .001$, $\eta^2_p = .77$], such that Sadness ($M_{T2} = 2.57$, $SD = .80$; $M_{T3} = 1.31$, $SD = .50$) decreased after completing the emotion regulation tasks (see Figure 4).There was an interaction between condition and time for Sadness, $F(3, 168) = 2.73$, $p < .05$, $\eta^2_p = .05$. Specifically, the control and PA-Low conditions (which were not different post-regulation task) reported the highest levels of sadness, followed by the PA-High and OA conditions, which were not different from each other following the emotion regulation task. (see Figure 6).

Mirror Tracing Task: Do emotions predict persistence on an emotion task requiring self-control?

To understand whether changes in emotion predicted persistence on the mirror task, two hierarchical regressions were conducted with momentary emotions after the induction (pre-regulation task) entered in Step one and momentary emotions after using the emotion regulation tasks (post-regulation task) entered at step two, with persistence on the mirror tracing task as the outcome variable. Valence and arousal were assessed in the first model, and the specific emotions in the second model. People who did not quit on the mirror-tracing task ($n = 8$) were not included in these analyses because they do not have a score reflecting the time they decided to quit the task. People who were reportedly disengaged from the emotion regulation task ($n = 22$) or who experienced technological issues completing the task ($n = 7$) *were* also excluded (final $N = 157$).

Overall, the model with valence and arousal did not account for a significant amount of variance in persistence on the mirror tracing task, $R^2 = .006$, $F(4, 155) = .21$, $p = .93$.

The overall model with specific emotions accounted for 18% of the variance in mirror tracing persistence, $F(10, 141) = 2.78$, $p < .01$. For step one, specific emotions after the emotion induction (pre-regulation task) accounted for 11% of the variance in mirror tracing persistence, $F(5, 136) = 3.51$, $p < .01$. Greater Sadness ($B = 25.17$, $SE = 8.23$, $p < .01$), greater Serenity ($B = 16.01$, $SE = 7.01$), $p <= .02$, and less Hostility $B = -33.78$, $SE = 10.69$, $p < .01$, after the emotion induction (pre-regulation task) predicted greater persistence on the mirror tracing task. Fear ($B = 13.69$, $SE = 11.56$, $p = .24$, and Joviality ($B = -9.28$, $SE = 13.83$, $p = .50$, were not significant predictors of mirror tracing performance.

Adding post-regulation task specific emotions to the model did not account for significantly more variability in persistence on the mirror tracing task, $F\Delta(5, 131) = 1.92$, $p = .10$, $R^2\Delta = .06$.

Even though Step two was not significant overall, it is notable that post-regulation task Sadness ($B = 33.13$, $SE = 15.52$, $p = .04$, and Serenity ($B = -11.66$, $SE = 5.81$, $p < .05$) were significant unique predictors of mirror tracing persistence; greater remaining sadness and less remaining serenity after the regulation task when controlling for specific emotions experienced after the induction predicted longer mirror tracing persistence. For pre- to post-regulation task emotions and mirror tracing task correlations and descriptive statistics see Table 2.

Condition differences. To examine if emotion regulation task conditions moderated the effect of post-regulation task emotion on mirror tracing task persistence, I conducted seven moderated regressions using the PROCESS macro for SPSS Version 3.0 (Hayes, 2017). When controlling for other pre- and post-regulation task specific emotions, there was no effect of condition on MTT persistence for any of the specific emotion or for emotional valence and arousal. Condition did not interact with Valence, $\beta = 2.52$, $SE = 3.56$, $p = .48$, Arousal, $\beta = 2.33$,

SE = 2.98, *p* = .42, Joviality, β = -2.05, *SE* = 5.23, *p* = .70, Serenity, β = -8.04, *SE* = 5.17, *p* = .12, Fear, β = -18.95, *SE* = 15.49, *p* = .22, Hostility, β = 8.10, *SE* = 27.80, *p* = .77 or Sadness, β = -11.45, *SE* = 12.67, *p* = .37.

Secondary Analyses

How did condition influence emotion regulation task experience?

Vividness of mental imagery and comfortability engaging in the emotion regulation task. I ran two ANOVAs examining whether condition influenced end-of-study ratings of (1) vividness of mental imagery and (2) comfortability engaging in the emotion regulation task.

Vividness of mental imagery. Differences between conditions were found for vividness of mental imagery $F(3, 170) = 3.75$, $p = .01$, $\eta^2 = .06$ (see Figure 5). Bonferroni follow-up tests revealed that the control condition reported lower vividness of mental imagery compared to the high arousal-PA condition. There were no other differences.

Comfortability engaging in the emotion regulation task. There were also differences across conditions in end-of-study ratings of comfortability engaging in the regulation task $F(3, 170) = 20.95$, $p < .001$, $\eta^2 = .27$. Participants in the opposite action condition reported lower comfortability than each of the other three groups, which did not differ from each other. (see Figure 7)

Do individual differences predict emotion change following the emotion regulation task?

The PROCESS macro for SPSS Version 3.0 (Hayes, 2017) was used to conduct 14 moderated regressions to understand whether depressive symptoms and difficulties regulating emotions (entered into the model as predictors) interacted with condition (entered as the moderating variable) to predict post-regulation task emotions (entered as the outcome variable) when controlling for pre-regulation task emotions (entered as covariates). Contrasts were dummy

coded with the control condition as the reference variable where the control condition was compared against the low arousal-PA, high arousal-PA and opposite action conditions separately. Of note, I wanted a more stringent test against Type 1 error because these are secondary analyses and due to the number of analyses conducted. Therefore, I only looked at interactions of $p < .004$. All statistics for these analyses can be found in Table 3 and a Figure depicting these results can be found in Figure 8.

There was only one moderated effect from the above analyses, which was an interaction between depressive symptoms and condition on post-regulation task sadness. The interaction between depression and condition accounted for 8.7% of the variance in post-regulation task sadness [$R^2\Delta = .09$, $F(3, 163) = 9.78$, $p < .001$]., Specifically, the effect of depression on post-regulation sadness was significant for the control condition ($B = .04$, $SE = .01$, $t = 7.35$, $p < .001$) and the low-arousal positive affect condition, ($B = .02$, $SE = .01$, $t = 3.07$, $p < .01$), and stronger for the control condition. Depressive symptoms over the past two weeks did predict post-regulation sadness for the high arousal-PA ($B = .004$, $SE = .007$, $p = .52$) or the opposite action ($B = .003$, $SE = .006$, $p = .68$) conditions. Neither depressive symptoms nor difficulties regulating emotions interacted with condition to predict any other post-regulation task emotions, where the p-value for the interaction was less than .01.

Discussion

The main purpose of the current study was to test the effectiveness of opposite action in regulating emotion, specifically sadness. I designed a dismantling study to understand whether the valence, arousal and behavioral components of opposite action aided people in their emotional recovery (e.g. decreased sadness and increased joviality, valence and arousal after the completion of each emotion regulation task) after I induced sadness. Based on the tenants of this

DBT skill, I predicted that using opposite valence, arousal as well as behaviors opposing natural action tendencies associated with sadness would each have additive contributions to emotional recovery. Results suggest that using opposite valence and arousal caused significant decreases in sadness and increases in joviality, valence and arousal; however, the behaviors I asked people in the opposite action condition to engage in did not seem to change emotion across these domains above and beyond using opposite valence and arousal.

Emotion Induction

In the current study I aimed to cause sadness in order to understand the effect of opposite action components on sadness. Results indicated that our manipulation was successful in doing so. Because emotions are by definition fleeting, previous studies using emotion inductions have met challenges designing strong manipulations that cause intense emotions lasting for extended periods of time (Ellard, Farchione & Barlow, 2012; Phillippot, 1993). Like these studies, I faced the task of inducing sadness that was enduring enough to last from the end of the induction until participants were set up to complete the emotion regulation tasks as well as the task of inducing sadness comparable to sadness warranting the use of opposite to emotion action outside of a laboratory setting. One reason I believe the induction was successful in meeting these challenges is because I compiled 3 consecutive video clips shown to induce sadness, rather than using only one video clip. This is a strength because no study I am aware of has used this strategy to induce sadness. This may have increased the chances that one or more video clips would resonate with each participant as well as augmented or built upon sadness evoked by prior video clips. The sample that was recruited (people who scored 30 or above on the Emotion Reactivity Scale; Nock et al., 2008) also likely led to stronger emotional reactions to the video clips. Theoretically, people who have higher levels of Emotion Reactivity and therefore tend to experience strong

emotions for prolonged periods of time prior to returning to baseline level of arousal and in response to a wide array of stimuli should experience more intense and enduring emotional responses to emotion inductions. Using our recruitment strategy was critical for the current study, without a group of participants scoring low on the Emotion Reactivity Scale I was unable to compare emotion reactions of people scoring high and low on the scale; Future studies should address this.

Does Opposite Valence Change Sadness?

Results indicate that using opposite valence significantly changes emotion when people are feeling sad. Comparing the control condition (which was designed to be neutral in valence) with the low arousal-PA condition, allowed us to better understand the impact of using opposite valence in changing sadness. Results showed that the low-arousal PA condition experienced greater emotional valence, joviality and serenity (all positively valenced) than the control condition following the completion of their respective emotion regulation tasks, which is consistent with previous research suggesting that using opposite valence is effective in changing emotion (Holmes & Mathews, 2005; Lane, Chua & Dolan, 1999). Additionally, post-regulation task of fear, hostility and sadness (all negatively valenced emotions) and arousal were not different for the control and low arousal-PA conditions.

Does Opposite Arousal Change Sadness?

Results to the current study also suggest that using opposite arousal changes sadness. By comparing the high and low arousal positive affect conditions I was able to understand the additive affects of using opposite arousal to change emotion above and beyond valence. Results indicated that the high arousal-PA condition experienced greater emotional arousal, joviality (a high valence, high arousal emotion) and fear (a low valence, high arousal emotion), less serenity

(a high valence, low arousal emotion) and sadness (low valence and arousal) than the low arousal PA condition. So, the high arousal PA condition experienced greater levels of emotions that involve high arousal, with the exception of hostility. As predicted, these two conditions did not experience differences in valence or hostility following the emotion regulation task.

Does Opposite Behavioral Change Sadness?

Comparing the high arousal-PA condition with the opposite action condition allows us to better understand the impact of the behavioral component of opposite action on sadness when manipulated in a laboratory setting. Contrary to predictions, opposite action condition experienced lower post-regulation task valence and serenity and higher post-regulation task fear in comparison to the high arousal-PA condition. Post-regulation task arousal, joviality, hostility and sadness were not different for the high arousal-PA and opposite action conditions. This suggests that the behavioral component in the Opposite Action task did not change sadness above and beyond the affect of using opposite valence and arousal to change sadness. In fact the task without the behavioral component (high arousal-PA condition) actually showed greater success in increasing positive emotion (valence) than the same task with the behavioral component and was no more effective in decreasing sadness than the same task with the behavioral component. If this finding is generalizable and there are not moderators that explain this relationship, this finding suggests that using opposite action (and potentially other emotion regulation tasks with behavioral components) should be as (or less) effective as using skills less difficult to implement, such as imagery (and potentially other emotion regulation skills with cognitive and emotive components, but not a behavioral component). However, there are likely reasons why differences in emotion across these 2 conditions following the emotion regulation

task were not found, especially considering higher levels of post-regulation task fear for the opposite action condition noted above.

Self report data demonstrate that people in the opposite action condition were less less comfortable doing the emotion regulation task and experienced more fear following the emotion regulation task than the other conditions. It could be that these two factors (greater fear and discomfort due to the opposite action task than the other emotion regulation tasks) affected engagement in the emotion regulation task as more people were excluded from the opposite action condition ($N_{opposite\ action} = 8$) than the other conditions (3 people were excluded from the control condition and 4 were excluded from the low and high arousal-PA conditions) due to lack of self- and other reported engagement. Because participants in the opposite action condition were asked to express excitement via physical behaviors (e.g. jumping up and down, waving their hands in the air etc.) in front of research assistants they had never met before, participants (especially those who might be more prone to social anxiety; Goldin, Manber, Hakimi, Canli & Gross, 2009) likely experienced discomfort and fear due to the task, which may have in turn influenced level of engagement with the task. However, I was unable to analyze whether comfortability engaging in the emotion regulation tasks predicted emotion change from pre- to post-regulation task because as a predictor, comfortability engaging in the emotion regulation task would have needed to be collected prior to or at the same time as the outcome variable (i.e. pre- to post-regulation task emotions). While efforts were made to increase comfortability engaging in the opposite action task by having research assistants act out physical behaviors in the guided movement task, participants in this condition were still less comfortable engaging in the task.

One question worth asking is, would the components of opposite action work differently when working with a therapist after developing rapport in comparison to the environment where the components were tested (in a laboratory with an unfamiliar research assistant)? Perhaps a strong (therapeutic) rapport is necessary prior to introducing this skill to clients to cultivate comfortability engaging in it. It may be that even in the context of a strong therapeutic relationship, this skill elicits self-conciousness; however, it may increase sense of emotional safety, which may be important. Future work should look at these components in the context of a safe relationship or when in a setting where the task might be more comfortable to engage in.

Does Emotion Change Predict Mirror Tracing Task Persistence?

People begin tasks with pre-existing emotions, which likely shape subsequent behaviors and approaches to tasks due to their associated action tendencies (e.g. some emotions facilitate approach behaviors and others facilitate avoidance behaviors; Mehrabian & Russell, 1974; Chong & Park, 2017; Frijda, 1986; Frijda, 1983), cognitive appraisal patterns (e.g. appraising the task as something worth putting their resources toward, or appraising their own ability to succeed in the task as sufficient or insufficient) and other characteristics of them (e.g. sadness tends to slow down processing and increase analytical processing). We also know that emotions play a role in motivation, information-processing and coping (e.g. Clore, 1992; Folkman & Lazarus, 1988; Schwarz, 1990); however, there is little research exploring the role of emotions in goal-directed behavior in much detail. With these ideas in mind, the mirror-tracing task was included in the current study to understand whether emotion change as a result of our emotion regulation tasks predict persistence on a distressing task requiring self-control. The task was also used to help us understand whether specific task components influenced persistence on the task differently.

I found that while pre-regulation task changes in valence, arousal, fear and joviality did not predict mirror tracing task persistence, higher levels of pre-regulation task sadness and serenity and lower levels of hostility did predict greater persistence on the mirror tracing task. This suggests that using these skills when feeling some level of sadness, and serenity, but not hostility has positive implications for one's ability to persist through feelings of distress on a challenging task.

Interestingly post-regulation task sadness predicted greater persistence on the mirror tracing task, suggesting that when people feel more sad, they tend to persist for longer periods of time on difficult tasks requiring distress tolerance. This is consistent with previous findings that sadness facilitates analytical, bottom-up processing (Isabell, & Lair, 2013) and maintaining negative emotional states (Leyman, De Raedt, Schacht & Koster, 2007). For example, Bertels, Demoulin, Franco, Destrebecqz (2013) found people who were induced to feel sad (but not angry) showed "increased conscious access" to newly acquired knowledge acquired from a learning task.

There is also literature suggesting that when people are in negative emotional states, they have more difficulties disengaging from related stimuli due to a negative attention bias. For example, depressed participants consistently demonstrate more difficulties disengaging from images of negative facial expressions than healthy controls (Leyman, De Raedt, Schacht & Koster, 2007). Another study (Karparova, Kerstring & Suslow, 2005) found that depressed individuals were better able to detect negative faces more quickly in a crowd than positive faces; however, results did not support that depressed individuals experience greater difficulties disengaging attention from facial emotion in the visual search task used in the study. To our knowledge this phenomena has not been tested using other types of negative emotional stimuli,

such as the mirror-tracing task. Perhaps people still feeling sad at the start of the mirror-tracing task had greater difficulties disengaging from negative emotional stimuli provoked by the task.

Evidence that sadness prior to an emotionally challenging task predicted increased persistence was accrued, which supports the idea that it is important to continue exploring the role of emotion in tasks requiring self-control (e.g. can shifts in emotion improve these efforts, which types of skills are best for various types of tasks etc.). Future studies should not only continue exploring behavioral consequences of emotion regulation, but also why it is the case that sadness predicted persistence on a distressing task. For example, what are the mechanisms (e.g. cognitions, slower processing speed, difficulties disengaging from negatively valenced stimuli etc.) by which sadness facilitates persistence on distressing tasks similar to the mirror-tracing task.

The effect of post-regulation task emotions on mirror tracing persistence was not different across conditions. In other words, emotion regulation components associated with each task did not influence mirror-tracing persistence. It is possible that using a stronger manipulation would have lead to different results or it could be that specific emotion regulation components dismantled in the current study (cognitive, emotive and behavioral) do not have differential effects on this type of task.

True self-regulation task paradigms ask participants to engage in tasks requiring self-regulation that one identifies with. It is ideal for self-regulation tasks to be consistent with participant goals and values to ensure that they are invested in the self-regulation task (i.e. recruiting dieters trying to reduce sugar intake, presenting them with sugary foods and assessing the number of cookies eaten); however, in the current study participants were *given* the goal of persisting on the mirror-tracing task and we cannot know whether or not they possessed an

intrinsic goal to persist on the task. In other words, it is unknown whether people were invested in applying self-regulation resources to persist on the task and therefore cannot consider the task a true self-regulation task. Participant goals may have been contrary to persisting on the mirror-tracing task. For example, some participants may have had a goal to finish the task quickly so they could leave. Future studies should use address this limitation by including a task known to be consistent with the participant's goals and values.

Another limitation in using the mirror-tracing task is that people who did not quit the 5-minute long mirror-tracing task did not have a quit score and therefore cannot be used to analyze mirror tracing task persistence. This limited participants who had the strongest ability to persist on the mirror-tracing task to influence study outcomes.

Our samples size was also not large enough to enable analyses looking at the effect of individual differences on mirror-tracing task persistence across conditions. While a relatively large sample was recruited, future research should recruit an even larger sample to address related questions.

Do Individual Differences Predict Emotion Change Due to the Emotion Regulation Task?

I wanted to understand whether depressive symptoms and difficulties regulating emotion interacted with condition to predict post-regulation task emotions. I found that higher depressive symptoms over the past 2 weeks predicted less emotion change for the control and low arousal-PA condition's as a result of the emotion regulation tasks. Interestingly, the effect was strongest for the control condition and depression did not predict post-regulation sadness for the high arousal-PA and opposite action tasks. This is interesting because the conditions unaffected by depressive symptoms included emotion regulation task with more pathways for changing emotion (opposite valence, opposite arousal, mental imagery and the opposite action condition

also included a behavioral component). It seems that people with more depressive difficulties might benefit most from engaging in emotion regulation skills with a greater number of components utilized to change emotion. It might be that the high arousal-PA and opposite action tasks were more stimulating (as they used opposite arousal or both opposite arousal and physical behaviors) and that this factor was especially important for people experiencing greater levels of depressive symptoms. For example, behavioral activation is an empirically supported and highly effective treatment for depression that requires that people increase their engagement in certain activities that they likely began withdrawing from over the course of depression. Behavioral activation likely increases stimulation for depressed individuals because they are now engaging in more activities and they are using more pathways to improve their mood, which is likely also true for the high arousal-PA and opposite action tasks in the current study.

Conclusions

The current study sought to understand the effectiveness cognitive, behavioral and emotive components of a commonly used emotion regulation skill. Results suggested that using opposite emotion (both opposite valence and arousal) works to change sadness; however, the action component of the skill did not make the skill anymore effective. In fact people in the opposite action condition were less comfortable engaging in the task than any other condition, which likely mitigated the effectiveness of the opposite action task. These findings are important because they can inform when and how to use the skill in clinical settings. For example, perhaps this skill is most effective when introducing the skill once rapport and sense of safety has developed in the therapeutic relationship. Two questions the current study begs are 1) was the skilled really tested in the way it is used in treatment? and 2) is the context of a therapeutic relationship necessary for the behavioral component to increase the effectiveness of the skill? It

is still unknown whether the action component works in a therapeutic context. It may be that in a therapeutic context, the physical actions are pathways to the generation of opposite emotion. On the other hand, it may be that using other pathways (cognitive and emotive) is more effective. In sum, further exploration as to whether, how and when the physical action component of opposite action might increase effectiveness and if not, whether there are more practical emotion regulation skills to use (e.g. imagery) is needed.

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Appendix

Tables

Table 1. *Opposite action plus positive imagery and imagery scenarios*

Control condition	Low arousal imagery condition	Opposite action and high arousal imagery condition
Alarm Clock: You wake up to the sound of your alarm clock and notice the sound of the loud beeps carrying across your room. After about 15 seconds you reach over to your nightstand, turn off the alarm and pick up your phone. You notice a notification that you have 2 new emails. You swing your legs over the edge of the bed and put your feet on the ground. You can feel the carpet on your feet and the cool air on your arms and face. You walk to the bathroom, get your tooth-brush ready and begin brushing your teeth. You notice the minty smell and tingling sensation in your mouth. You rinse your toothbrush off, noticing the sound of the water rushing out of the faucet and walk to the kitchen for breakfast.	**Lake/nature walk:** After getting a good night's sleep, you go for a leisurely stroll at sunrise along the tree-lined lake behind your house. You hear birds happily chirping as you walk towards the golden-blue sky. You see a mother squirrel and its young scamper up the tree in front of you. Pausing, you take a long, slow, deep breath feeling the cool, crisp air in your lungs, while admiring the snow-capped mountains beyond. You look towards the still, blue lake feeling one with nature. You're flushed with the feelings of warmth and gladness, thankful for a new day.	**Winning the lottery:** You bought 10 tickets for the powerball lottery with high hopes of winning $1,000,000. Drawing day has arrived and you are sitting in front of the TV. The first 4 numbers have been called out and they match with your lottery ticket. You're sitting on the edge of your seat gasping excitedly as you wait for the last number to be called. The last number is called and it matches your ticket! You begin jumping up and down waving your ticket back and forth while yelling out "I won, I won, I won!"
Grocery store: As you notice the grocery store sign ahead while driving home, you remember you need milk and cereal. After pulling into a parking lot and parking your car, you remove the key from the ignition and hear the	**Cozy night**: You take a seat on your cozy sofa next to one of you closest friends. Sipping your favorite beverage, you engage in quiet conversation. In your peripheral vision, you see the orange glow of the fire and	**Sports game (favorite team wins):** You are a die-hard sports fan for a particular basketball team. Your team has made it to the championships and you are seated in the first row cheering on your team. Your

Table 1 (Cont.)

Control condition	Low arousal imagery condition	Opposite action and high arousal imagery condition
engine turn off. You shut the door locking the car and you hear the sound of the car door shutting. Once in the store, you grab your grocery cart and begin moving toward the milk isle. You can hear the sound of the wheels rolling on the floor and the beeps at the cash register. You grab your milk, feeling a cold sensation on your hand and move to the cereal isle. After selecting your cereal at the breakfast isle, you place your cereal in the cart and begin walking to the cash register.	feel its warmth. The dim lighting and aroma of the lit candles soothe your senses, accentuating the relaxed mood. The pleasant background music compliments the conversation. You turn to look through the window at the falling snow onto the white, fluffy landscape, as you snuggle deeper into the comfort of your soft blanket.	team has the ball, takes it down the court. He shoots, he SCORES! You begin jumping up and down and give your friend seated beside you a high five. Now the score is tied, with 10 seconds left in the game. The other team rebounded and race to their side of the court with the ball. It is the last 5 seconds of the game. He shoots, he MISSES! Your team WON! You begin jumping up and down and pumping your fists with excitement! You chest bump your friend seated by you, smiling ear to ear.
Lunch: Its lunch-time and you just finished writing your last sentence for an assignment. You set down your pen, grab your wallet and walk toward the exit. You open the door to your building and begin walking toward the street. You can hear the sounds of cars driving on the pavement and see the colors of street-lights changing from green to red. You walk-into the sandwich shop noticing the sound of a chime as you open the door. You step toward the cashier who asks you for your order, and you tell him that you will have a chicken sandwich and lemonade. You open your wallet and take a ten-dollar	**Beach**: You step out on the beach feeling the sand between your toes and the moist breeze on your face. You see the sun's gleaming reflection on the water and notice a dolphin surfing in a wave. A short way down the beach you hear the laughter of children splashing in the shore. As you walk toward the sound, you pick up shiny shells on the wet sand, and watch a pelican diving for the perfect meal. The smell of the salty air and sound of the crashing waves are both refreshing and soothing.	**Graduation:** You have worked hard for the past four years and you are finally graduating from college. Your family is in the audience watching proudly. Your name is called, and you begin making your way to the podium with a large smile on your face. You shake the chair of the department's hand, and see your family standing watching. You smile proudly and have an upright posture, then sprint to the steps leaping off the stage with your arms in the air yelling "Wooo-hoooo!!!!" Once landed, you pull your confetti gun from your pocket, then shoot confetti into the air yelling

Table 1 (Cont.)

Control condition	Low arousal imagery condition	Opposite action and high arousal imagery condition
ten-dollar bill and hand it to the cashier. The cashier hands you a your lemonade and you feel the cold and moist cup on your hands.		"Yeeeaaahhh!!!" The crowd roars! You walk away feeling elated throwing your cap in the air!

Table 2. *Pre- to post-regulation task emotions and mirror tracing task correlations and descriptive statistics. Asterisks denote statistically significant differences between groups at the p < .05 (*) and p < .01 (**) level.*

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	*M* (*SD*)
1.	MTT Persistence	--														76.74 (69.57)
2.	T2 Fear	.05	--													1.46(.57)
3.	T2 Sadness	.16	.41**	--												2.59 (.81)
4.	T2 Hostility	-.12	.41**	.50**	--											1.53 (.62)
5.	T2 Joviality	.04	.001	-.08	-.03	--										1.34(.48)
6.	T2 Serenity	.13	-.27**	-.17*	-.03	.53**	--									2.44 (.99)
7.	T2 Valence	.01	-.32**	-.47**	-.43**	.36**	.36**	--								3.09 (1.47)
8.	T2 Arousal	.01	.11	-.09	.02	.06	-.02	.05	--							4.08 (1.60)
9.	T3 Fear	-.04	.34**	.30**	.33**	-.01	-.12	-.07	.11	--						1.25 (3.80)
10.	T3 Sadness	.16	.34**	.50**	.37**	.11	.03	-.22**	.03	.26**	--					1.32 (.51)
11.	T3 Hostility	-.08	.19*	.20*	.51**	.07	.01	-.13	.09	.34**	.48**	--				1.11 (.34)
12.	T3 Joviality	.11	.25**	.35**	.29**	.27**	.12	-.10	-.04	.21*	-.11	-.12	--			2.64 (1.09)
13.	T3 Serenity	-.01	-.06	.15	-.01	.26**	.39**	.11	.05	-.28**	.12	-.08	.06	--		3.23 (1.13)
14.	T3 Valence	.01	.08	.06	-.02	-.13	-.07	-.04	-.12	-.18*	-.32**	-.38**	.42**	.24**	--	6.87 (1.64)
15.	T3 Arousal	.08	.08	.002	-.02	-.04	-.16	-.02	.13	.34**	-.28**	-.10	.52**	-.38**	.13	5.0 (2.12)

Table 3. *Moderated regressions conducted in PROCESS v 3.0 (Hayes, 2017), with either DASS-21 or S-DERS as the predictor variable, dummy coded condition (with control as the reference variable) as the moderator, and post-induction emotion (T2) as a covariate.*

Outcome	Predictor	Main Effect Predictor B (SE), p	Variance accounted for by predictor x condition (dummy coded)
Post ER task Valence	Depression	-.04 (.03), p = .11	$R\Delta^2$ = .009, F(3, 162) = .56, p = .64
	DERS	-.40 (.40), p = .32	$R\Delta^2$ = .04, F(3, 162) = 2.16, p = .09
Post ER task Valence Arousal	Depression	-.04(.03), p =.14	$R\Delta^2$ = .008, F(3, 162) = .66, p = .58
	DERS	-.44 (.44), p = .31	$R\Delta^2$ = .01, F(3, 162) = .99, p = .40
Joviality	Depression	-.005 (.02), p = .70	$R\Delta^2$ = .001, F(3, 163) = .07, p = .97
	DERS	.04 (.24), p = .87	$R\Delta^2$ = .03, F(3, 163) = 2.04, p = .11
Serenity	Depression	.002 (.01), p = .87	$R\Delta^2$ = . 01, F(3, 163) = 1.54, p = .21
	DERS	.12 (.20), p = .55	$R\Delta^2$ = .01, F(3, 163) = 1.25, p = .29
Fear	Depression	.005 (.006), p = .39	$R\Delta^2$ = .002, F(3, 163) = .13, p = .94
	DERS	.005 (.09), p = .95	$R\Delta^2$ = .009, F(3, 163) = .71, p = .54
Hostility	Depression	-.001 (.005), p = .81	$R\Delta^2$ = .02, F(3, 163) = 1.25, p = .29
	DERS	-.06 (.07), p = .37	$R\Delta^2$ = .04, F(3, 163) = 3.48, p = .02
Sadness	Depression	.04 (.005), p < .001	$R\Delta^2$ = .09, F(3, 163) = 9.78, p < .001
	DERS	.27 (.10), p < .01	$R\Delta^2$ = .02, F(3, 163) = 1.87, p = .14

Figures

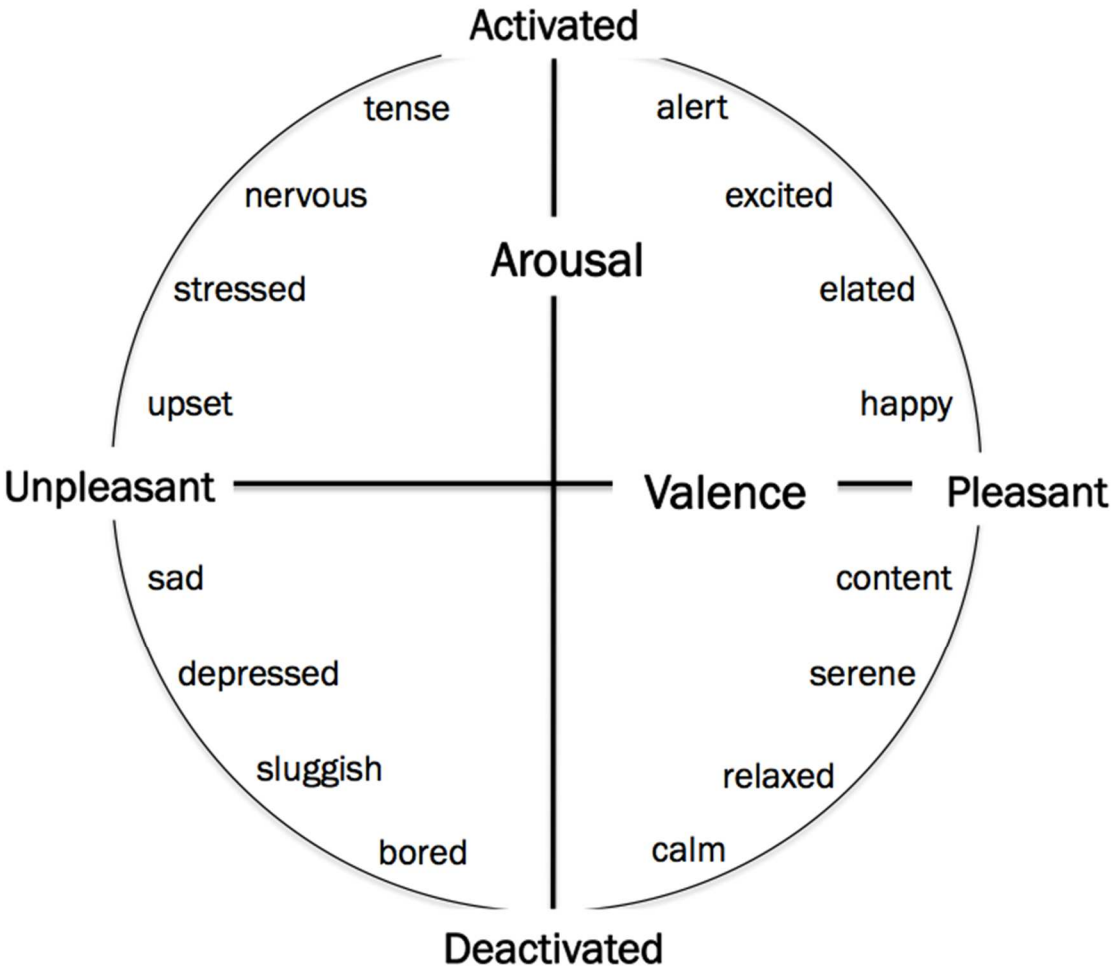

Figure 1. Russell's (2003) circumplex model of affect. A plot of emotions along two dimensions (valence and arousal), where the basic emotions tend to form a circle. Within this framework, each emotion has a corresponding opposite emotion, which is opposite in both valence and arousal. Figure taken from Posner, Russell and Peterson, 2005.

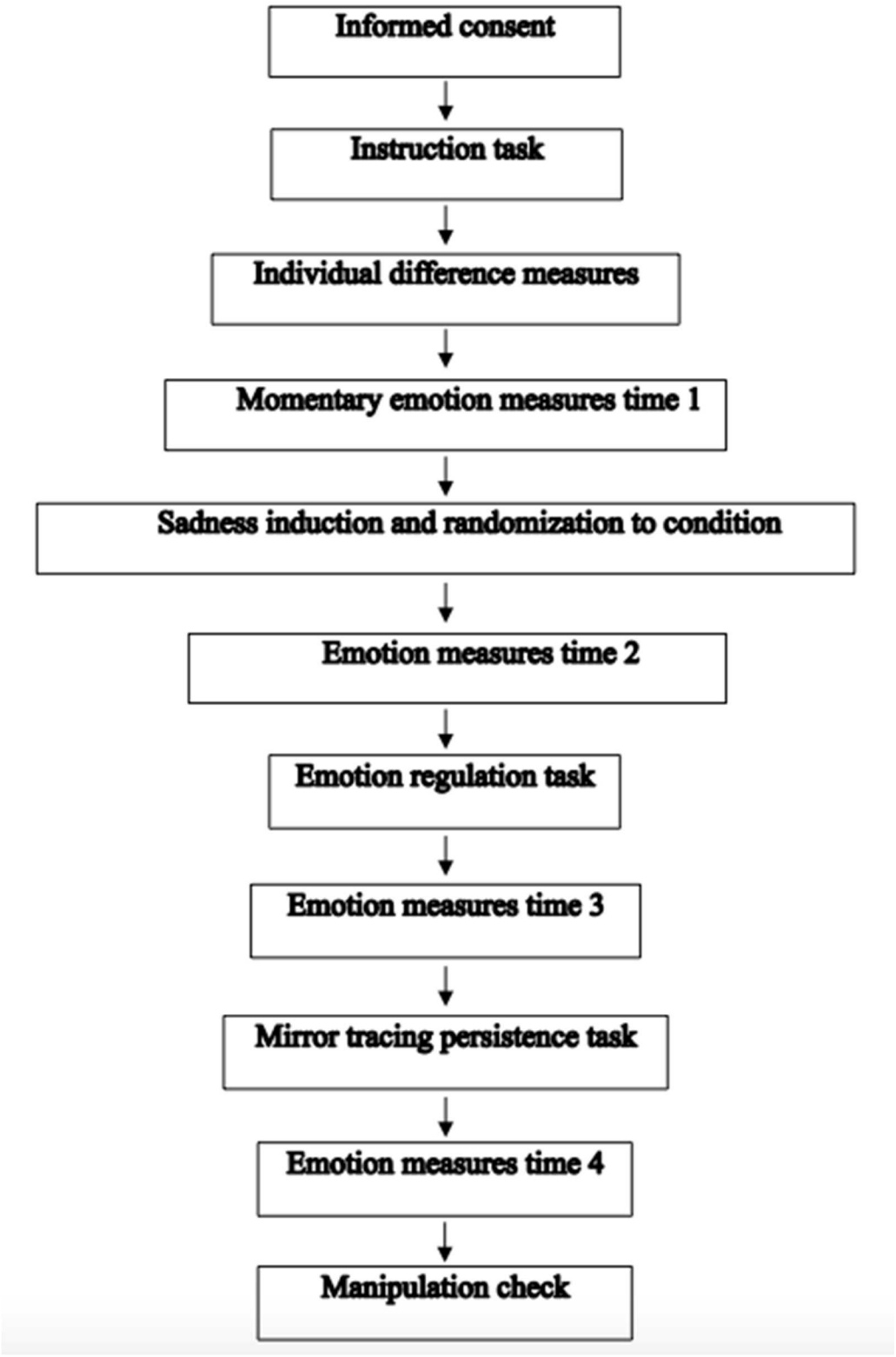

Figure 2. Study timeline.

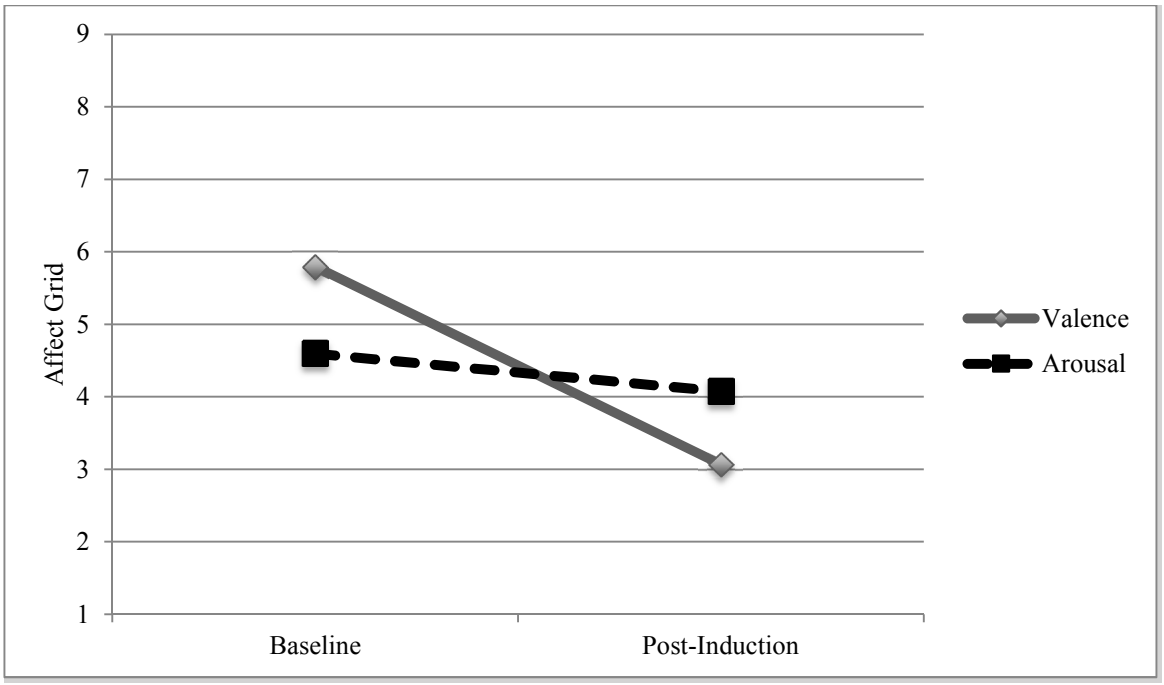

Figure 3. Emotional valence and arousal scores before and after completing the sadness induction. All changes from baseline to post-induction are statistically significant (see text).

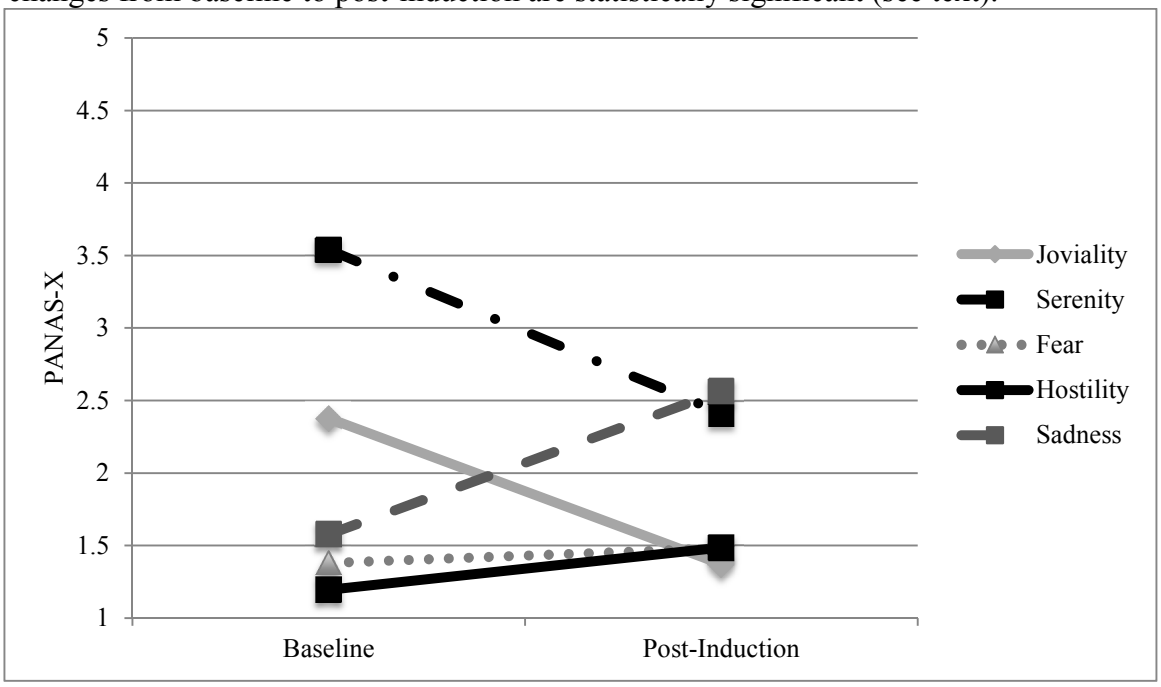

Figure 4. Specific emotional states before and after completing the sadness induction. All changes from baseline to post-induction are statistically significant (see text).

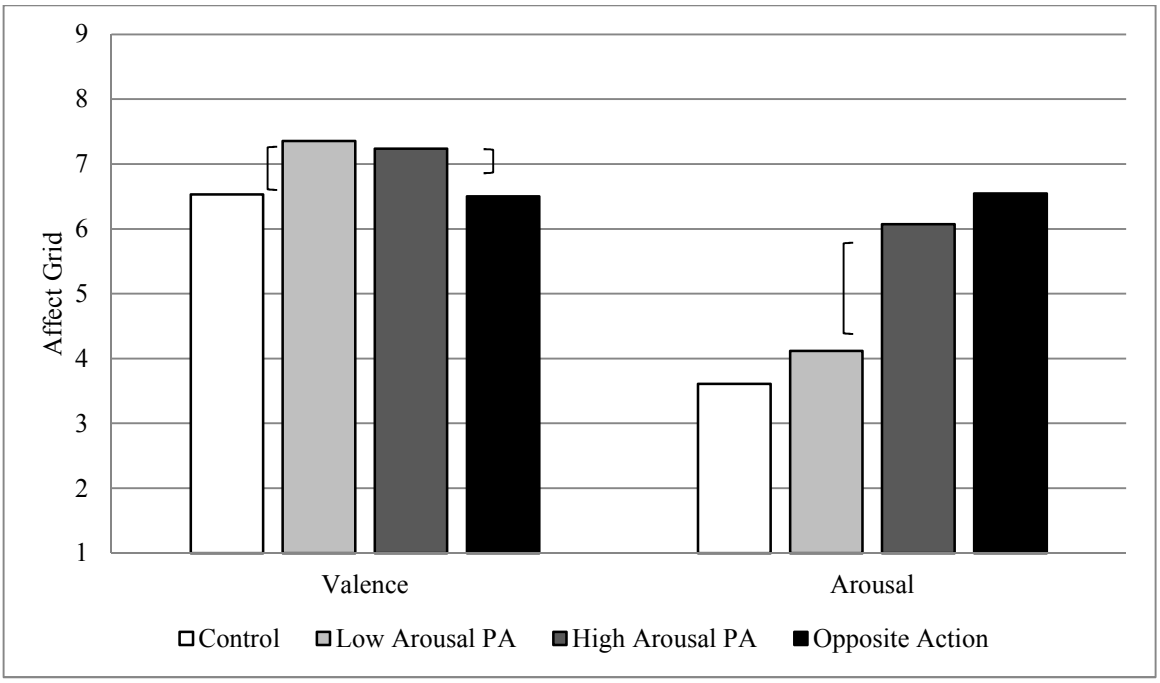

Figure 5. Post-regulation task emotional Valence and Arousal scores across conditions. Asterisks denote statistically significant differences between groups (see text).

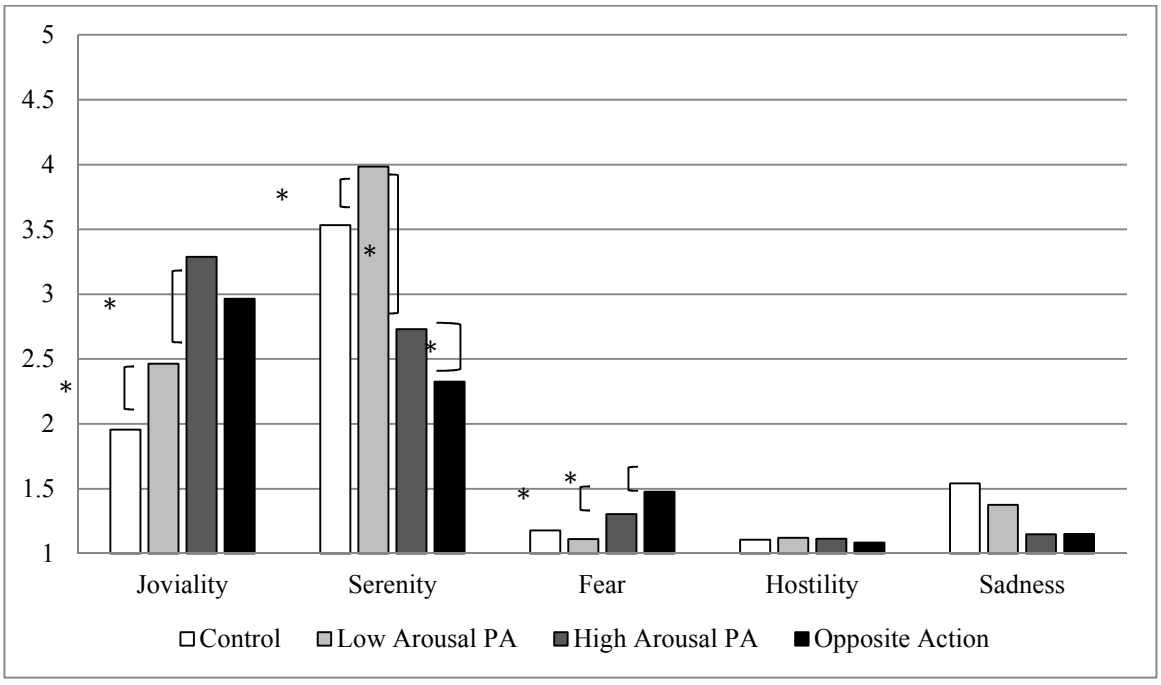

Figure 6. Post-regulation task specific emotions across conditions. Asterisks denote statistically significant differences between groups (see text).

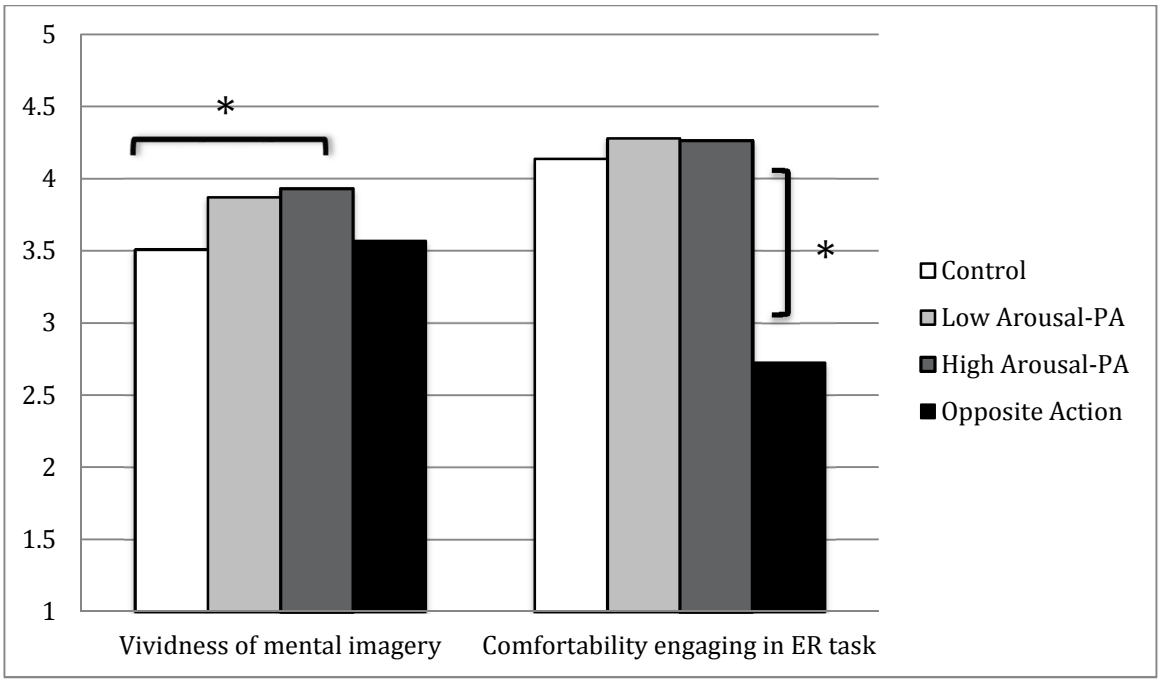

Figure 7. Vividness of mental imagery and comfortability engaging in emotion regulation tasks across conditions.

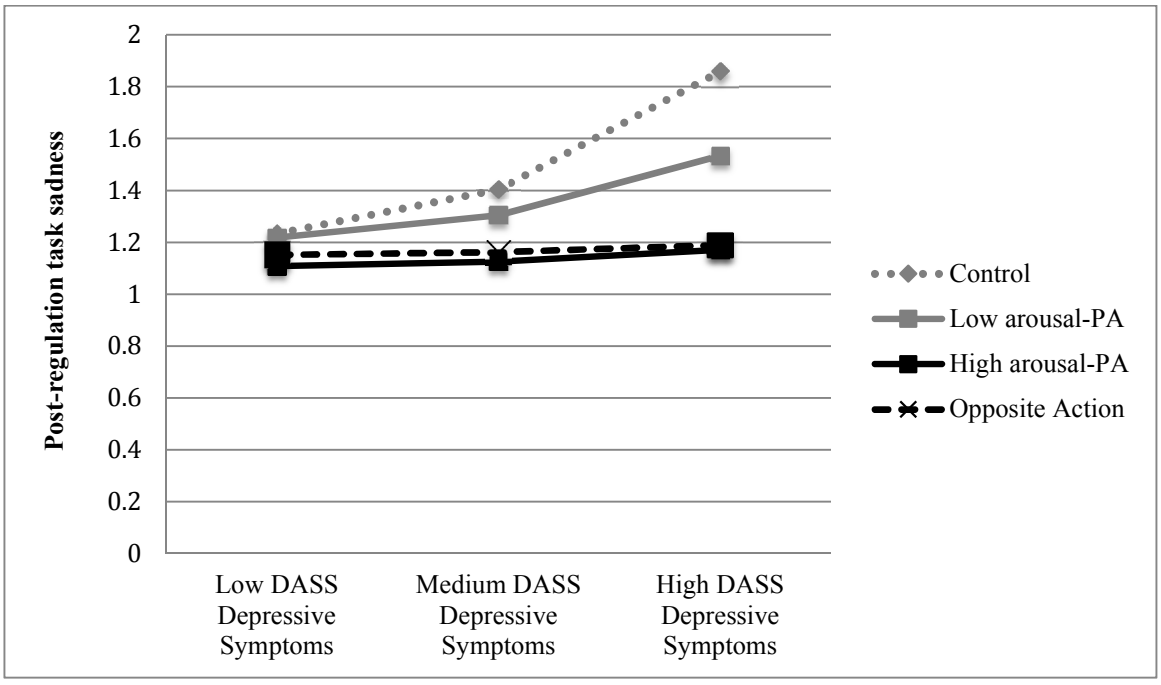

Figure 8. Effect of depression by condition interaction on post-regulation task sadness when controlling for pre-regulation task sadness across conditions.

UNIVERSITY OF ARKANSAS

Office of Research Compliance Institutional Review Board

September 11, 2017

MEMORANDUM

TO:	Kaitlyn Chamberlain Danielle Baker Kayla Skinner Morgan Hill Jennifer Veilleux
FROM:	Ro Windwalker IRB Coordinator
RE:	New Protocol Approval
IRB Protocol #:	17-08-053
Protocol Title:	*Movement, Cognition and Emotion*
Review Type:	☒ EXEMPT
Approval Date:	09/08/2017

Your protocol has been approved by the IRB. We will no longer be requiring continuing reviews for exempt protocols.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

If you have questions or need any assistance from the IRB, please contact me at 109 MLKG Building, 5-2208, or irb@uark.edu.

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Measures

Manipulation Check Questions

Please read each statement and write the number 1, 2, 3, 4 or 5 that indicates your experience with *the task*. There are no right or wrong answers.

1	2	3	4	5
Extremely Unpleasant	Somewhat unpleasant	Neither pleasant or unpleasant	Somewhat pleasant	Extremely unpleasant

___ 1. How pleasant was scenario 1/writing about you're morning yesterday?
___ 2. How pleasant was scenario 2/writing about you're afternoon yesterday?
___ 3. How pleasant was scenario 3/writing about you're evening yesterday?

1	2	3	4	5
Not vivid at all	Slightly vivid	Somewhat vivid	Moderately vivid	Extremely vivid

___ 4. How vividly did you imagine scenario 1/you're morning yesterday?
___ 5. How vividly did you imagine scenario 2/you're afternoon yesterday?
___ 6. How vividly did you imagine scenario 3/you're evening yesterday?

1	2	3	4	5
Completely disengaged	Somewhat disengaged	Neither engaged nor disengaged	Somewhat engaged	Completely engaged

___ 7. How engaged they were in the task?

Please circle one:

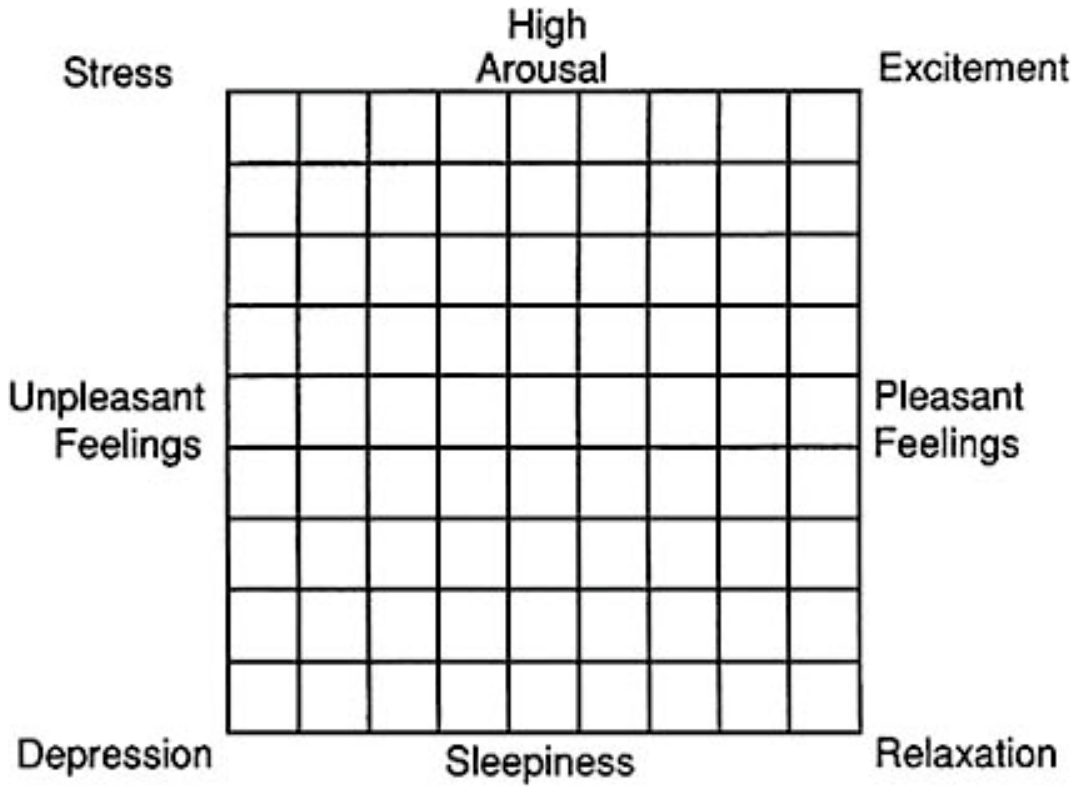
___ 8. Were you able to maintain imagery for the duration of the task (yes/no)
___ 9. Were you able to carry out the task at hand for the duration of the task (yes/no)

1	2	3	4	5
Extremely uncomfortable	Somewhat uncomfortable	Neither comfortable nor uncomfortable	Somewhat comfortable	Extremely comfortable

___ 10. How comfortable were you in completing the task?

Emotional Valence and Arousal: Affect Grid

Please rate how you are feeling right now.



Depression and Anxiety: DASS-21

Please read each statement and circle a number 0, 1, 2 or 3 that indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

0	1	2	3
Didn't apply to me at all	Applied to me some degree or some of the time	Applied to me to a considerable degree or a good part of time	Applied to me very much, or most of the time

1	I found it hard to wind down	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3

4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I found it difficult to work up the initiative to do things	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I experienced trembling (eg, in the hands)	0	1	2	3
8	I felt that I was using a lot of nervous energy	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting agitated	0	1	2	3
12	I found it difficult to relax	0	1	2	3
13	I felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3

Emotion Regulation: DERS

On a regular basis, how often does each item apply to you:

1	2	3	4	5
Almost Never (0-10%)	Sometimes (11-35%)	About half the time (36-65%)	Most of the time (66-90%)	Almost Always (91-100%)

_____ 1. I am clear about my feelings.

_____ 2. I pay attention to how I feel

_____ 3. I experience my emotions as overwhelming and out of control.

_____ 4. I have no idea how I am feeling.
_____ 5. I have difficulty making sense out of my feelings.
_____ 6. I am attentive to my feelings.
_____ 7. I know exactly how I am feeling.
_____ 8. I care about what I am feeling.
_____ 9. I am confused about how I feel.
_____ 10. When I'm upset, I acknowledge my emotions.
_____ 11. When I'm upset, I become angry with myself for feeling that way.
_____ 12. When I'm upset, I become embarrassed for feeling that way.
_____ 13. When I'm upset, I have difficulty getting work done.
_____ 14. When I'm upset, I become out of control.
_____ 15. When I'm upset, I believe that I will remain that way for a long time.
_____ 16. When I'm upset, I believe that I'll end up feeling very depressed.
_____ 17. When I'm upset, I believe that my feelings are valid and important.
_____ 18. When I'm upset, I have difficulty focusing on other things.
_____ 19. When I'm upset, I feel out of control.
_____ 20. When I'm upset, I can still get things done.
_____ 21. When I'm upset, I feel ashamed with myself for feeling that way.
_____ 22. When I'm upset, I know that I can find a way to eventually feel better.
_____ 23. When I'm upset, I feel like I am weak.
_____ 24. When I'm upset, I feel like I can remain in control of behaviors.
_____ 25. When I'm upset, I feel guilty for feeling that way.
_____ 26. When I'm upset, I have difficulty concentrating.
_____ 27. When I'm upset, I have difficulty controlling my behaviors.
_____ 28. When I'm upset, I believe there is nothing I can do to make myself feel better
_____ 29. When I'm upset, I become irritated with myself for feeling that way
_____ 30. When I'm upset, I start to feel very bad about myself
_____ 31. When I'm upset, I believe that wallowing in it is all I can do
_____ 32. When I'm upset, I lose control over my behaviors
_____ 33. When I'm upset, I have difficulty thinking about anything else
_____ 34. When I'm upset, I take time to figure out what I'm really feeling

_____ 35. When I'm upset, it takes me a long time to feel better

_____ 36. When I'm upset, my emotions feel overwhelming

Distress Tolerance: DTS.

Please indicate the level to which you agree with each of the following statements.

1	2	3	4	5
Strongly agree	Mildly agree	Agree and disagree equally	Mildly disagree	Strongly disagree

___ 1. Feeling distressed of upset is unbearable to me.
___ 2. When I feel distressed or upset, all I can think about is how bad I feel.
___ 3. I can't handle feeling distressed or upset.
___ 4. My feelings of distress are so intense that they completely take over.
___ 5. There's nothing worse than feeling distressed or upset.
___ 6. I can tolerate being distressed or upset as well as most people.
___ 7. My feelings of distress or being upset are not acceptable.
___ 8. I'll do anything to avoid feeling distress or upset.
___ 9. Other people seem to be able to tolerate feeling distressed or upset better than I can.
___ 10. Being distressed or upset is always a major ordeal for me.
___ 11. I am ashamed of myself when I feel distressed or upset.
___ 12. My feelings of distress or being upset scare me.
___ 13. I'll do anything to stop feeling distressed or upset.
___ 14. When I feel distressed or upset, I must do something about it immediately.
___ 15. When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels.

Emotion Reactivity: ERS

This questionnaire asks different questions about how you experience emotions on a regular basis. When you are asked about being 'emotional,' this may refer to being angry, sad, excited, or some other emotion. Please rate the following statements.

0	**1**	**2**	**3**	**4**
Not at all like me	A little like me	Somewhat like me	A lot like me	Completely like me

_____ 1. When something happens that upsets me, it's all I can think about it for a long time.
_____ 2. My feelings get hurt easily.
_____ 3. When I experience emotions, I feel them very strongly/intensely.

_____ 4. When I'm emotionally upset, my whole body gets physically upset as well.
_____ 5. I tend to get very emotional very easily.
_____ 6. I experience emotions very strongly.
_____ 7. I often feel extremely anxious.
_____ 8. When I feel emotional, it's hard for me to imagine feeling any other way.
_____ 9. Even the littlest things make me emotional.
_____ 10. If I have a disagreement with someone, it takes a long time for me to get over it.
_____ 11. When I am angry/upset, it takes me much longer than most people to calm down.
_____ 12. I get angry at people very easily.
_____ 13. I am often bothered by things that other people don't react to.
_____ 14. I am easily agitated.
_____ 15. My emotions go from neutral to extreme in an instant.
_____ 16. When something bad happens, my mood changes very quickly. People tell me I have a very short fuse.
_____ 17. People tell me that my emotions are often too intense for the situation.
_____ 18. I am a very sensitive person.
_____ 19. My moods are very strong and powerful.
_____ 20. I often get so upset it's hard for me to think straight.
_____ 21. Other people tell me I'm overreacting.

Positive and Negative Affect: PANAS

This scale consists of a number of words that describe feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way in general, that is, MOST OF THE TIME. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____	interested	_____	irritable
_____	distressed	_____	alert
_____	excited	_____	ashamed
_____	upset	_____	inspired
_____	strong	_____	nervous

_____	guilty	_____	determined
_____	scared	_____	attentive
_____	hostile	_____	jittery
_____	enthusiastic	_____	active
_____	proud	_____	afraid

Positive and Negative Affect: PANAS-X

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to the word. Indicate <u>to what extent you feel this way right now.</u> Use the following scale to record your answers:

1 Very slightly or not at all	2 A little	3 Moderately	4 Quite a bit	5 Extremely
_____afraid	_____energetic	_____lonely		_____at ease
_____excited	_____scornful	_____frightened		_____disgusted
_____loathing	_____joyful	_____lively		_____nervous
_____cheerful	_____irritable	_____alone		_____angry
_____sad	_____shaky	_____delighted		_____jittery
_____calm	_____blue	_____relaxed		_____enthusiastic
_____downhearted	_____happy	_____scared		_____hostile