

The Effect of Art-Making on Emotion by Unilateral Hemispheric Activation

A Senior Honors Thesis

Submitted in Partial Fulfillment of the Requirements
for Graduation in the Honors College

By
Anna Ciancio
Psychology & Studio Art Major

The College at Brockport
May, 2018

Thesis Director: Dr. David Abwender, Associate Professor and Chair, Psychology

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Abstract

This research study investigates whether or not the motor action of art-making through the process of art therapy influences brain activity in a way that affects emotional state. The participants were 133 adults from introductory psychology classes at the College at Brockport, State University of New York. Participants drew on a piece of paper located either to the right or left of the center of the table for five minutes while wearing goggles that directed their vision in the same direction. This was preceded and followed by a measure of emotional state. Findings suggest that side of drawing has a greater impact on the happiness of non-depressed participants and the sadness of depressed participants.

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Art therapy is a treatment in which mental health professionals use art-making to improve clients' functioning and their well-being (American Art Therapy Association, 2013). Through art-making, clients "explore their feelings, reconcile emotional conflicts, foster self-awareness, manage behavior and addictions, develop social skills, improve reality orientation, reduce anxiety, and increase self-esteem" (American Art Therapy Association, 2013, 1). It is not known through what mechanisms of action art therapy operates. This research study investigates whether or not the motor action of art-making influences brain activity in a way that affects emotional state.

Art therapy includes drawing, painting, sculpture, and other art forms, the creative process, and the resulting artwork to enhance the physical, mental, and emotional well-being of clients or patients. It is practiced in a wide variety of settings, such as hospitals, psychiatric and rehabilitation facilities, wellness centers, schools, and so on (American Art Therapy Association, 2013). Art therapy has been found to be effective in reducing symptoms of depression in outpatient group art therapy (Chandraiah, Anand, & Avent, 2012) and state-related anxiety, which is defined as a person's current level of anxiety (Sandmire, Gorham, Rankin, & Grimm, 2012). Different mechanisms of effect in art therapy have proposed in relation to elevating mood. Drake and Winner (2012) defined "venting" as "expressing negative feelings" and distraction as "expressing something unrelated to the negative feelings," and they found that distraction was more successful in elevating mood than was venting. What has not yet been explored is the possibility of other mechanisms of action, such as cerebral hemispheric activation.

Emotion and Brain Lateralization

Emotions are scientifically complicated. Emotions are based in *core affect*, the neurophysiological state, consciously accessible as feeling, that is a blend of valence, or hedonic, and arousal variables (Russell, 2003). This is not to be confused with mood, which is a prolonged core affect without an intentional object (Russell, 2003). Valence and arousal can also be affected by individual differences that result in issues of how best to capture how people communicate their affective states (Barrett, 1998). Some people are *valence focused* and experience more co-occurrences among similarly valenced affective states which would fit a dimensional model, while others who are *arousal focused* experience fewer co-occurrences between similar affective states and would fit a discrete model. For example, some people, who are high in valence focus, have a hard time differentiating between anxiety and depression due to the fact that both have a negative valence, but despite that anxiety denotes high levels of arousal while depression denotes low levels (Barrett, 1998). This suggests that neither discrete emotions nor dimensions could accurately describe the subjective affective experiences of all individuals (Barrett, 1998). Tsuchiya and Adolphs (2007) presented a model of emotion and consciousness, suggesting that the two intersect and overlap. Emotion, according to this model, consists of an emotion state (made up of the appraisal of a situation, the emotional response, and the thoughts pertaining to the emotion) and feeling (based on conscious experience of the components of the emotion state and conscious experience of the stimuli or memory that caused the emotion state). Consciousness and emotion both emerge as a result of neuronal activity in the brain, as well as sometimes emerging from the same brain structures (Tsuchiya & Adolphs, 2007). It is also important to note that the communication of individuals about their emotions and the actual experience and expression of emotions may stem from different processes in the brain

(Davidson, 1992). *Emote* literally means to move or prepare for action (Maxwell & Davidson, 2007), suggesting the behavioral components of emotion that are seen in the theories of approach and avoidance. However, emotion is just as commonly organized by valence, pleasantness or hedonic value.

Lateralization of emotional processes within the brain has three possible aspects: the right hemisphere recognizes emotions better, the right hemisphere controls emotional expression, and/or the right hemisphere is specialized for negative emotional experience while the left deals with positive emotional experience (Silberman & Weingartner, 1986). Silberman and Weingartner (1986) conducted a meta-analysis that found that many studies had suggested that the right hemisphere may be superior in recognizing emotions, but in most of these studies emotionality is confounded with general pattern processing. Some studies also suggested that both hemispheres can recognize emotions, but the right hemisphere's strategy may be more frequently utilized. While the right hemisphere has been shown to be activated when emotions are felt, the left hemisphere is also involved when there is verbal mediation involved. The discrepancies in these studies may be due to differences in physiological methodologies (Silberman & Weingartner, 1986). According to the same meta-analysis, a number of studies provided strong evidence suggesting that the right hemisphere is specialized for dealing with negative emotions and the left for positive emotions. This pattern has been demonstrated most strongly for the anterior regions of the hemispheres (Silberman & Weingartner, 1986). Schiffer et al. (2007) even hypothesized that while one hemisphere may have a more negative disposition and the other may be more positive, the side with the more negative hemispheric emotional valence varies among individuals. Using chimeric faces tasks and functional magnetic resonance imaging (fMRI), Killgore and Yurgelun-Todd (2007) found evidence for both the right

hemisphere hypothesis, which suggests that the right cerebrum is dominant for processing all emotions regardless of affective valence, and the valence specific hypothesis, which suggests that the left hemisphere is specialized for processing positive affect while the right hemisphere is specialized for negative affect. The valence hypothesis has been found to be significant in right-handed individuals, but not in non-right-handed individuals who showed no consistent hemispheric dominance for language (Costanzo et al., 2015). The Wada test uses sodium amytal to sedate one hemisphere of the brain and then observe the effects on memory, language, and other psychological processes (Trimble, 2010). The collective results of the literature show discrepancies in the effect of amytal on mood, except that there was a strong association between the right hemisphere sedation and euphoria, characterized by laughter and elevated mood (Trimble, 2010).

Emotions can also be organized by approach- and withdrawal-related behaviors which are asymmetrically balanced in the anterior cerebral cortex (Davidson, 1992). This suggests that left hemisphere emotions are not necessarily “positive” but instead are approach-related, such as joy or anger, both of which involve engaging with the target of the emotion. On the same note, right hemisphere emotions are not “negative” but instead are withdrawal-related. For example, anxiety and fear involve moving away from the target of the emotion. Given this, depression is more related to low left hemisphere activity because there is an absence of approach-related emotions and behaviors. This has been shown in studies of individuals with brain damage to the left hemisphere who experience a deficit in approach behaviors (Davidson, 1992). Davidson (1992) conducted a study in which subjects were shown film clips to induce either approach-related positive emotion or withdrawal-related negative emotion. Using facial and EEG data, it was found that the hemisphere and valence interaction was highly significant (Davidson, 1992).

Differential Hemispheric Activation

Line bisection tasks, in which participants attempt to bisect horizontal lines by marking the veridical center, are often used as an indicator of hemispheric activation. Bisection bias to the left or right of the center indicates that the contralateral hemisphere was preferentially activated (Jewell & McCourt, 2000). Neurologically normal subjects tend to misbisect left of the center point, called “pseudoneglect,” most likely due to a general right-hemisphere bias in spatial attention (Jewell & McCourt, 2000). Cattaneo et al. (2014) found that perceiving happy emotion, either visually or auditorily, significantly shifted the bisection bias in a line bisection task to the right, by activating the left hemisphere. This supports the valence hypothesis that suggests that left hemisphere is related to positive emotions. There was not a significant leftward bias relating to perceiving a sad emotion (Cattaneo et al., 2014).

Unilateral hemispheric activation can be manipulated by body orientation and gaze directing, as well as unilateral muscle contractions. Drake (1984) instructed participants to turn their legs, shoulder, heads, and eyes to the right or left and found that participants who were oriented to the right were more personally optimistic. In a later study, Drake (1987) again employed lateralized gaze for unilateral hemispheric activation, but to study its effect on aesthetic judgments of photographs. In males, orientating towards the right increased positive evaluations of the photographs (Drake, 1987). Lempert and Kinsbourne (1982) also had participants turn their heads and eyes to the right or left. They found that turning to the right improved cued recall. Propper, Januszewski, Christman, and Brunye (2011) were able to link increased hemispheric asymmetry through lateralized gaze in either direction with anger. Schiffer, Anderson, and Teicher (1999) employed glasses that limited vision to either the left or right lateral visual field to induce changes in bilateral ear temperatures, electroencephalogram

(EEG) laterality, and anxiety. In a later study, Schiffer et al. (2004) again employed taped glasses and found that lateral visual field stimulation could activate contralateral extrastriate cortical areas.

For muscle contractions, Gable, Poole, and Cook (2013) used contralateral hand contraction to study the effect of unilateral hemispheric activation on global and local processing, which were enhanced by the activation of the right hemisphere and the left hemisphere, respectively. Schiff et al. (1998) also used unilateral hand contractions, as well as face contractions, to manipulate hemispheric activation in studying behavioral persistence, which was found to be higher in the right contraction group. Based on these studies of hemispheric activation, art-making in the form of art therapy has the potential to also activate a single hemisphere.

The Current Study

Although art therapy is a widely accepted practice, the mechanisms of action are not completely understood. Both positive and negative emotions are a product of art therapy; this may be due to hemispheric bias. Unilateral hemispheric bias can be manipulated by gaze and motor tasks, which in this case is drawing. The current study will survey the effects of art-making by hemispheric activation on emotion. It is hypothesized that both sadness and happiness will be more affected by drawing than gazing and working on the right than the left. It is also hypothesized that both sadness and happiness will be influenced by task, side, and depression status with sadness being more affected in the depressed participants and happiness being more affected in non-depressed participants.

Method

Participants

The study used a sample of 133 adults from introductory psychology classes at the College at Brockport, State University of New York. Some participants were excluded from the study due to either not having English as a first language or being left handed. The sample was 36% male, 63% female, and 1% other; and the mean age was 19.3 years (+/- 1.7).

Procedure

Participants were randomly assigned to four groups: two experimental groups and two control group. Forty four participants drew on a paper located 10cm to the right of their body's midline, and 46 drew on the left. They also wore "hemifield goggles," as seen in Figure 1, safety goggles covered with masking tape so that one side is covered entirely and 50% of the medial aspect of the other (Schiffer, Anderson, & Teicher, 1999; Schiffer et al., 2004) to direct participants' gaze to the right or left. Twenty one non-drawing (control) participants wore the hemifield goggles to direct their gaze to the right and 22 to the left. Participants were asked to come to a laboratory and were first presented with an informed consent form. Then a series of questionnaires were presented.

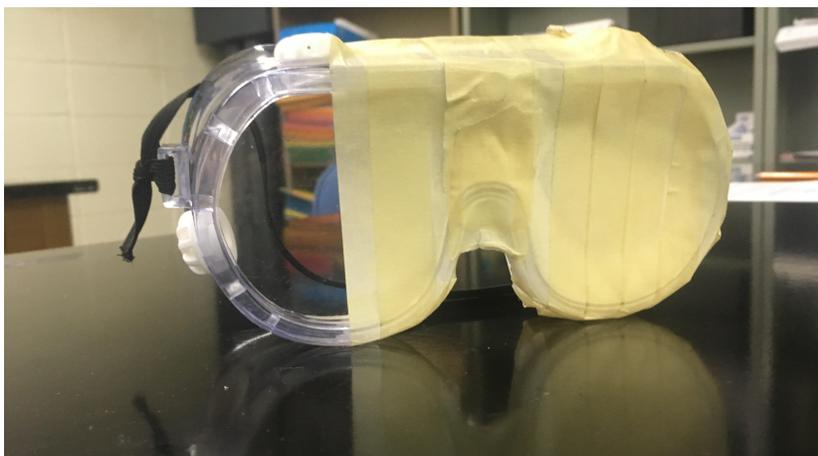


Figure 1. Hemifield goggles.

Materials. The questionnaires started with the Discrete Emotion Questionnaire (DEQ) to survey the participants' emotional state (Harmon-Jones, Bastian, & Harmon-Jones, 2016). The DEQ asks participants "to what extent did you these experience these emotions?" and then presents a list of emotion words and a 1-7 scale ranging from "not at all" to "an extreme amount" (Harmon-Jones, Bastian, & Harmon-Jones, 2016). The words are separated into a variety of categories; for this analysis we focused on happiness and sadness. .. Happiness included the words *happy, satisfaction, enjoyment, and liking*; sadness included *sad, grief, lonely, and empty*.

This was followed by a personal and medical history questionnaire to identify any conditions that might affect the results. Then, various self-report measures were presented in randomized order: The Handedness Inventory to determine participants' dominant hand (Briggs & Nebes, 1975), The Balanced Inventory of Desirable Responding (BIDR), a social desirability bias inventory (Paulhus, 1991), and The Center for Epidemiologic Studies Depression Scale (CESD-R) to measure depression (Eaton, Smith, Ybarra, Muntaner, & Tien, 2004). The BIDR presents a variety of phrases related to social desirability and participants have a scale from 1 (not true) to 7 (very true) to indicate how much they agree with the phrase. Each item that has been rated 6 or 7 receives 1 point; higher scores suggest higher social desirability bias (Paulhus, 1991). The CESD-R lists symptoms related to depression and allows participants to indicate how often they have felt this way in the past week or so with the options ranging from "not at all or less than 1 day" to "nearly every day for 2 weeks" (Eaton, Smith, Ybarra, Muntaner, & Tien, 2004). Possible scores range from 0-60. Participants who scored above the cut-off score of 16 were considered to be depressed for the purposes of this study.

Hemispheric Tasks. There were two experimental conditions, drawing on the left or the right, and two control conditions, gazing left or right. After completing the self-report measures,

the participants were moved to a different table located behind them that was set up ahead of time. The drawing participants were presented with a piece of standard white paper that was taped down on each corner to the table and was located either on the right or left side. The chair at the table was kept between pieces of tape on the floor to ensure that it would be located in the center of the table. A 2B drawing pencil and a white plastic eraser were provided. They wore hemifield goggles to direct and limit their vision to the same side on which they were drawing. They were instructed to draw anything they would like for five minutes. They were also asked to remain facing forward and not to turn their head or body to the right or left. After five minutes, participants completed the DEQ for the second time.

Lateralized Gaze. In the lateralized gaze conditions, participants had their gaze oriented to either their left or their right by wearing the hemifield goggles for five minutes. According to the literature, looking in one direction should activate the contralateral hemisphere (Drake, 1984, Drake, 1987; Lempert & Kinsbourne, 1982; Propper et al., 2011).

Results

Since the DEQ was presented twice, we focused on the variable of post-task scores while controlling for variance in pre-task scores, as well as controlling for social desirability bias. This was accomplished by regressing post-task DEQ sadness and happiness on pre-task DEQ sadness or happiness and BIDR scores and saving the residuals, which then reflect variance in post-task emotions free of variance attributable to baseline emotional states and social desirability biases. The data analytic task is then to see if the independent variables of depression (present versus absent), side (L versus R), and task (drawing versus gazing) account for variance in post-task emotions. 33.8% of participants scored above the cut-off on the CESD-R.

Sadness

Significant main effects were found for task, $F(1,124) = 21.13, p < .001$, such that drawers had lower post-task sadness than gazers, and for side, $F(1,124) = 3.93, p < .05$, such that participants who worked on the right have lower post-task sadness than those who worked on the left. Furthermore, a task x depression interaction was observed, $F(1,124) = 18.90, p < .001$; as shown in Figure 2, among non-depressed persons (left), sadness did not vary as a function of what task was performed, while for depressed participants (right), drawing results in far less post-task sadness than gazing did. Finally, a side x depression interaction was evident, $F(1,124) = 5.37, p = .022$; as seen in Figure 3, for non-depressed participants (dark gray), sadness was not affected by which side the participant drew or gazed on, but for depressed participants (light gray), drawing or gazing left led to much higher sadness than drawing or gazing right did.

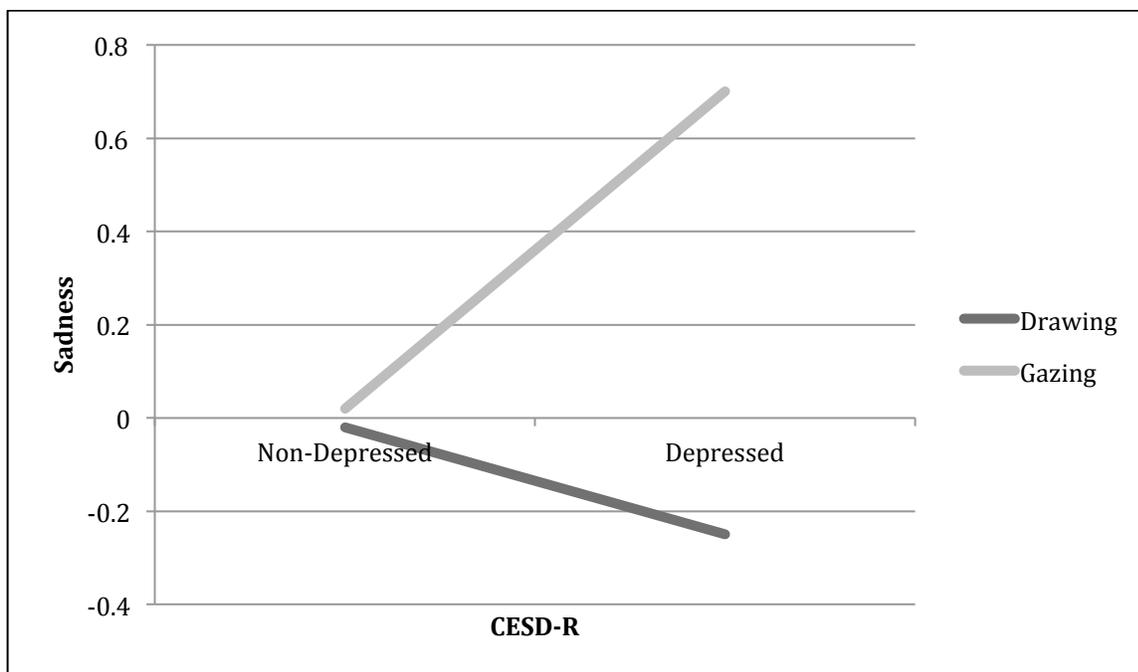


Figure 2. Sadness x task in depressed and non-depressed participants.

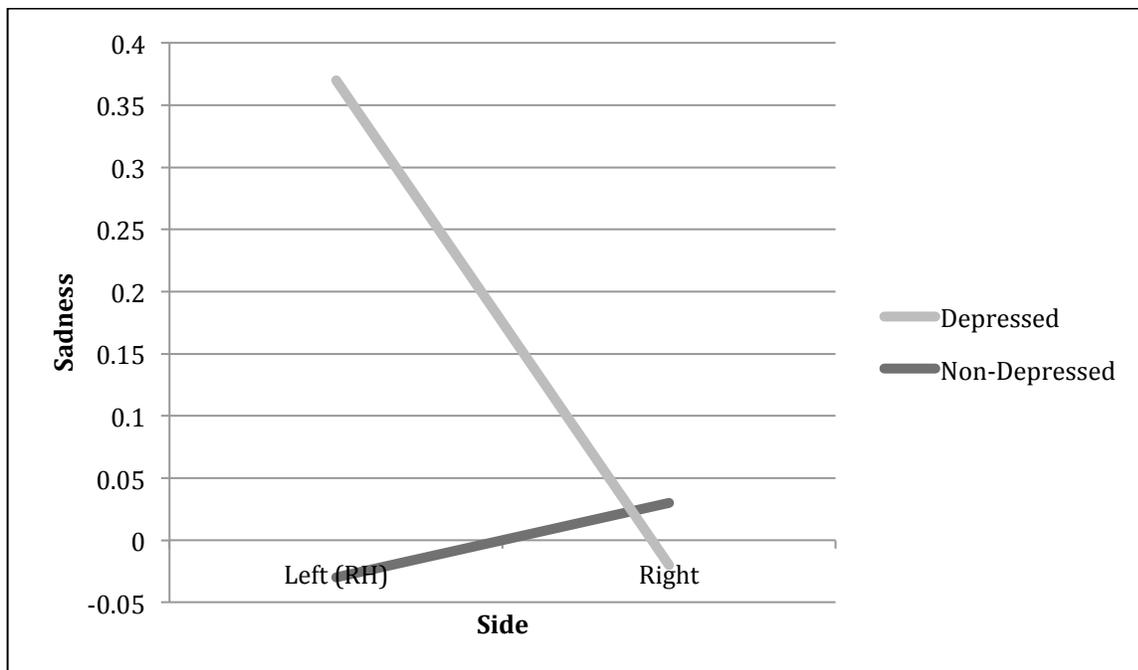


Figure 3. Sadness x side in depressed and non-depressed participants.

Happiness

Significant main effects were found for task, $F(1,123) = 13.51, p < .001$, such that drawers had higher post-task happiness than gazers. Also, a task x side x depression interaction was observed, $F(1,123) = 5.62, p < .033$. Among non-depressed persons (Figure 4), happiness increased in participants who drew on the right side as opposed to gazing on either side or drawing on the left. Among depressed participants (Figure 5), gazing side has little effect on happiness, as does drawing side.

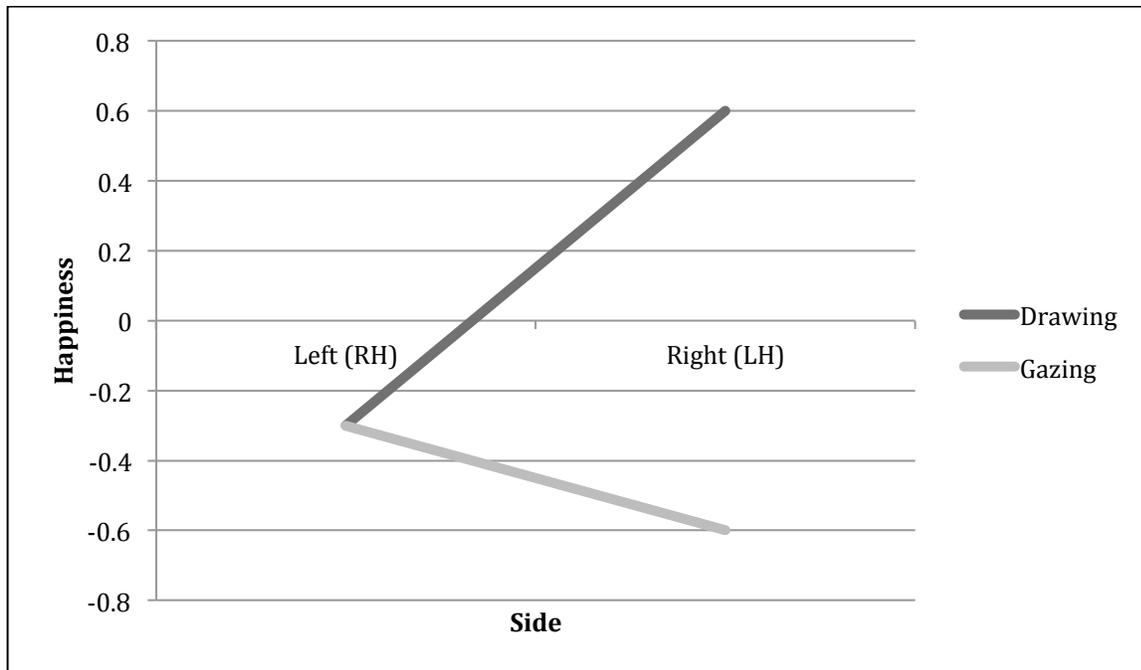


Figure 4. Side x task in non-depressed participants.

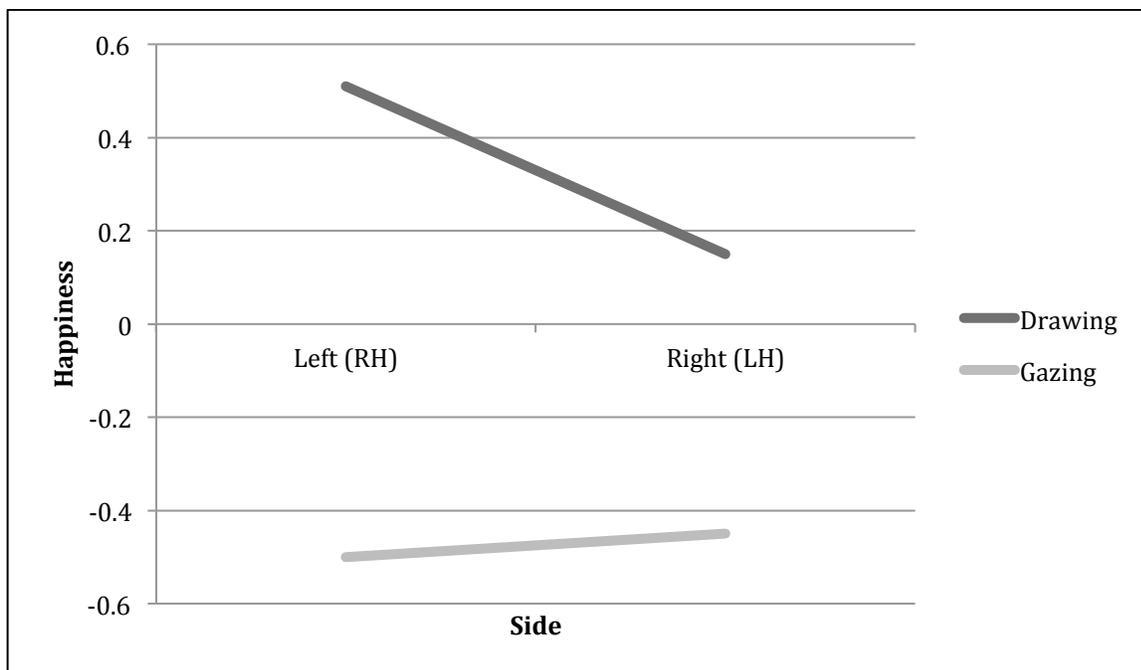


Figure 5. Side x task in depressed participants.

Drawing Only

In regards to drawing participants only, a side x depression x emotion interaction was observed, $F(1,86) = 4.78, p < .032$. As shown in Figure 5, both depressed and non-depressed participants show lower sadness as an effect of drawing on the right. This effect is far more clear for the depressed persons (light gray). Additionally, non-depressed persons (dark gray) show greater happiness as a function of side of drawing, as seen in Figure 6. This effect is actually reversed in depressed persons (light gray) as drawing on the right leads to lower happiness than drawing on the left.

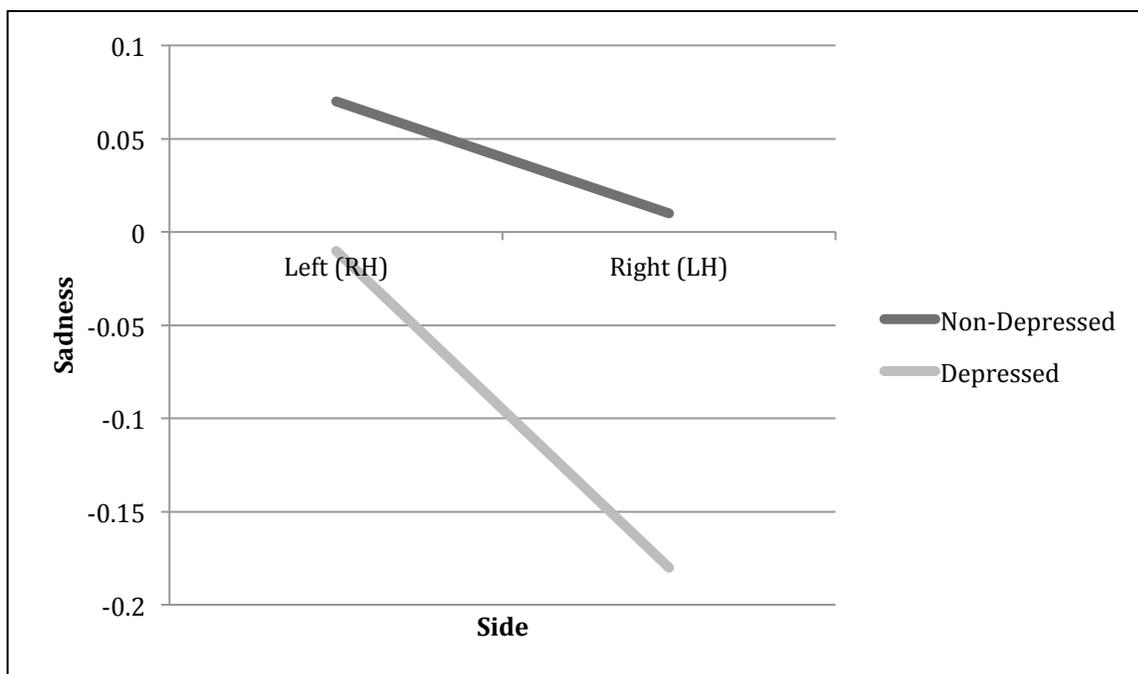


Figure 5. Depression status x side on sadness in participants who drew.

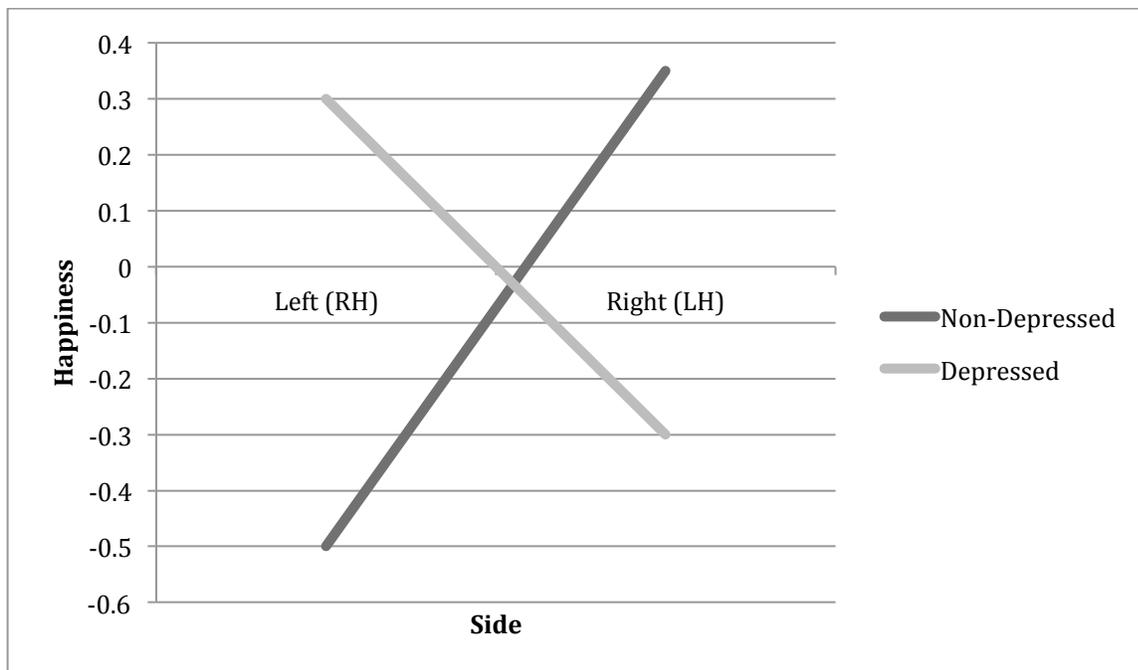


Figure 6. Depression status x side on happiness in participants who drew.

Discussion

While art therapy has been shown to successfully reduce symptoms of depression (Chandraiah, Anand, & Avent, 2012), the present study sought to combine these results with the knowledge of mechanisms of hemispheric activity of the brain. It was thought that manipulations of cerebral hemispheric activity could affect participants' affective state, thus offering insight into art therapy's mechanisms of effect.

Without considering depression status, drawing was more successful than gazing in both lowering post-task sadness and increasing post-task happiness, as hypothesized. Also, participants who worked on the right, drawing or gazing, had less post-task sadness than those who worked on the left. This also supports the hypotheses.

For participants who fell below the cutoff for the CESD-R, suggesting non-depression status, drawing on the right and activating the left hemisphere led to higher post-task happiness.

The task did not significantly affect their happiness if they worked on the left, but those that worked on the right had more of an increase in happiness if they drew instead of gazed. In this same group, sadness was not affected by which side the participant drew or gazed on. For participants who did show depressive symptoms, drawing and gazing on the right (raising left hemisphere activity) led to lower post-task sadness. Side of gazing, either to the left or right, did not make much difference but gazing was generally associated with lower happiness scores than drawing.

In practice, it would be reasonable to suggest that art therapy could be more successful with depressive clients if the work space existed to the right of the client. Specifically, this would be helpful in lessening sad feelings. Creating art in the right visual field could also be beneficial in art therapy with non-depressed populations to increase happiness. Since the goal of art therapy is to “improve or restore a client’s functioning and his or her sense of personal well-being” (American Art Therapy Association, 2013, 1), increasing happiness, or decreasing sadness, should facilitate reaching this goal.

These results do not provide support for the valence specific hypothesis, which suggests that the left hemisphere is specialized for processing positive affect while the right hemisphere is specialized for negative affect (Killgore & Yurgelun-Todd, 2007). This theory would suggest that sadness is a negative affect and therefore related to the right hemisphere as opposed to left, as our results suggest. There was also no support for the right hemisphere hypothesis, in which the right cerebrum is dominant for processing all emotions (Killgore & Yurgelun-Todd, 2007). In this case we should have seen a general increase in emotion, most likely an emotion the participant was already experiencing, in those that were in the left group.

However, there was support for the cerebral asymmetry associated with approach- and withdrawal-related behaviors. This theory suggests that the left hemisphere is specialized for approach-related emotions and the right hemisphere is specialized for withdrawal-related emotions (Davidson, 1992). Based on this, depression and sadness would be related to a lack of left hemisphere activity due to the deficiency of approach-related emotions. In the current study, increased happiness, an approach-related emotion, was associated with activating the left hemisphere in participants who did not show symptoms of depression. Sadness was also related to the left hemisphere but in the case of decreasing sadness in those participants who did show symptoms of depression.

Some limitations in the present study should be considered. First, the CESD-R is not a clinical diagnosis of depression. It only shows that a participant is experiencing some symptoms of depression. In future research, this study could be replicated with a clinically depressed population to see how the results compare. This would provide stronger evidence for utilizing a right-oriented workspace in practice. Other limitations include the logistics of the task. Some participants may not have actively drawn for the 5 minute period. The drawing task also could have been changed to be longer since art therapy tasks would last longer in practice. This study could also be replicated with a longer drawing task to explore if the effects on lateralization would be stronger. Another potential limitation is experimental demand characteristics; drawers may have reported better post-task emotion scores assuming that that was the goal of the study. While this is impossible to rule out, it is important to note that drawing did not always lead to better affective outcomes than gazing did. The results show that the effect of drawing on emotion is a function of side and depression status.

Additionally, this study focused on approach-related processes and emotions. Future research could examine withdrawal-related affect, such as fear or anxiety, to examine the effects of working on the left. To compare this to depression status, this could be examined in diagnostic groups of people with generalized anxiety disorder or social anxiety. Future research could also examine how the content of the drawings or the participants' feelings about the drawing affect post-task emotions. It may be helpful in this case to give a more directive drawing task.

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