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Effects of Coloring Mandalas on State-Anxiety Reduction with a Focus on Big-Five Personality Traits

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Effects of Coloring Mandalas on State Anxiety Reduction with a Focus on Big-Five Personality
Traits

A thesis presented by

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to the Department of Psychology

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Connecticut College

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Abstract

The present two-part study examined the effects of coloring mandalas on state anxiety reduction with considerations of duration spent coloring and Big-5 personality traits. It was hypothesized that coloring mandalas for 30 minutes would significantly reduce levels of state anxiety. There were three coloring conditions that were randomly assigned to 105 participants. Measures included a Spielberger State-Trait Anxiety Inventory (STAI) pre- and post-test which assessed levels of state and trait anxiety, and a Big-Five Personality Scale that examined five main personality traits (Goldberg, 1992). Participants had up to 30 minutes to color their mandala before completing a post-intervention STAI. There were no differences across the three coloring conditions, but a paired samples t-test showed a significant reduction in state anxiety from Time 1 to Time 2. Bivariate correlations of personality factors with anxiety reduction, trait anxiety, and duration revealed a significant relationship among neuroticism, anxiety reduction, and duration within the “Easy” coloring condition. There was also a positive relationship in this condition between anxiety reduction and duration of coloring. A multiple regression analysis in the “Easy” condition predicting anxiety reduction was also examined. A second preliminary study was conducted to distinguish whether the coloring intervention was unique in its anxiety reduction effect. A comparison between coloring and puzzle-making revealed no significant difference in anxiety reduction between the two conditions.

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Effects of Coloring Mandalas on State Anxiety Reduction with a Focus on Big-Five Personality Traits

Anxiety may be defined as “an emotion characterized by feelings of tension, worried thoughts and physical changes like increased blood pressure” (American Psychological Association [APA], 2017). It is a natural feeling that all humans experience throughout their lives, but there is a point at which anxiety surpasses typical levels and becomes a disorder (Evans et al., 2012; YoungMinds, 2017). Anxiety disorders are the most common class of psychological disorders (Curry & Kasser, 2005; Kessler et al., 1994). A National College Health Assessment reported that in a sample of 4,770 college students, anxiety was cited as their greatest stressor, interfering with their studies and performance (Aaron, Rinehart & Ceballos, 2011; American College Health Association [ACHA], 2008). According to the Anxiety and Depression Association of America (ADAA; 2016), anxiety disorders amongst college students are clearly becoming a larger issue, as 75% of the 40 million adults affected by an anxiety disorder had experienced their first anxiety episode by age 22. Additionally, a national survey showed that over 62% of students who dropped out of college did so because of their mental health issues (ADAA, 2016). College is a stressful time for students as they struggle to figure out who they are, to develop relationships, to pursue extracurricular activities, to succeed academically, and to make potentially life-altering decisions as they near the end of their college experience.

These findings highlight the need to find various forms of relief and treatment for students suffering from anxiety. As suggested by Aaron, Rinehart, and Ceballos (2011), the current methods being used for anxiety prevention are not sufficient, either because students are

not embracing proposed treatment strategies or the pressures of current academic life require additional interventions. The standard combination of cognitive-behavioral therapy (CBT) and medication may be effective, but not all students may have access to these remedies, and others may not feel their degree of anxiety warrants this level of intervention.

Personality

In the last few decades, the science of personality has converged around five main personality traits that everyone has to differing degrees: neuroticism, extraversion, conscientiousness, openness to experience, and agreeableness (Costa & McCrae, 1992). With these traits in mind, research has demonstrated that certain personality traits can serve as risk markers for developing an anxiety disorder (Brandes & Bienvenu, 2006). There is evidence that suggests high neuroticism may be a risk marker for severe anxiety. Neuroticism, as defined by Brandes & Bienvenu (2006), is “one’s tendency to experience negative emotions and cope poorly with stress” (p. 263). In addition to being at risk for an anxiety disorder, individuals higher in neuroticism are also predisposed to depression and increased risk for suicidal ideation. The combination of a high neurotic personality plus the stress many individuals face throughout their transition to college can provide students with heightened vulnerability to anxiety.

High-neuroticism individuals are more prone to interpersonal stress, in addition to increased negative life events (Gunthert, Cohen, & Armeli, 1999). Neurotic individuals typically have increased levels of worry, self-criticism, anxiety, and low self-esteem (Armstrong & Rimes, 2016). Furthermore, a common process that has been found as a mediator between neuroticism and anxiety disorder is the process of rumination. Rumination may be defined as “turning attention to one’s symptoms and analysis of the causes and consequences of those symptoms (page 115)”, rather than solutions (Papageorgiou & Wells, 2004, p. 115).

Larsen and Ketelaar (1991) examined emotional reactivity to a negative mood induction procedure which demonstrated that those higher in neuroticism responded with stronger negative affect than those lower in neuroticism (Gunthert et al., 1999). Another theory to explain high-neuroticism individuals' poor coping skills could be a combination of their coping choices along with their general coping effectiveness. As defined by Gunthert et al. (1999), coping choice is the coping mechanism that individuals use in response to stress as differentiated from coping effectiveness, which is how effective coping strategies are in reducing distress. High-neuroticism individuals are more likely to make poor coping choices, including the use of hostile reactions, self-blame, distancing, withdrawal, among other less constructive strategies. A final consideration for ineffective coping of this population is the result of their cognitive appraisals. Gunthert et al. (1999) discussed how higher-neuroticism individuals may evaluate stressful experiences more unfavorably than those lower in neuroticism, resulting in greater perceived stressfulness of daily events.

Based on the previously mentioned theories, Gunthert et al. (1999) conducted their own study to examine how neuroticism influences perceptions of stress, as well as a general investigation of coping choice, coping effectiveness, and affect reactivity. Participants in the study recorded the most stressful part of their day for two weeks. The participants also self-reported their appraisals of overall stressfulness, controllability, resolution, undesirability, and coping efficacy. Participants' reactivity to stress was analyzed using a hierarchical linear modeling (HLM) software. The main findings included greater stress reactivity to interpersonal events, potentially due to an interpretation bias in interactions with others (i.e., individuals higher in neuroticism may perceive neutral encounters as negative encounters). Furthermore, individuals higher in neuroticism had more negative appraisals of daily events than low-

neuroticism individuals. Lastly, as stated earlier, higher-neuroticism individuals did display less effective coping strategies that involved self-blame, hostile reactions, and catharsis, all which could be considered as maladaptive coping choices (Gunthert et al., 1999). In light of these findings, it would be valuable to develop interventions targeted towards individuals higher in neuroticism, with a focus on improving both their coping choices and coping effectiveness.

Therapies

There are a few alternative therapies available for treating anxiety and anxiety disorders, including exposure therapy, acceptance and commitment therapy (ACT), mindfulness-based therapies, and art therapies. Exposure therapy is a form of CBT that exposes the individual to the feared situation or object, essentially desensitizing them to their fear (ADAA, 2016). ACT is a newer therapeutic treatment that uses strategies of acceptance and mindfulness (i.e., being present, living in the moment). ACT teaches individuals the skills to cope with unwanted feelings and thoughts, learn to accept them, and commit to a change in behavior. Mindfulness-based approaches are typically used in combination with CBT or mindfulness-based stress reduction (MBSR). The premise of these mindfulness-based approaches is to experience present moments non-judgmentally, and to respond to stress reflectively, rather than reflexively (Hofmann, Sawyer, Witt, & Oh, 2010). The belief is that mindfulness-based approaches can counter previously adopted avoidance strategies, which can only prolong the problem and, ultimately, give more power to the anxious beliefs and feelings.

Armstrong and Rimes (2016) sought to create a mindfulness-based therapy for reducing neuroticism, anxiety, depression, and functional impairment from stress vulnerability. The research design consisted of a randomized, 8-week MBCT (mindfulness-based cognitive therapy) course or an online self-help course. The results demonstrated that the experimental

condition (MBCT course) had lower levels of neuroticism at 4 weeks post-treatment.

Additionally, the MBCT group had significantly lower levels of rumination (a mediator between neuroticism and anxiety disorders), and higher levels of self-compassion, which could counteract some of the maladaptive coping strategies neurotic people typically use (e.g., self-blame). It was suggested that the improvements may be associated with increases in self-compassion, mindfulness, decentering, and beliefs about acceptability of experiencing/expressing negative emotions (which was only found in the experimental condition) (Armstrong & Rimes, 2016,). This study has strong implications for MBCT as an intervention for reducing neuroticism, rumination, and anxiety symptoms, while promoting mindfulness and healthy coping skills.

Mindfulness-based Art Therapy (MBAT) is another new and developing treatment approach to both trauma and anxiety. MBAT incorporates both the practice of mindfulness skills (e.g., body scans, meditations, yoga, and educational sessions on stress and coping) and mindful art activities (Monti et al., 2006). Mindful art activities utilize mindfulness to focus the individuals on the present moment. Art making provides the opportunity to observe emotions in the present moment, which can be especially beneficial for individuals experiencing difficult emotions. Chapman et al. (2001) conducted a study examining MBAT as a treatment for pediatric trauma patients and explored the potential neural pathway effects of art therapy in the context of stress and trauma. Chapman et al. (2001) proposed that certain art therapy tasks could integrate specific brain pathways related to distressing experiences, ultimately providing a mechanism for stress reduction (Chapman et al., 2001; Monti et al., 2006). It was suggested that the stimulation from art media could activate the right hemisphere, leading to a greater awareness of threatening events and one's emotional responses, while also engaging the left hemisphere through more language-based intervention (Monti et al., 2006). Ultimately, the

processes of both mindfulness and art making support the potential for transforming threat schemas, consequently affecting coping responses in individuals. The use of both verbal and non-verbal modes of information processing promote healthy self-regulation, as well as self-exploration and self-expression through MBAT.

Arguably, all art therapies could be considered mindfulness-based. Meditative states are expressed with high levels of theta waves that are also expressed during imaginative states (Kruk, Aravich, Deaver, & Debeus, 2014). Art making has produced demonstrated effects of elevated theta waves supporting claims that ““frontal theta is critical for the production of meditative states’ that benefit attentional and cognitive processing” (Baijal & Srinivasan, 2010, p. 37, as cited in Kruk et al., 2014, p. 58). This research suggests that art making is an inherently meditative and mindfulness-based task that has the potential to decrease levels of state anxiety. Furthermore, both mindfulness and art making can provide the opportunity for individuals to develop self-awareness, strengthening their capacity for understanding their emotions and ultimately addressing them in more healthy ways.

Art therapy is best defined as a form of psychotherapy that fosters self-expression, while allowing individuals to “explore their feelings, reconcile emotional conflicts, develop social skills, reduce anxiety, and increase self-esteem” (American Art Therapy Association, 2013). Furthermore, art therapy has been described as having the capacity to increase positive emotions, engagement and flow, and to identify/create meaning in our lives (Wilkinson & Chilton, 2013). Examples of art therapies include collage, phototherapy, sculpting, digital art, painting, or drawing/coloring. Art therapy has been especially employed as a collateral treatment for trauma or chronic illnesses, such as cancer (Henderson, Rosen, & Mascaro, 2007; Nainis, 2011; Pifalo, 2002). The benefits of using art therapy in cases of trauma are especially useful as art therapy

promotes non-verbal communication for those who may feel uncomfortable or are unable to express themselves (Henderson et al., 2007; Nainis, 2008; Pifalo, 2002). Research has demonstrated that traumatic memories are stored in the right hemisphere which inhibits the individual's verbal declarative memory of the trauma, suggesting great relevance and importance in studying nonverbal, expressive therapies as treatment for individuals with PTSD, especially children (Klorer, 2005).

As the realities of stress and depression in college students elicit more attention and concern, however, there has been more focus on art therapy as an intervention for students (Curry & Kasser, 2011; Sandmire, Gorham, Rankin, & Grimm, 2012; van der Venet & Serice, 2012). Art therapy holds the attraction of being a creative outlet for young adults, while also offering an alternative to the heavy verbal demands of their academic pursuits. For these reasons, it holds great promise as a companion anxiety reduction strategy to accompany cognitive-behavioral and pharmacological treatments. One art form in particular that has captured the attention of art therapists and researchers is the coloring and tracing of Mandalas.

Mandalas

Mandalas were first introduced into the treatment world by the psychiatrist Carl Jung, who proposed concentration on mandalas as a therapeutic technique to facilitate "individuation," a process of psychological integration and wholeness of the self (Jung, 1973; Pisarik & Larson, 2011). More specifically, individuation is a process where our unconscious selves can be brought into consciousness. Contemplation of a mandala and its interlocking and symmetrical elements can connect back to a more pure dimension of childhood, even infancy, and is believed to be able to carry information between the ego and Self (the conscious and the unconscious) (Fincher, 2017). Individuation as a process allows more self-awareness and understanding of who one is as

a whole, and demonstrates positive mental health. By understanding ourselves more fully, we promote holistic healing, mentally and physically, and minimize the distress we may feel from the confusion of not knowing who we are at our core. Mandalas are believed to help one access one's true Self, nearing the potential for wholeness.

Mandalas are defined as any artistic design created within a circular context, as the circle represents the self and helps individuals to organize and center themselves within the circle (Pisarik & Larson, 2011). It is noted in Gestalt psychology that simple, closed forms are more quickly perceived and recognized as meaningful (Fincher, 2017; Kohler, 1992). The act of coloring shapes, specifically circles, goes back to our childhoods. A child's drawing/coloring abilities develop in parallel with a child's cognitive and emotional development. Specifically, as children practice the art of creation and making, they are developing a sense of themselves as active agents, and not passive recipients to others (Fincher, 2017). This self-awareness unites feeling, willing, and thinking, as we begin to see ourselves as individuals. As an adult, coloring a circle can bring us back to our earliest experiences of unity and self-coherence. The act of coloring a mandala can reconnect our present selves with our earliest ways of being, which can center one both physically and psychologically.

This circular element has demonstrated effectiveness in studies that examined the qualities of drawing within a circle versus a square; the results revealed more positive affect when coloring the circle in contrast to a square (Slegelis, 1987). Mandalas were found to be calming and soothing, as well as a facilitator of individuation and self-healing. Jung claimed that mandalas involved a "rearranging of the personality," elaborating that mandalas had the ability to center one's psyche, especially in states of disorientation, panic, or chaos (Slegelis, 1987, p. 301). In art therapy, the presence of lines and angles is often representative of hostility, negative

affect, aggression, or fear (Slegelis, 1987, p. 306). Slegelis (1987) hypothesized that art drawn within a circle would have fewer number of angles than angles drawn in a square. Students were randomly assigned to a square or circle condition and were told to start with a shape in the center, and to focus on this shape and “let it grow spontaneously” (Slegelis, 1987, p. 307). The results demonstrated a statistically significant difference in the number of angles drawn within the circle versus the square, supporting the original hypothesis. One might infer from these findings that circles do invoke a more calming state of mind, while supporting previously mentioned psychological processes. Further discussion revealed more realistic drawings within circles, potentially representative of Jung’s concept of the “Self.” The circles also generally yielded happier and more positive themed drawings than the squares.

There has been an increasing number of studies focused on mandalas and their effectiveness across populations as a method of therapy and stress reduction (Aaron et al., 2011; Drake, Searight & Olson-Pupek, 2014; Kersten & van der Venet, 2010; Pisarik & Larson, 2011; van der Venet & Serice, 2012; Visnola, Sprudza, Bake & Pike, 2010; Walsh, Chang, Schmidt & Yoepp, 2005) Additionally, mandalas are incredibly beneficial when addressing sexually abused populations as abused individuals may be unable to discuss sensitive information, but be able to express themselves symbolically and find peace of mind (Henderson et al., 2007). In the last two decades, the coloring of mandalas has increasingly been utilized by art psychotherapists as a tool for self-expression, conflict resolution, self-awareness and healing (Henderson et al., 2007). Various studies have demonstrated the effectiveness of mandalas across different populations, including college students (Aaron et al., 2011; Drake et al., 2014; Kersten & van der Venet, 2010; Pisarik & Larson, 2011; Walsh et al., 2005).

Pisarik and Larson (2011) sought to increase authenticity in undergraduate college students and promote healthy psychological well-being through the creation of mandalas. Authenticity is considered a developmental process, similar to that of individuation: the process involves exploration, discovery, acceptance, and arrival at behaviors in accordance with one's true self (Pisarik & Larson, 2011, p. 84). Research has examined the development of one's "authentic self" and has found that this development can reduce feelings of distress that are often experienced during times of transition (e.g., a student's transition to college). Due to modern social dynamics, however, it has become more difficult to achieve an authentic self (Pisarik & Larson, 2011, p. 85). In response to this concern, Pisarik and Larson (2011) explored the effects of creating mandalas on the facilitation of improved awareness and evaluation of one's authentic self.

The study utilized a pretest-posttest, nonrandomized, control group research design. The participants consisted of students enrolled in a university course titled "Life Skills Needed for Success." The study spanned the course of a week with data collection at the beginning of the first class period and again at the end of the last class period of the same week. All participants were asked to complete the pretest measures which consisted of two subscales of the Authenticity Inventory [awareness subscale and unbiased processing subscale] (Goldman & Kernis, 2002) and two subscales of Ryff's Scales of Psychological Well-Being (RSPW) [self-acceptance and personal growth] (Ryff, 1989). Following this, participants in the control condition were allowed to leave and participants in the mandala condition were given coloring materials and instructed to, first, trace a large circle, and then fill the circle with representations

of themselves in the current moment. After the allotted drawing time of 50 minutes, participants completed a worksheet for interpreting their mandala. The group met again, three days later, and followed the same procedure. After finishing the interpretation worksheet, participants were given a posttest that assessed the same measures listed for the pretest.

The results showed that there were statistically significant effects for measures of authenticity and psychological well-being, with an increase in authenticity awareness for the mandala group pre-test to post-test, and higher levels of self-awareness, unbiased processing, and personal development for participants in the mandala group (Pisarik & Larson, 2011). Finally, this research has strong implications for a positive relationship between an authentic sense of self and one's psychological well-being, with a strong focus on mandalas as a facilitative process for promoting the development of authenticity in undergraduate college students.

Mandalas and art therapy are also beneficial interventions when addressing more vulnerable populations as they may be unable to discuss sensitive information, but are able to express themselves symbolically and achieve more peace of mind through this expression (Henderson et al., 2007; Pifalo, 2002). Pifalo (2002) conducted a study that examined the effects of different art therapy interventions on long- and short-term effects of sexual abuse in child and adolescent victims. Drawing has been noted as a highly-recommended art therapy intervention for victims of abuse, as it allows the opportunity for unconscious mental representations to appear in the child's drawings.

However, there is much skepticism about the validity of these methods for revealing unconscious impulses through symbolism. Critics have noted three major issues with the commonly used Draw-a-Person [DAP] test, a psychological projective personality and cognitive test used in evaluations: 1) lack of appropriate methodological procedures, 2) defensive response

style, and 3) insufficiently validated scoring procedures (Sims, Dana, & Bolton, 1983). Specifically, Sims et al. (1983) found failure to control factors (e.g., drawing quality, intelligence) can invalidate meaningful interpretation of drawings used for testing. Similar studies found that the drawing quality itself could indicate levels of anxiety as highly anxious children had lower quality drawings compared to children with lower levels of anxiety (Silverstein, 1966; Sims et al., 1983). Furthermore, the relationship between intelligence and drawings needs to be further investigated as there is inconsistent evidence of some relationship between the two (Koppitz, 1966; Mogar, 1962; Sims et al., 1983). Finally, child participants may utilize different defenses for coping with anxiety that could result in inconsistent findings, and most scoring systems used with DAP were not multidimensional and did not consider previously mentioned variables (e.g., drawing quality) (Sims et al., 1983). Despite these critiques, projective testing methods continue to be used and can be useful. However, it is important to remain critical when reviewing these results and other methods should be considered for more accurate analyses and understanding of the individual.

Nonetheless, art therapy interventions are important to utilize in this field as they bypass standard talk-therapies that could have counterproductive effects on victims of abuse. They are a potential way of breaking through the previously mentioned difficulties in a traumatized individual's ability to draw on verbal declarative memory (Klorer, 2005). Pifalo's (2002) 10-week long group art-therapy intervention ultimately demonstrated significant reductions in anxiety, posttraumatic stress, and dissociative symptomatology pre-test to post-test according to the Briere Trauma Symptom Checklist for Children (TSCC; Briere, 1996). Ultimately, the study supported art therapy as a useful intervention for beginning the necessary healing process of the trauma from child/adolescent sexual abuse.

Various studies have shown promising research in supporting the anxiety reduction efficacy of coloring mandalas amongst undergraduate students (Curry & Kasser, 2005; Pisarik & Larson, 2011; Sandmire et al., 2012; van der Vennet & Serice, 2012). Curry and Kasser (2005) examined different coloring art activities (i.e., mandalas, plaid form designs, and free-form) in order to measure their effectiveness in reducing anxiety among undergraduate college students. Anxiety levels were measured using an adaptation of the Spielberger State-Anxiety Inventory (Curry & Kasser, 2005). The adapted measure consisted of 14 items from the original STAI (Spielberger, Gorsuch, & Lushene, 1970) using a 9-point Likert scale. Anxiety levels were measured at three different times; T1 was at the beginning of the study, T2 was after an anxiety induction, and T3 was after the coloring intervention (Curry & Kasser, 2005). The research supported a significant difference between the mandala and plaid groups versus the free-form drawing, which suggested that the complexity of both the mandala and plaid designs induced a meditative state that ultimately reduced anxiety levels (Curry & Kasser, 2005). A replication study by van der Vennet and Serice (2012) showed a significant difference in anxiety reduction between the mandala design versus both the plaid design and free-form drawing, which differed from the original study's results (Curry & Kasser, 2005). Van der Vennet and Serice's (2012) study demonstrated a significant reduction in anxiety levels only in the mandala group, which could be explained by the circular form, which is "inherently meditative" (p. 91) and helps individuals center themselves. These results also aligned with the earlier cited findings of Pisarik and Larson (2011).

The Present Study

The purpose of the current study is to replicate the findings of Curry and Kasser (2005), and to provide more evidence supporting the effectiveness of mandalas in anxiety reduction among undergraduate college students. Curry and Kasser (2005) allotted 20 minutes of coloring time and demonstrated significant results, and a replication study also used 20 minutes (van der Venet & Serice, 2012). A more recent study that examined the effectiveness of mandala coloring in reducing state anxiety and negative affect allotted only 7 minutes of coloring time (Muthard & Gilbertson, 2016). These studies raised questions about the potential effects of duration spent coloring on levels of state anxiety. For this reason, the current study was designed to allow mandala coloring for up to 30 minutes. The purpose of this was to examine if and how duration spent coloring affected posttest levels of state anxiety, and if there might be an ideal amount of time spent coloring for optimal anxiety reduction.

Additionally, the study explored why certain people respond more favorably to coloring mandalas, whereas others find the task unhelpful or even stressful. It employed the Big-5 personality factors as additional variables in this study to try and better understand who may benefit most from mandala coloring, and why this may be. At this point, no other studies have examined duration of mandala coloring or personality traits as additional factors in the prediction of anxiety reduction. Finally, other studies have had two coloring conditions that compare the effects of mandala coloring to a different coloring activity (e.g., free-form coloring, geometric/plaid) (Curry & Kasser, 2005; van der Venet & Serice, 2012). Since the value of mandala coloring seemed reasonably well established, this study focused on differentiation in mandala coloring and chose to use three mandala templates, each of a different level of complexity. There were no *a priori* hypotheses about how complexity of design might affect

anxiety reduction, however it was hypothesized that longer periods of coloring mandalas would correlate significantly with decreased levels of anxiety and stress. Lastly, personality type was examined, using the Big-Five factors, to see if/how personality plays a mediating role in this intervention's effectiveness. Of particular focus was the personality factor of Neuroticism (also referred to as low Emotional Stability), given its close relationship to anxiety and stress vulnerability.

In addition to this first study, a second smaller study was conducted to examine mandala coloring in contrast to another distracting mental activity. This study compared the effects of coloring mandalas to another mindful activity, constructing jigsaw puzzles. The purpose of this was to clarify if the therapeutic benefits revealed in the first study were the results of coloring mandalas specifically or, rather, the effects of a therapeutic distraction. Previous research that examined the alteration of time perception during jigsaw puzzle tasks suggested a "flow"-like experience for some participants when working on the jigsaw puzzle, pointing to full immersion and focus on the task (Iwamoto & Hoshiyama, 2011). The state of flow can be equated to mindfulness, the state of being fully aware of oneself and being in the moment. Therefore, the conditions of jigsaw construction and coloring mandalas both had the potential to offer the same therapeutic benefits to the participants. Although puzzles have the potential to induce a state of flow, mandala coloring may go beyond a temporary state of mindfulness to actually encouraging deeper psychological processes, such as individuation. Because of this possibility, it was hypothesized that coloring mandalas will have a stronger effect on anxiety reduction in the participants than jigsaw puzzle tasks.

Method (Study 1)

Research Design

The present study was an experimental procedure with a repeated-measures between-subjects design, where participants were randomly assigned one of three coloring options, based on level of difficulty. Dependent variables were change in anxiety from pre- to post-test (calculating by a difference score and labeled “anxiety reduction,” and duration of time spent coloring.

Participants

The study had 105 participants, 36 participants each in the “Easy” and “Medium” difficulty conditions and 33 participants in the “Hard” difficulty condition. The participants consisted of Connecticut College students (86 women, 18 men, and 1 non-binary). The male participants were split equally across difficulty conditions (6 in each condition). Psychology students were able to receive course credit for their participation in the study. The majority of the students self-identified as White/Caucasian ($n=78$, 74.3%), Asian/Asian-American ($n=11$, 10.5%), African-American/Black ($n = 7$, 6.7%), Latino/Hispanic ($n = 7$, 6.7%), Afro-Latina ($n = 1$, 0.9%), and no racial identity ($n = 1$, 0.9%). All the students were between the ages of 18 and 22 years old ($M = 20$, $SD = 1.16$). Lastly, 42 participants recorded having had previous experience coloring mandalas as a relaxation technique.

Materials

Mandala Design. The Mandala design was the main focus of this study. There were three mandala options available within this study that were randomly assigned to the participants. The three options ranged from “Easy”, “Medium”, and “Hard” levels of difficulty (see Appendix A). Each design consisted of an outline of a specific mandala on a sheet of white paper. Colored

pencils were available in a large box at the researcher's table in a set of 12 different colors. Participants could select as many of the pencils as they desired to take with them to color the design. The majority of participants selected multiple pencils of varying colors.

Level of Anxiety. Levels of anxiety were measured using the Spielberger State-Trait Anxiety Inventory for Adults, Form Y, consisting of 40 items (STAI; Spielberger, 1983) (see Appendix B). The scale is designed to measure trait and state anxiety, as well as diagnose anxiety. Form Y is the most commonly used version of the state-trait inventory; it consists of 20 items for assessing trait anxiety and 20 items for assessing state anxiety. State anxiety measures the level of anxiety a participant is feeling at that moment, whereas trait anxiety measures the level of anxiety a participant generally feels. Responses were scored on a 4-point Likert scale ranging from either "not at all" to "very much so" when assessing state-anxiety or "almost never" to "almost always" when assessing trait-anxiety. An example of a state-anxiety question versus a trait-anxiety question is "I feel nervous" versus "I lack self-confidence." Higher scores indicated higher levels of anxiety. This specific scale has a high internal consistency with Cronbach α values ranging from .86 to .95 (APA, 2017).

Big-Five Personality Scale. The 50-item Big Five Personality Scale (IPIP; see Appendix C) consists of 50 items and is used to measure the Big Five dimensions of personality. The scale uses the Big-Five Factor Markers developed by Goldberg (1992). The Big-Five Factor markers were developed from previous personality measures, including the NEO-PI (Goldberg, 1992). The IPIP 50-item Big-Five factor markers measure each personality factor with 10 items that have been found to correlate highly with the "appropriate scales of the NEO-FFI and the

EPQ-R, providing concurrent validity for the IPIP” (Gow et al., 2005, p. 326). There is particularly high reliability for emotional stability/neuroticism, extraversion, and conscientiousness, although openness still demonstrates adequate reliability at 0.59 (Gow et al., 2005).

The five personality variables that are examined consist are extraversion, conscientiousness, emotional stability, agreeableness, and openness to experience. When scoring emotional stability, the inverse score measures Neuroticism, which is the opposite of emotional stability. Extraversion includes character traits such as sociability, activity, and positive emotionality; Agreeableness expresses more altruism, modesty, and trust; Conscientiousness results in more goal-directed behavior (e.g., thinking before speaking, following rules, organizing); Neuroticism demonstrates more negative emotionality, such as anxiety, nervousness, and sadness; finally, Openness to experience is the opposite of closed-mindedness (John et al., 2008). Participants were given a list of 50 statements to which they would respond on a 5-point Likert scale on how much they “disagree” or “agree”. An example of a statement found on the Big-Five Personality Scale is “I am the life of the party” or “I have little to say”.

Each personality trait was represented by ten of the statements with higher scores corresponding to how representative that trait was of the participant (e.g., a score of 50 in Agreeableness would suggest a more altruistic and trusting individual). Neuroticism was the only personality trait measured inversely as it was scored as “Emotional Stability”, the opposite of Neuroticism; for example, a score of 50 on Emotional Stability would be the equivalent of a score of 0 in Neuroticism, which would suggest a person very low in Neuroticism. Responses associated with Emotional Stability were inverted to find scores for Neuroticism.

Procedure

Participants had the option of signing up for a 45-minute session, using the sign-up sheets online at conncoll.edu/sona-systems, or stopping by the Reference desk in the Shain Library at Connecticut College during allotted periods of time when the researcher was present. Students had the opportunity to receive class credit for completing the study if they were within the Psychology department. Other students outside of the Psychology department had no incentive and participated in the present study out of personal interest or for reasons unknown to the researcher. Participants were not informed of which condition they would be placed in until arriving at the researcher's table on the first floor of the library, at which point they were randomly assigned to a mandala condition. The participants then selected their colored pencils and were given the option to go anywhere in the library to complete the study. Most of the students completed the study on the first floor of the library, which is rated to be of an average noise level. The survey packet that the participants were given included an informed consent form (see Appendix D), STAI test (T1), Big-Five Personality test, their randomly assigned Mandala design, a post-test state-anxiety inventory scale (T2), demographics, and a debriefing form. The consent form explained that the study sought to examine the effects of coloring mandalas. The participants could color for up to 30 minutes, and their self-reported time would then be recorded on the Demographics page. At the end of the study, all participants completed a Demographics form and were debriefed (see Appendices E & F). Due to the nature of the study, it was possible that students might report high levels of anxiety when participating; for this reason, guidance on how to contact the Connecticut College Counseling Center was provided in the debriefing form.

Results (Study 1)

Overview of Data Analysis

The first part of the two-part study hypothesized that 30 minutes of coloring mandalas would significantly reduce anxiety levels. The first statistical analysis conducted was a MANOVA to examine if mandala coloring would reduce anxiety across conditions. The second analysis was a bivariate correlation that explored the relationships among duration of time spent coloring, the Big-Five personality traits, and difference in anxiety reduction from Time 1 to Time 2. An additional bivariate correlation was run to look at Emotional Stability, duration of time spent coloring, and anxiety reduction for each of the three conditions. Finally, a multiple regression analysis was conducted to examine the relationship between low Emotional Stability, duration of coloring and anxiety reduction within the “Easy” coloring condition. Lastly, an ANOVA was used to examine gender differences, however, the results were not significant.

Examining Anxiety Reduction and Duration

To test the hypothesis that mandala coloring would reduce anxiety across conditions, a MANOVA was conducted. Table 1 presents the means and standard deviations for anxiety reduction and duration of coloring. A MANOVA for difference in anxiety reduction from Time 1 to Time 2 and duration of coloring was conducted using difficulty of coloring as the independent variable/ fixed factor. This analysis was non-significant (Wilks Lambda = .96, $F(4, 202) = 1.07$, $p = .374$), which then led to an examination of anxiety reduction collapsed across the three levels of difficulty using a paired t -test. This analysis yielded a significant result of $t(1,104) = 7.193$, $p < .001$, indicating that there was a reduction in anxiety from Time 1 ($M=42.18$) to Time 2 ($M=34.23$), regardless of mandala complexity.

Table 1.

Means and Standard Deviations for Anxiety Reduction and Duration of Coloring among Difficulty Conditions

Difficulty of Coloring Task	Change in State Anxiety (<i>M, SD</i>)	Duration of Time Coloring (<i>M, SD</i>)
Easy	9.56 (10.89)	19.17 (8.41)
Medium	6.67 (12.60)	21.53 (8.77)
Hard	6.82 (9.24)	21.36 (8.66)

Notes. N = 105.

Correlations of anxiety reduction, duration of coloring, and personality variables

Although there was no *a priori* hypothesis about personality type as a mediating variable, there was an interest in examining personality type in relation to anxiety reduction. To explore the possible relationships of personality variables to anxiety reduction and the duration of coloring, bivariate correlations were conducted for the IPIP Big Five personality measures, difference in anxiety reduction from Time 1 to Time 2, and duration of coloring collapsed across conditions (see Table 2).

There were a few significant relationships that emerged for the correlations of personality variables, anxiety reduction, and duration of coloring. The higher participants were in Emotional Stability, the less anxiety reduction they experienced from the coloring task ($r = -.288, p < .01$). Additionally, the higher participants were in Emotional Stability, the shorter time they persisted in coloring ($r = -.226, p < .05$). Similarly, trait anxiety at Time 1 was positively correlated with anxiety reduction within this study ($r = .416, p < .001$). Because both trait anxiety and the personality trait Neuroticism were strongly correlated to one another ($r = -.755, p < .001$), further analyses examined just Neuroticism instead of both Neuroticism and trait anxiety, as the results for both were likely to show a high degree of overlap. A third significant relationship occurred for anxiety reduction and duration of coloring, indicating that the longer individuals colored, the more anxiety reduction they experienced ($r = .249, p < .05$). This raised the question of whether it is possible that there could be a mediating relationship between a person's degree of Emotional Stability, the length of time they colored, and anxiety reduction; for example, due to the nature of this study (e.g., an anxiety reducing intervention), would a person with lower Emotional Stability be more likely to color for a longer duration of time than a person with higher Emotional Stability and would this then play a role in anxiety reduction?

Table 2.

Correlations of Anxiety Reduction, Duration of Coloring, Trait Anxiety, and Big Five Personality Measures (N = 105)

	Anx. Red.	E	A	E.S. ^a	O	C	Duration	Trait Anx.
Anx. Red.								
E	-.11							
A	-.16	.22*						
E.S. ^a	-.29**	.22*	.07					
O	-.02	.27**	.25**	.08				
C	-.19	.02	.21*	.19	.17			
Duration	.25*	-.07	.12	-.23	.05	-.05		
Trait Anx.	.42**	-.29**	-.13	-.76**	-.08	-.41**	.21*	

Notes. n = 105. E = Extraversion, A = Agreeableness, E.S. = Emotional Stability, O = Openness,

C = Conscientiousness; Trait Anx. = Trait Anxiety. ** - Correlation is significant at the 0.01

level (2-tailed). * - Correlation is significant at the 0.05 level (2-tailed).

^a = Emotional Stability is the inverse of Neuroticism

To examine these relationships in more depth, the researcher investigated whether these relationships were similar for all three coloring difficulty conditions. As Table 3 reveals, the relationship between low Emotional Stability and anxiety reduction only maintained significance in the Easy Coloring condition ($r = -.571, p < .001$). The relationship between anxiety reduction and duration of coloring still rose to significance in the easy condition ($r = .338, p < .05$), but was no longer significant in the medium and hard coloring conditions. Lastly, there was only a significant relationship between Emotional Stability and duration of coloring in the medium coloring condition ($r = -.383, p < .05$), indicating that individuals presenting with lower levels of emotional stability persisted in coloring longer during this condition.

Examining the Relationships among Anxiety Reduction, Duration, and Emotional Stability in the Easy Coloring Condition

There had been no *a priori* hypotheses made about the relationship between personality type and anxiety reduction; however, Neuroticism had been of particular interest given its close relationship to high anxiety and stress. Since anxiety reduction was correlated with both duration and low Emotional Stability in the Easy Coloring Condition, a multiple regression predicting anxiety reduction from duration and Emotional Stability was conducted. This regression would help to determine if both the length of time coloring and the personality variable of Neuroticism were contributing independently to individuals' anxiety reduction during the Easy Coloring

Table 3. (N = 105)

Correlations among Emotional Stability, Anxiety Reduction, and Duration in the Difficulty Conditions

	Emotional Stability ^a	Reduction	Duration
1. Easy (n = 36)			
Emotional Stability			
Reduction	-.57**		
Duration	-.13	.34*	
2. Medium (n = 36)			
Emotional Stability			
Reduction	-.16		
Duration	-.38*	.25	
3. Hard (n = 33)			
Emotional Stability			
Reduction	-.11		
Duration	-.16	.22	

Notes. ** - Correlation is significant at the 0.01 level (2-tailed).

* - Correlation is significant at the 0.05 level (2-tailed)

^a = Emotional Stability is the inverse of Neuroticism

condition. The multiple regression was significant, $R^2 = .396$, Adjusted $R^2 = .359$, $F(2, 35) = 10.81$, $p < .001$, see Table 4. This analysis indicated that lower levels of Emotional Stability were strongly and independently predictive of greater anxiety reduction in the Easy condition, while length of time coloring maintained a weaker and non-significant independent relationship to anxiety reduction.

Discussion of Study 1 and Rationale for Study 2

The first study replicated previous findings of the efficacy of mandala coloring in anxiety reduction. However, it did not find any particular benefit from varying mandala difficulty for the overall sample. However, when examining personality characteristics of the sample, it did emerge that there was a relationship between the personality variable of Emotional Stability/Neuroticism and anxiety reduction in the Easy mandala condition.

Since the mandala coloring seemed to demonstrate a reliable anxiety reduction effect, it raises the question as to whether another non-coloring mentally distracting task might serve the same function. To examine this question in a preliminary fashion, a brief study was conducted at the end of the first semester of the current academic year during a time of intensified stress (immediately prior to the final exam period). Because of the time restrictions and undergraduate students' final exams period, analysis of the first study data had not been completed before this second preliminary study was conducted; therefore, the "Medium" level of mandala complexity was selected for this study. This mandala coloring was then compared to the task of constructing jigsaw puzzles; all other measures and procedures were the same as employed in the first study.

Table 4.

Regression of Emotional Stability, Anxiety Reduction, and Duration

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Emotional Stability	-.728	.186	-.535	-3.92	.001
Duration	.344	.176	.267	1.95	.059

Notes. Dependent Variable: Anxiety Reduction. SE B = unstandardized beta.

Method (Study 2)

Research Design

The present study was an experimental procedure between subjects design on anxiety, where participants were randomly assigned to either a mandala coloring condition of Medium level of difficulty or a jigsaw puzzle task. Change in anxiety was measured from pre- to post- test (calculated by a difference score and labeled “anxiety reduction”).

Participants

The study had 34 participants, 17 participants in each condition. The participants consisted of Connecticut College students (22 women and 12 men). The male participants were split equally across the two conditions (6 in each condition). Psychology students were able to receive course credit for their participation in the study. The majority of the students self-identified as White/Caucasian ($n = 23$, 67.6%), Asian/Asian-American ($n = 4$, 11.8%), African-American/Black ($n = 5$, 14.7%), Latino/Hispanic ($n = 1$, 2.9%), and no self-described racial identity ($n = 1$, 2.9%). All the students were between the ages of 18 and 22 ($M = 19$, $SD = 1.05$). Lastly, 11 participants (32.4%) reported having had previous experience coloring mandalas as a relaxation technique.

Materials

Mandala Design. The mandala design consisted of an outline of a specific mandala on a sheet of white paper. In contrast to the first study, only the Medium difficulty mandala design was used in the second study. Colored pencils were available in a large box at the researcher's table in a set of 12 different colors. Participants could select as many of the pencils as they desired to take with them to color the design. The majority of participants selected multiple pencils of varying colors.

Jigsaw Puzzle. The jigsaw puzzle was a 250-piece puzzle that illustrated fish in an ocean. The puzzle was left on the researcher's table after each participant, allowing future participants to continue the puzzle. The participants had access to the box cover so they had a visual for recreating the puzzle. Participants were allowed to work on the puzzle at the same time if necessary, although this did not occur very often due to scheduling and random assignment to different conditions.

Measures

Level of Anxiety

Levels of anxiety were measured using the Spielberger State-Trait Anxiety Inventory for Adults that was previously described in Study 1 (STAI; Spielberger, 1983).

Big-Five Personality Scale

The Big Five dimensions of personality were measured using the 50-item Big Five Personality Scale that was previously described in Study 1 (Goldberg, 1992).

Procedure

Participants had the option of signing up for a 45-minute session, using the sign-up sheets online at conncoll.edu/sona-systems, or stopping by the Reference desk in the Shain Library at Connecticut College during allotted periods of time when the researcher was present.

Participants were not informed of which condition they would be placed in until arriving at the researcher's table on the first floor of the library, at which point they were randomly assigned to the mandala or jigsaw puzzle task. The participants in the mandala condition then selected their colored pencils and were given the option to go anywhere in the library to complete the study.

Most of the students completed the study on the first floor of the library, which is rated to be of an average noise level. The participants in the jigsaw puzzle condition were instructed that they did not have to finish the entire puzzle and to only complete what they felt comfortable doing.

The jigsaw puzzles were only available on the first floor. The survey packet that the participants were given included a consent form, STAI test (T1), Big-Five Personality scale, their randomly assigned Mandala design or a notice to work on the jigsaw puzzle, a post-test state-anxiety inventory scale (T2), demographics, and a debriefing form. The consent form (Appendix G) explained that the study sought to examine mindfulness. The participants could color or work on the puzzle for up to 30 minutes, and their self-reported time would then be recorded on the Demographics page. At the end of the study, all participants completed a Demographics form and were debriefed (see Appendices H and I). Due to the nature of the study, it was possible that students might report high levels of anxiety when participating; for this reason, guidance on how to contact the Connecticut College Counseling Center was provided in the debriefing form.

Results and Discussion (Study 2)

It was hypothesized in the second part of the two-part study that mandala coloring would produce greater anxiety reduction than jigsaw puzzle making. First, an ANOVA was conducted that looked for differences in anxiety reduction between the conditions. The results did not yield significance, $F(1,33) = .561, p = .459$; however, the means were in the right direction for supporting the hypothesis that mandala coloring would produce greater anxiety reduction than jigsaw puzzle making (see Table 5).

Examining Anxiety Reduction across Conditions from Time 1 to Time 2

Following this, a paired samples t -test was conducted to examine anxiety reduction across conditions from Time 1 to Time 2, regardless of type of mindful activity. The paired samples t -test produced a significant result of $t(1, 33) = 4.107, p < .001$, indicating a reduction in state anxiety levels across conditions from Time 1 ($M=42.15$) to Time 2 ($M=33.74$). Table 5 presents the means and standard deviations for anxiety reduction between the two conditions, mandala coloring and jigsaw puzzles. Bivariate correlations of personality factors with anxiety reduction across conditions and between conditions were calculated to examine any relationships unique to the two conditions, or across conditions, but did not produce any significant results (see Table 6). However, once again the trends for both coloring and the jigsaw puzzle from the bivariate correlations suggested that individuals with lower levels of emotional stability were likely to show more anxiety reduction when collapsed across conditions ($r = -.283, p = .105$). Unfortunately, the small number of participants limited the power of the correlations to yield findings that reached significance.

Table 5.

Means and Standard Deviations for Anxiety Reduction between Conditions

Condition	Anxiety Reduction <i>M</i>	Anxiety Reduction <i>SD</i>
Coloring (<i>n</i> = 17)	10.41	10.70
Puzzle (<i>n</i> = 17)	8.91	11.60

Table 6.

Correlations of Anxiety Reduction and Big-Five Personality Traits between Conditions

	Across Conditions	Coloring Only	Jigsaw Puzzles Only
Extraversion	.19	.01	.34
Agreeableness	.12	-.06	.23
Conscientiousness	-.14	-.09	-.19
Emotional Stability	-.28	-.17	-.35
Openness	.09	-.04	.14

Note. *N* = 34.

Examining Gender Differences on Anxiety Reduction across Conditions

Lastly, a 2 (gender) x 2 (condition) ANOVA was run to examine any potential gender differences on levels of anxiety reduction across conditions and between conditions. The results were statistically significant, however, due to the small sample size, these results should be considered preliminary and require further investigation. There was a significant main effect for gender on anxiety reduction, $F(1,34) = 6.847, p < .05$. Across both conditions, women showed a much stronger response to the interventions than men, women $M = 12.45$ (11.43), men $M = 2.42$ (9.12).

General Discussion

The purpose of the present studies was to examine the effects of coloring mandalas on anxiety levels. It was hypothesized that coloring mandalas would reduce levels of state anxiety from pre- to post-intervention. Additionally, the study sought to examine if duration of time spent coloring impacted anxiety reduction. Specifically, it was hypothesized that 30 minutes of mandala coloring would significantly reduce levels of anxiety, however, having participants select how long they would color for allowed the study to examine any differences in anxiety reduction in relation to how long they colored. This was done in hopes of discovering the ideal amount of time to spend coloring for optimal anxiety reduction. Finally, the study considered if personality type could be a mediating factor in an individual's responsiveness to this coloring intervention.

The results of both studies supported the main hypothesis that coloring mandalas would reduce anxiety levels across the three different conditions of difficulty. By assessing levels of state anxiety before and after the coloring intervention, the researcher was able to demonstrate that the majority of participants experienced anxiety reduction from Time 1 to Time 2 after having spent up to 30 minutes coloring. These results lend support to previous studies that have examined the effects of coloring on anxiety levels pre- and post-coloring intervention (Curry & Kasser, 2011). Although not an exact replication, there are many similarities between the present study and that of Curry and Kasser (2011). They examined the effectiveness of different art activities (e.g., mandala coloring, free-form coloring, or coloring a plaid form) in the reduction of anxiety levels. Their study included a STAI assessment at three different times,

upon arrival, after an anxiety induction, and after coloring. Their results revealed that anxiety reduction levels from T2 to T3 were much larger in the mandala group compared to the free-form coloring group, but differences between the mandala group and plaid-form group were not statistically significant.

Although the coloring intervention reduced anxiety levels for the majority of the sample, it is possible that this was not due to the act of coloring mandalas, but rather because coloring served as a distraction activity that could take away focus from present stressors. To explore this possibility, a second study was conducted comparing mandala-coloring to puzzle-making, a different distracting task. Due to the time frame of this second study, the researcher was not able to get a large enough sample to make as robust a comparison as hoped for. The results point in the right direction, that there is something unique to coloring mandalas, but did not reach significance. It is evident that future work would require a larger sample to explore those differences. Further analyses in Study 2 also showed significant gender differences on anxiety reduction, demonstrating that women had a stronger response to the interventions than men. However, due to the small sample size of this study, these results should be considered preliminary and also require further investigation in future studies.

There were additional questions examined in the first study around the role that personality might play in relation to the use of coloring and anxiety reduction. Results revealed that there was a significant negative correlation between the personality trait of low Emotional Stability (i.e., Neuroticism) and anxiety reduction. This means that individuals that were higher in Emotional Stability experienced less anxiety reduction. A closer examination of this negative correlation revealed that the significant relationship was only found in the “Easy” coloring condition. This suggests that emotionally stable individuals who were in the “Easy” coloring

condition experienced less anxiety reduction. This also means that individuals that were low in Emotional Stability experienced significant anxiety reduction. This would suggest that individuals lower in Emotional Stability found the “Easy” coloring condition to be a calming, therapeutic distraction that reduced their levels of anxiety. The “Easy” coloring condition was the only mandala design to have a significant relationship with Emotional Stability/Neuroticism, suggesting that the other two coloring designs may be too complex or stressful for those higher in Neuroticism, leading to minimal anxiety reduction. Finally, there was one additional finding in the “Medium” coloring condition between Emotional Stability and Duration, which indicated that individuals with lower emotional stability engaged in longer periods of coloring in this condition. Yet, since the relationship between Emotional Stability and anxiety reduction did not hold in this condition, it is not clear that the longer duration was continuing to yield any benefit for these less emotional stable participants.

Regarding the hypothesis of duration, there were no statistically significant findings of an ideal amount of time to spend coloring in order to achieve optimal anxiety reduction. Although no other studies, to my knowledge, have examined duration of time spent coloring as a covariate of anxiety reduction, a few research studies have examined 20 minutes as a controlled coloring time within their experiments, and have reported promising results (Curry & Kasser, 2011; Henderson et al., 2007; van der Venet & Serice, 2012).

Overall, the current study presents promising results that support and promote the use of mandala coloring on college campuses. Universities should consider mandala coloring as a more accessible therapeutic alternative for reducing anxiety levels in college students, in addition to the many previously mentioned psychological benefits. Individuals higher in Neuroticism are at even greater risk for developing anxiety disorders and/or depression, and could benefit greatly

from this type of therapeutic intervention. Art therapy counseling groups could be established in college counseling centers, and mandala coloring resources could be available on-campus (e.g., libraries, student centers). The implementation of mandala coloring and art therapy in general has the potential to help reduce levels of anxiety for most college students, ultimately contributing to more effective intervention for anxiety disorders on college campuses and, consequently, improving student well-being.

A few limitations of this study were the lack of a control condition in Study 1, the unequal gender distribution, allowing participants to choose how long they colored for, and the use of only self-report measures. Furthermore, regarding the second study, a limitation was the use of the moderate mandala design, given the greater effectiveness of the Easy design with regard to the variable of Emotional Stability, in addition to unequal gender distribution, use of only self-report measures, and allowing participants to choose how long they colored for. The first study only focused on different mandala designs varying in difficulty, but it would have been more interesting and effective to have included a control group where participants either had no task (Muthard & Gilbertson, 2016) or a different distraction activity, art-based or not. A second limitation of this study was the unequal gender distribution of the sample. There were significantly more female participants (86 females) than males (16 males), which restricted the generalizability of the study across genders, and limited the opportunity to find any gender effects on anxiety reduction. Another limitation of this study was allowing participants to choose the length of time they colored. It is possible that some people stopped coloring sooner because they were not feeling the therapeutic effects, but might have experienced the benefits had they continued coloring. Future studies should consider a research design that explores the

impact of different durations of time spent coloring, but more systematically. For example, one group of participants could be instructed to color only for 5 minutes and the next group of participants could be instructed to color for 30 minutes. This ensures accuracy in examining the effects of duration spent coloring on anxiety reduction by eliminating the use of self-report.

A final limitation of the first study was the use of only self-report measures, specifically for anxiety assessment and reporting duration of time spent coloring. Although the STAI is a reliable assessment, all self-report scales are subject to response bias. It would have offered more strength to the effects of the intervention had I included some methods to assess physiological responses (e.g., galvanic skin response, heart rate) before and after the coloring intervention. Furthermore, regarding the issue of self-reported duration of time spent coloring, it may have been more appropriate to have had the researcher time participants for accuracy. Other analyses that could have been considered, and should be in future studies, are analyses of coloring outcomes, specifically how much did participants color between the lines, how intricate were the designs, what colors did participants use, among other considerations. Furthermore, looking at color choice in combination with personality type could lead to a very interesting study. Finally, considering the second study, there would have likely been more significant findings with a larger participant pool and had I employed the “Easy” coloring condition. However, due to the effort to conduct the study at a period of higher stress (i.e., undergraduate students’ final exams), analyses on the first study had not been completed until after having conducted this second study.

In addition to these limitations, it is worth considering that there may have been more effective analyses to use within this study. For example, because of the nature of the present study's research design it would have made more sense to utilize a mixed between-within subjects ANOVA, which might have resulted in more robust analyses over all (given that difference scores may have greater variability and less reliability). Rather than using difference scores of anxiety from Time 1 to Time 2, using a repeated measures ANOVA may have shown a complexity by time interaction, as well as generally detect more differences in effectiveness across mandala conditions than the analyses used in the present study. Future studies should use the mixed between (mandala conditions)-within (Time 1 to Time 2) subjects ANOVA on anxiety to more effectively examine these interactions.

Future coloring studies should also examine gender differences and gender effects on anxiety reduction. Although the second study had only a small sample of men and women, the differences in their anxiety reduction scores were so striking that it makes a strong argument for further examination of gender differences in response to mindfulness interventions for anxiety. Furthermore, studies should investigate this relationship in the context of art-making versus puzzle-making, as these results were only preliminary. Questions to address would be, why are these interventions more anxiety reducing for women than for men and what might be the preference for type of task in each gender? Another suggestion for future research would be to conduct a small longitudinal study to examine how long the effects of the coloring intervention last for those who experienced anxiety reduction. Future research should also examine the relationship between neuroticism and anxiety reduction in less complex art-making activities (i.e., "Easy" condition).

Additionally, this relationship should be examined between mandala coloring and other distraction activities, such as jigsaw puzzles. Is this relationship unique to mandala coloring or distraction activities in general? Because there is a clear significant relationship between high Neuroticism and anxiety reduction within the “Easy” coloring condition, it would be interesting to explore this relationship further to increase understanding and develop more effective interventions and treatment plans. Finally, it would be interesting to apply this coloring intervention in real life situations for “in the moment” stress reduction. Most experimental studies are artificial so, although certain interventions may work in the lab, it may not work in real life. Researchers will need to think about how best to examine this intervention outside of the lab, perhaps through a longitudinal study where participants are asked to utilize this coloring intervention for “in the moment” stress reduction and then reflect on their experience with this over time.

Future studies should also consider what should be done in companionship with coloring; for example, should there be an additional component of mindfulness training or cognitive-behavioral education/intervention? Would coloring add something unique to current anxiety-reducing interventions, such as mindfulness training or CBT? Finally, future researchers should examine individuals that are more resistant to therapies that involve counseling and psychotherapy, and consider coloring as a less threatening, more practical alternative for anxiety reduction.

As reported in previous research, written disclosure has shown effectiveness on physical and mental health in traumatized individuals, due to the cognitive restructuring that results from formulating a narrative of a certain trauma (Henderson et al., 2007). It has been hypothesized in research that this written disclosure paradigm allows a traumatic event to be “summarized,

stored, and allowed to become a nonthreatening memory... leading to a decrease in psychological distress” (Henderson et al., 2007, p. 148). Despite these previous findings, however, this paradigm has been ineffective in treating individuals with disordered cognitive processes, limited literacy, less verbal capacities, and children who may not have enough understanding of the written language. Mandala coloring could be useful in therapeutic settings when working with children or individuals with less verbal capacities. It is for these individuals that written disclosure is not helpful and that alternative therapies must be considered for their benefit, such as art therapy.

Although some researchers have felt art therapy alone is not enough to offer the same cognitive benefits as written therapy, mandala coloring is uniquely equipped for addressing trauma. As previously mentioned within this paper, Carl Jung (1973) has examined the many therapeutic benefits of mandala coloring. It has been found that mandala coloring can promote the process of individuation, allowing the connection between one’s unconscious and conscious Self, as well as facilitate psychic integration and personal meaning in one’s life, and can help an individual reveal their true, authentic self. This increased self-awareness and understanding of ourselves as a whole can promote holistic healing, both mentally and physically, and demonstrates healthier psychological well-being. It is for these reasons that mandala coloring should be researched as an alternative form of treatment for 1) children, 2) individuals with less verbal capacities or limited literacy, and 3) individuals with disordered cognitive processes.

There is even more support for the use of mandala drawing as a treatment for individuals suffering from trauma than might originally be believed. As explored in previous literature, mandala drawing provides cognitive integration and organization that is similar to the processes observed in written disclosure. Pifalo (2002) examined the effects of art therapy on a sample of

children who were victims of sexual abuse. The art therapy intervention consisted of directives that targeted the specific issues relevant to sexually abused children in an effort to reduce trauma symptomatology, including high anxiety and increased stress responses (Pifalo, 2002). Art therapy, such as mandala coloring, is a developmentally appropriate intervention for children that allows them to express their trauma without sharing their trauma in words. Current research has reported reduced PTSD symptom severity, anxiety, posttraumatic stress, and dissociative symptomatology scores after participating in either mandala drawing or an art therapy treatment (Henderson et al., 2007; Pifalo, 2002). These previous studies provide evidence for art therapy and mandala making as an effective alternative therapy for those who have experienced trauma. Future research should continue to explore the therapeutic relationship of mandalas and trauma healing, especially for traumatized children. The present study has added to the growing literature that points to the efficacy of mandala coloring as a valuable asset in anxiety reduction for those experiencing “in the moment” anxiety, or those that are generally more susceptible to high stress and anxiety disorders. Whether this intervention is utilized for supporting college students or trauma victims, the impact mandala coloring could have on psychological well-being cannot be ignored.

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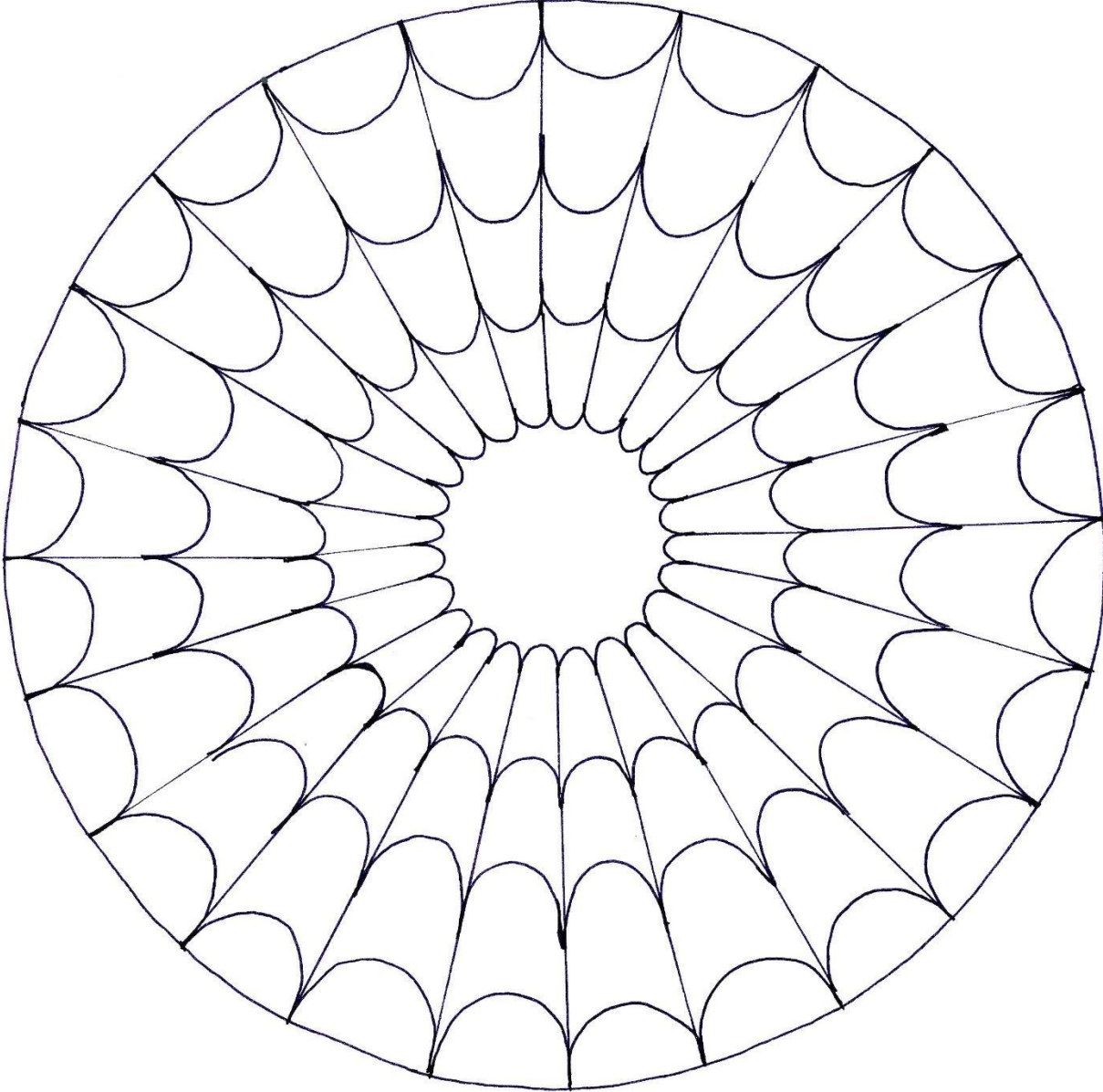
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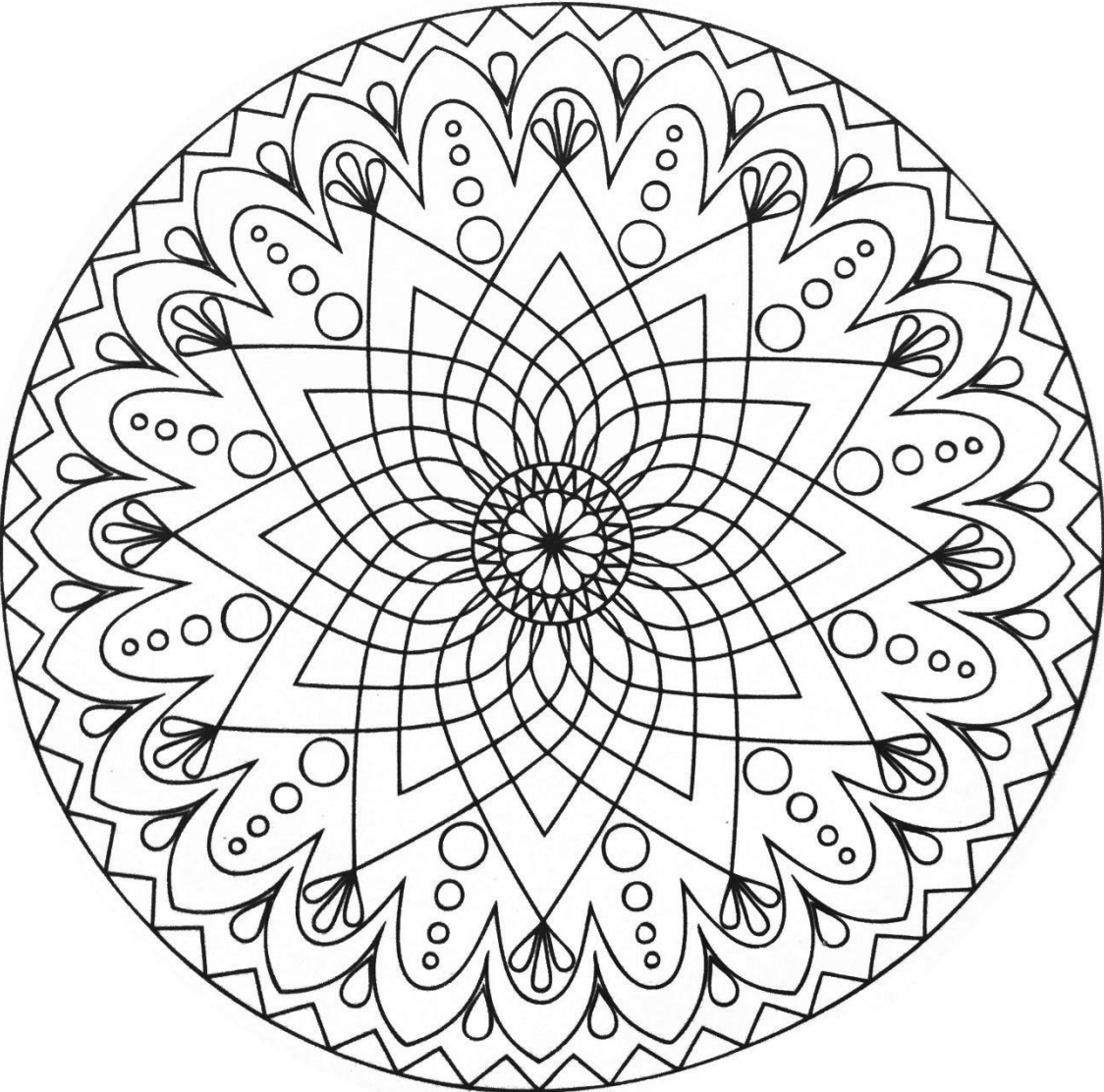
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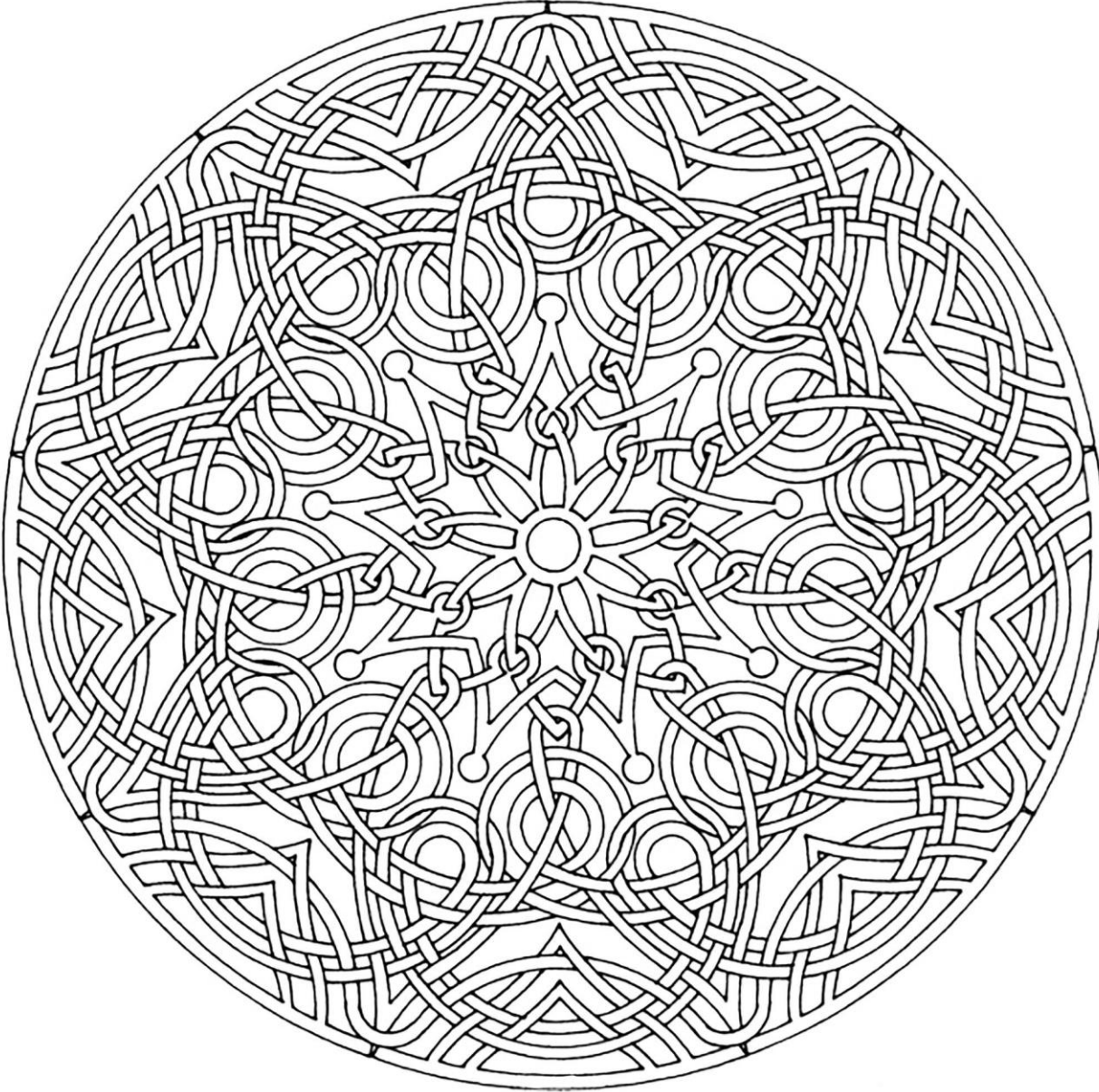
Appendix A-1.



Appendix A-2.



Appendix A-3.



Appendix B-1.

Part One

Directions: Please indicate how you feel *at this moment* from “not at all” to “very much so”.

- | 1 | 2 | 3 | 4 |
|--|----------|---------------|--------------|
| Not at all | Somewhat | Moderately so | Very much so |
| 1. I feel calm | | | |
| 2. I feel secure | | | |
| 3. I am tense | | | |
| 4. I feel strained | | | |
| 5. I feel at ease | | | |
| 6. I feel upset | | | |
| 7. I am presently worrying over possible misfortunes | | | |
| 8. I feel satisfied | | | |
| 9. I feel frightened | | | |
| 10. I feel comfortable | | | |
| 11. I feel self-confident | | | |
| 12. I feel nervous | | | |
| 13. I am jittery | | | |
| 14. I feel indecisive | | | |
| 15. I am relaxed | | | |
| 16. I feel content | | | |
| 17. I am worried | | | |
| 18. I feel confused | | | |
| 19. I feel steady | | | |
| 20. I feel pleasant | | | |

Appendix B-2.

Part Two

Directions: Please indicate how you *generally* feel most of the time from “almost never” to “almost always”.

1	2	3	4
Almost never	Sometimes	Often	Almost always

1. I feel pleasant
2. I feel nervous and restless
3. I feel satisfied with myself
4. I wish I could be as happy as others seem to be
5. I feel like a failure
6. I feel rested
7. I am “calm, cool, and collected”
8. I feel that difficulties are piling up so that I cannot overcome them
9. I worry too much over something that really doesn’t matter
10. I am happy
11. I have disturbing thoughts
12. I lack self-confidence
13. I feel secure
14. I make decisions easily
15. I feel inadequate
16. I am content
17. Some unimportant thoughts run through my mind and bothers me
18. I take disappointments so keenly that I can’t put them out of my mind
19. I am a steady person
20. I get in a state of tension or turmoil as I think over my recent concerns and interests

Appendix C.

Directions: Please indicate how much you agree or disagree with each statement on a scale of 1-5, where 1 = disagree, 2 = slightly disagree, 3 = neutral, 4 = slightly agree, 5 = agree.

Rating	I....	Rating	I....
	1. Am the life of the party.		26. Have little to say.
	2. Feel little concern for others.		27. Have a soft heart.
	3. Am always prepared.		28. Often forget to put things back in their proper place.
	4. Get stressed out easily.		29. Get upset easily.
	5. Have a rich vocabulary.		30. Do not have a good imagination.
	6. Don't talk a lot.		31. Talk to a lot of different people at parties.
	7. Am interested in people.		32. Am not really interested in others.
	8. Leave my belongings around.		33. Like order.
	9. Am relaxed most of the time.		34. Change my mood a lot.
	10. Have difficulty understanding abstract ideas.		35. Am quick to understand things.
	11. Feel comfortable around people.		36. Don't like to draw attention to myself.
	12. Insult people.		37. Take time out for others.
	13. Pay attention to details.		38. Shirk my duties.
	14. Worry about things.		39. Have frequent mood swings.
	15. Have a vivid imagination.		40. Use difficult words.
	16. Keep in the background.		41. Don't mind being the center of attention.
	17. Sympathize with others' feelings.		42. Feel others' emotions.
	18. Make a mess of things.		43. Follow a schedule.
	19. Seldom feel blue.		44. Get irritated easily.
	20. Am not interested in abstract ideas.		45. Spend time reflecting on things.
	21. Start conversations.		46. Am quiet around strangers.
	22. Am not interested in other people's problems.		47. Make people feel at ease.
	23. Get chores done right away.		48. Am exacting in my work.
	24. Am easily disturbed.		49. Often feel blue.
	25. Have excellent ideas.		50. Am full of ideas.

Appendix D.

Informed Consent

I hereby consent to participate in Kiersten Anderson’s research study on concentration/attention when coloring mandalas.

I understand that this research will involve filling out several questionnaires.

I understand that the direct benefits of this research are not known, and my results will not be shared with me upon completion of this study.

I have been told that there are no known risks or discomforts related to participating in this research.

I have been told that Kiersten Anderson can be contacted by email at kanders4@conncoll.edu

I understand that I may decline to answer any questions as I see fit, and that I may withdraw from the study without penalty at any time.

I understand that all information will be anonymous and identified with a code number.

I have been advised that I may contact the researcher who will answer any questions that I may have about the purpose and procedures of this study.

I understand that this study is not meant to gather information about specific individuals and that my responses will be combined with other participants’ data for the purpose of statistical analyses.

I consent to publication of the study results as long as the identity of all participants is protected.

I understand that this research has been approved by the Connecticut College Human Subjects Institutional Review Board (IRB).

Concerns about any aspect of this study may be addressed to Professor Ann Devlin, Chairperson of the Connecticut College IRB (asdev@conncoll.edu).

 I am at least 18 years of age, and I have read these explanations and assurances and voluntarily consent to participate in this research on concentration/attention levels when coloring mandalas.

Name (printed) _____

Signature _____

Date _____

Appendix E.

Demographics Questionnaire

Directions: Please complete the following demographic information.

Age: _____

Gender: _____

Class Year: _____

Race/Ethnicity: _____

What floor of the library are you taking this survey? _____

How much time have you spent coloring? (max. 30 minutes) _____

Do you consider yourself to be a stressed person generally? Yes or No

How do you destress? _____

Prior to this study, have you ever used mandala coloring as a relaxation technique? _____

Appendix F.

Debriefing Form

Thank you for participating in this research focused on the effectiveness of coloring mandalas for anxiety reduction in college students. In this research, I am comparing baseline levels and post-test levels of anxiety after coloring mandalas in an effort to see if there is a significant reduction in anxiety. Participants in this study include male and female students from Connecticut College.

Participants were informed that they were participating in a study on the effects of coloring mandalas. The therapeutic effects that were being specifically analyzed was left vague to keep participants from altering their answers in response to this study. Participants had the choice of three mandalas, each of a different level of difficulty. Similar research has been done on the effects of coloring mandalas on stress and anxiety reduction, including my previous study on mandalas versus free-form coloring. The purpose of this study was to further those previous results with a larger population and to allow participants to use this as a therapeutic intervention, not a manipulation. To my knowledge, there are no published studies that examine the direct therapeutic effects of coloring mandalas. Other studies have examined three conditions, including free-form, mandalas, and a plaid-design, however, the purpose of this study was to narrow the focus on mandalas specifically to gather more evidence of their effectiveness in anxiety reduction.

It is important that you do not share any information or discuss this experiment with any of your peers until the study is over, as it could compromise future results.

If you feel that you suffer from high levels of anxiety or stress, it is encouraged that you consider reaching out to the Connecticut College Counseling Center. They are located on campus in the Warnshuis Building and can be contacted at (860) 439-2275 or shs@conncoll.edu.

If you are interested in this topic and want to read the literature in this area, please contact Kiersten Anderson at kanders4@conncoll.edu.

Additionally, you can contact the chair of the IRB, Ann Devlin (asdev@conncoll.edu), if you have any questions or concerns about the manner in which the study was conducted.

Listed below are two sources you may want to consult to learn more about this topic:

- Pisarik, C., & Larson, K. (2011). Facilitating College Students' Authenticity and Psychological Well-Being Through the Use of Mandalas: An Empirical Study. *The Journal of Humanistic Counseling, 50*, 84-98.
- Curry, N., & Kasser, T. (2005). Can Coloring Mandalas Reduce Anxiety? *Art Therapy: Journal of the American Art Therapy Association, 81-85*. doi:10.1080/07421656.2005.10129441.

Appendix G.

Informed Consent

I hereby consent to participate in Kiersten Anderson’s research study on concentration/attention when coloring mandalas.

I understand that this research will involve filling out several questionnaires.

I understand that the direct benefits of this research are not known, and my results will not be shared with me upon completion of this study.

I have been told that there are no known risks or discomforts related to participating in this research.

I have been told that Kiersten Anderson can be contacted by email at kanders4@conncoll.edu

I understand that I may decline to answer any questions as I see fit, and that I may withdraw from the study without penalty at any time.

I understand that all information will be anonymous and identified with a code number.

I have been advised that I may contact the researcher who will answer any questions that I may have about the purpose and procedures of this study.

I understand that this study is not meant to gather information about specific individuals and that my responses will be combined with other participants’ data for the purpose of statistical analyses.

I consent to publication of the study results as long as the identity of all participants is protected.

I understand that this research has been approved by the Connecticut College Human Subjects Institutional Review Board (IRB).

Concerns about any aspect of this study may be addressed to Professor Ann Devlin, Chairperson of the Connecticut College IRB (asdev@conncoll.edu).

 I am at least 18 years of age, and I have read these explanations and assurances and voluntarily consent to participate in this research on concentration/attention levels when coloring mandalas.

Name (printed) _____

Signature _____

Date _____

Appendix H.

Demographics Questionnaire

Directions: Please complete the following demographic information.

Age: _____

Gender: _____

Class Year: _____

Race/Ethnicity: _____

Do you consider yourself to be a stressed person generally? Yes or No

How do you destress? _____

Prior to this study, have you ever used mandala coloring as a relaxation technique? _____

Appendix I.

Debriefing Form

Thank you for participating in this research focused on the effectiveness of coloring mandalas for anxiety reduction in college students. In this research, I am comparing baseline levels and post-test levels of anxiety after coloring mandalas versus a no task control group in an effort to see if coloring can significantly reduce levels of anxiety. Participants in this study include male and female students from Connecticut College.

Participants were informed that they were participating in a study on the effects of coloring mandalas. The therapeutic effects that were being specifically analyzed was left vague to keep participants from altering their answers in response to this study. Participants were randomly placed in either a control group or an experimental group. The control group was asked to sit silently and not use their phones for the duration of the study. The experimental group were randomly assigned one of three mandalas, each of a different level of difficulty. Similar research has been done on the effects of coloring mandalas on stress and anxiety reduction, including my previous study on mandalas versus free-form coloring. The purpose of this study was to further those previous results with a larger population and to allow participants to use this as a therapeutic intervention. A no task control group was implemented in order to maximize the differences between-groups, which was done in a different study that examined the effects of mandala coloring on negative affect and psychophysiological responses¹. Other studies have examined three conditions, including free-form, mandalas, and a geometric design, however, the purpose of this study was to narrow the focus on mandalas specifically to gather more evidence of their effectiveness in anxiety reduction.

It is important that you do not share any information or discuss this experiment with any of your peers until the study is over, as it could compromise future results.

If you feel that you suffer from high levels of anxiety or stress, it is encouraged that you consider reaching out to the Connecticut College Counseling Center. They are located on campus in the Warnshuis Building and can be contacted at (860) 439-2275 or shs@conncoll.edu.

If you are interested in this topic and want to read the literature in this area, please contact Kiersten Anderson at kanders4@conncoll.edu.

Additionally, you can contact the chair of the IRB, Ann Devlin (asdev@conncoll.edu), if you have any questions or concerns about the manner in which the study was conducted.

Listed below are three sources you may want to consult to learn more about this topic:

1. Muthard, C. & Gilbertson, R. (2016). Stress management in young adults: Implications of mandala coloring on self-reported negative affect and psychophysiological response. *Psi Chi Journal of Psychological Research*, 21(1), 16-28.
2. Pisarik, C., & Larson, K. (2011). Facilitating college students' authenticity and psychological well-being through the use of mandalas: An empirical study. *The Journal of Humanistic Counseling*, 50, 84-98.
3. Curry, N., & Kasser, T. (2005). Can coloring mandalas reduce anxiety? *Art Therapy: Journal of the American Art Therapy Association*, 81-85. doi:10.1080/07421656.2005.10129441.