Original Article:

HOW DOES COLORING INFLUENCE MOOD, STRESS, AND MINDFULNESS?

Brien K. Ashdown, Ph.D.

Jamie S. Bodenlos, Ph.D.

Kelsey Arroyo, B.S.

Melanie Patterson, B.S.

Elena Parkins, B.A.

Sarah Burstein

Hobart and William Smith Colleges, USA

Abstract

Manufacturers of adult coloring books often make the claim that coloring is a technique that can decrease stress and negative emotions and enhance relaxation and mindfulness. This technique has not been explored, with high external validity, in psychological research. Participants included 66 college students (63.6% females; 86.4% Caucasian). Study 1 examined the short-term effects (20 minutes) of coloring on mood and mindfulness. In Study 2, we examined the week-long effects of coloring on mood and mindfulness after asking the same participants to color for 20 minutes daily for seven consecutive days. Significant short-term effects of coloring were present, as stress decreased and relaxation increased. However, effects of coloring on mood, psychological symptoms and mindfulness over a one-week period were not found. Our findings provide support only for short-term benefits to coloring.
.

Keywords: coloring, coloring books, stress, mindfulness, negative emotions, relaxation, college students

INTRODUCTION

Anxiety disorders are very common in the United States (Merikangas et al., 2010). The lifetime prevalence of anxiety in 18-64 year-olds is 40.4% in females and 26.4% in males, and 38.8% in females and 26.8% in males ages 13-17 years (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). According to the American College Health Association (ACHA) 2015 National College Health Assessment survey, one in six college students (15.8%) have been diagnosed with, or treated for, anxiety (Brown, 2016). In addition, 56.9% of university students reported overwhelming anxiety (though not necessarily diagnosed), 30% claimed that stress affected their academic performance, 47.7% reported feeling as if they were hopeless, and 13.1% were diagnosed or treated for depression. At the time of that survey, 21.9% of students stated that anxiety had affected their academic performance in the last 12 months (compared to 18.2% of participants who were surveyed in 2008). Given that anxiety disorders and stress are related to multiple negative consequences such as impairment in occupational (Jensen, Patel, & Messersmith, 2011) and social (Aderkaa et al., 2012) functioning, physical health problems (Berghoff, Tulla, DiLillob, Messman-Moorec, & Gratza, 2017), infertility (Volgsten, Svanberg, Ekselius, Lundkvist, & Poromaa, 2008), substance use disorders (Prior, Mills, Ross, & Teesson, 2016), and many other issues, it is critical to find effective stress and anxiety management techniques to use as coping mechanisms.

Coping strategies to deal with stress and negative emotions vary by individual and situation. For instance, emotion-focused strategies are techniques used to deal with the negative emotional states associated with the stressor (Zhou, Li, Li, Wang, & Zhao, 2017) but not the stressor itself (which would be called problem-focused coping). Examples of emotion-focused coping are exercise, meditation, journaling, praying, eating, substance use, and doing arts or crafts. Creating art or crafts is an example of an emotion-focused strategy as it provides a way to manage negative emotional states associated with the stressor (Diliberto-Macaluso & Stubblefield, 2015). This mechanism may be an appealing and adaptive option for college students who have an inclination for art.

The therapeutic benefits of creating art on mood have been examined previously, providing support that engaging in art can reduce anxiety (Eaton & Tieber, 2017), improve mood in both clinical (Chiu, Hancock, & Waddell, 2015; Hill & Lineweaver, 2016; Laurer & van der Vennet, 2015) and non-clinical (Bell & Robbins, 2007; Wilkinson & Chilton, 2013) settings, as well as reduce stress (Abbott, Shanahan, & Neufeld, 2013; Curl & Forks, 2008). Abbott and colleagues (2008) used an undergraduate sample and examined art engagement as a way to reduce stress. They found that tasks in the art making condition were effective in reducing stress, compared to other conditions. Similar studies have been conducted with college students (Eaton & Tieber, 2017; Sandmire et al., 2016). Eaton and Tieber (2017) studied whether or not mood and anxiety were affected by the structure of a coloring activity, and found evidence of mood improvement and reduction in anxiety. This was especially true in those given the freedom to choose which color they used, compared

to those who copied the colors of an existing image. Sandmire et al. (2016) sought evidence supporting the anxiety-reducing properties of art. They found that those in the art-making condition experienced significantly less anxiety than the control group. Furthermore, a recent study by Mantzios and Giannou (2018) found a non-significant but tangible decrease in anxiety following a coloring intervention. These studies provide strong evidence for the benefits of art on reducing anxiety and stress.

   One type of art that has surged in popularity is the use of adult coloring books. Despite claims of reducing stress and increasing mindfulness, few studies have focused on how using adult coloring books affects mood in college students. As discussed previously, there is reason to believe that participating in art will have beneficial effects on negative emotional state as this has been found with a variety of tasks such as painting (Diliberto-Macaluso & Stubblefield, 2015), drawing (Drake & Winner, 2012), and working with clay (Kimport & Robbins, 2012). One study examining coloring with college students found anxiety and perseverance were positively affected after participation in a free choice coloring assignment (Eaton & Tieber, 2017). Duong and colleagues (2018) found that both coloring a mandala design and on a blank piece of paper resulted in anxiety reduction in a group of graduate students. Further research is necessary to examine how using coloring books might impact mood – in both the short term and the longer term – especially as it seems an increased number of people turn to coloring as a way to manage stress.

   In some previous work that examined the effects of art on mood, participants' mood is either manipulated prior to the intervention or explicitly targeted via an art endeavor. For instance, in several studies, mood inductions were used prior to participants engaging in the coloring intervention (Babouchkina & Robbins, 2015; Drake, Coleman, & Winner, 2011; Kimport & Robbins, 2012; Laurer & van der Vennet, 2015; van der Vennet & Serice, 2012). Participants were asked to make a list of personal stressors (Smolarski, Leone, & Robbins, 2015), watch short film clips to induce a negative mood (Diliberto-Macaluso & Stubblefield, 2015), recall the saddest event in their past (Drake & Winner, 2012), or imagine anxiety-producing past events (Boothby & Robbins, 2011). This was beneficial for researchers in order to increase the statistical power of their studies by enhancing the ability to find changes in mood. However, it may not be generalizable to natural conditions in which people use tools like coloring books to cope with stress, whether or not they are currently sad, feeling anxious, or in a negative mood. It also does not provide information on whether coloring can reduce negative mood if that mood is not first induced by researchers. In other words, it leaves unanswered the question of whether coloring can reduce negative mood states, no matter what level of mood the person coloring brings to the activity.

   Many studies that investigated how art affects mood also gave explicit instructions to participants to express positive emotions in their art (Dalebroux, Goldstein, & Winner, 2008; Diliberto-Macaluso & Stubblefield, 2015; Drake et al., 2011; Drake, Hastedt, & James, 2016; Drake & Winner, 2012). For instance, Smolarski et al. (2008) asked

participants to make a brief list of personal stressors in order to induce a negative mood. They were then randomly assigned to draw their current feelings, draw something that makes them happy, or color a neutral object. Drawing to express happiness was the most effective way to enhance participants' moods. It is unclear if using coloring books with neutral designs, without explicit instructions to express a positive emotion, have an effect on baseline negative emotional states. Given that coloring books do not provide instructions on expressing emotions during coloring, these studies provide little evidence as to how coloring neutral scenes (such as a mandala, rather than explicitly happy ones) affects mood compared to a non-art activity. Again, the question remains of whether coloring influences people's moods without those mood states being directly manipulated by the researchers.

While aiming to promote coloring books for mood enhancing benefits, marketing strategies sell coloring books on the premise that they enhance mindfulness and well-being (Barrett, 2015). Mindfulness is the ability to be present in the moment, nonjudgmentally, and can be examined as a state of consciousness enhanced by activities such as meditation or body scans (Keng, Smoski, & Robins, 2011). In adults, mindfulness has been associated with improved well-being and social functioning and decreased stress and anxiety (De Vibe et al., 2017). Previous evidence has suggested that mindfulness is negatively correlated with stress in both adults (Miners, 2008) and college students (Palmer & Rodger, 2009). There is also some evidence that mindfulness and art can be connected to enhanced well-being. In one study with children, a 12-week arts-based mindfulness group program for vulnerable children showed improvement in emotion regulation, mood, coping skills, empathy and ability to pay attention (Coholic & Eys, 2016). Although Mantzios and Giannou (2018) did not find benefits of coloring on mindfulness, research is needed to further explore how art could enhance presence in the moment. There are many parallels between art and mindfulness. For instance, art and coloring require concentration and focus as well as engagement of multiple senses. These activities enhance creativity, divergent and flexible thinking (van de Kamp, Admiraal, van Drie, & Rijlaarsdam, 2015), and may also have beneficial effects on mindfulness. Research is needed to explore the role of coloring on mindfulness.

It is important to recognize that mindfulness is not just ignoring a stressor or thinking about something else. There are, in fact, five facets of mindfulness: non-judging of experience, non-reactivity to inner experience, observing, describing, and acting with awareness (Baer, Smith, & Allen, 2004). When examining how art affects mood, there is evidence that the effects are obtained through distraction and not necessarily mindfulness (Dalebroux et al., 2008; Diliberto-Macaluso & Stubblefield, 2015; Drake & Winner, 2012; Drake et al., 2011; Drake et al., 2016; Smolarski et al., 2015). A previous study examined how drawing affected the mood of participants when the instructions for drawing were varied. After inducing a sad mood, participants were randomly assigned to a venting or distraction condition (Drake & Winner, 2012). Results indicated that distraction was more

effective than venting in reducing negative affect, which might have been attributed to the distraction from negative feelings. If distraction were the mechanism by which coloring affects mood, we would not expect to see changes in mindfulness after a coloring task, and instead might see these changes in any task (such as a control condition) that distracts the participants from their current mood.

There is also a need to examine how a single episode and multiple episodes of coloring effects mood and mindfulness, as they may be different. Although assessing how one episode of an activity provides important information about how it can impact mood, it is also important to understand how the effect would be in the real world where adults are often engaging in the activity on a more regular basis, especially if they purchase coloring books for the purpose of reducing negative emotions.

In summary, the use of coloring books has become popular among adults, including college students (Milliot, 2016). Companies sell these books on the premise that they will decrease stress and increase mindfulness, which can be particularly beneficial for college students under high levels of stress (Bodenlos, Noonan, & Wells, 2013). Despite these claims and popularity, there is a general lack of empirical evidence to support these psychological benefits (see Mantzios & Giannou, 2018, for a recent exception). As college students are one group that experience high levels of stress, especially during the academic year (Rayle & Chung, 2007), it is important to examine if, and how, coloring neutral scenes affects stress, mood, and mindfulness in this group. Given that much of the previous literature in this area lacks real-world generalizability because negative mood inductions are used and specific instructions are given to target certain positive moods, it is critical to assess how coloring neutral scenes affects mood without such explicit manipulations. In the current study, we explore whether both a single period of coloring and daily sessions of coloring over a one-week period affect negative mood states (without inducing them), relaxation and mindfulness in undergraduate students. We hypothesize that there will be a significant interaction between time and condition for the brief coloring session in that the coloring condition will have greater decreases in negative emotions and increases in mindfulness and relaxation compared to the control condition. In the one-week study, we hypothesize significant decreases in negative emotions and increases in mindfulness from baseline to post-intervention follow-up.

METHOD

Participants

Participants (N = 66) were undergraduate college students recruited from psychology courses at a small liberal arts college in the Northeastern United States. The majority of the sample identified as female (63.6%). All participants were between the ages of 18-22 years (M = 18.74, SD = 0.81) and included 86.4% first-year students and 13.6%

second-year students. The majority of our sample identified as White/Caucasian (86.4%), with 3% identifying as Asian, 7.6% as Hispanic/Latino/a, and 1.5% each as Native Hawaiian/Pacific Islander and as 'other.'

Measures

Demographic information. Participants answered questions regarding gender, age, class year, and race/ethnicity.

Perceived Stress Scale. Participants' levels of subjective stress were measured using Cohen's 14-item Perceived Stress Scale (PSS-14). The PSS-14 utilizes a Likert scale, with five indicating greatest stress and one indicating least stress, to measure how often and how intensely participants experience stress during the past month. An example question of the PSS-14 is "How often have you felt nervous or "stressed?" This measure is a valid and reliable scale of stress in young adults with $\alpha = 0.87$ (Cohen, Kamarck, & Mermelstein, 1983; Moeini, Shafil, Hidarnia, Babaii, & Birasch, 2008; Ries, Hino, & Rodriguez-Anez, 2010).

The Five Facet Mindfulness Questionnaire (FFMQ). We assessed levels of daily mindfulness using the Five Facet Mindfulness Questionnaire. This measure is a 39-item, Likert questionnaire determining how often mindfulness occurs (one being an incident that never or rarely occurs and five being an incident that always occurs) and how generally it is indicative of your experience. Scores for the FFMQ can range from 39 to 195, with higher scores indicating higher levels of mindfulness. An example question is: "When I'm walking, I deliberately notice the sensation of my body moving." The FFMQ incorporates a factor of five psychometrically sound mindfulness subscales (Gill & Hodgkinson, 2007). Observing Inner Experience is one's ability to notice or attend to internal and external experiences; Describing Experience is defined as labeling internal experiences with words; Acting with Awareness is understood as taking a non-evaluative stance towards one's thoughts or feelings; and Nonreactivity to Inner Experience means to allow thoughts and feelings to come and go without getting caught up in them (Berghoff et al., 2017). This measure has been reliable in past studies with a range of Cronbach's alphas of 0.75 to 0.91 (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Schutze, Rees, Preece, & Schutze, 2010).

The Positive and Negative Affect Schedule. We analyzed participants' positive and negative affect via the Positive and Negative Affect Schedule Questionnaire (PANAS). This questionnaire consists of two subscales, each with 10 questions that evaluate positive and negative affect (Volgsten et al., 2008). The PANAS is a 20-item scale consisting of one word each. Examples of these items are: "interested" and "ashamed". Each item asks for a value that represents how often the participant feels that word at this moment. The PANAS uses a Likert scale, with a response of one indicating "very slightly" and a response of five indicating "extremely". Previous works shows the PANAS measure is reliable with $\alpha = 0.89$ for the positive subscale and $\alpha = 0.85$ for the negative subscale (Watson, 1988).

The Beck Anxiety Inventory. We used the Beck Anxiety Inventory (BAI) questionnaire to evaluate participants' levels of anxiety over the past month. This scale is composed of 21 anxiety symptoms that represent both physical and cognitive symptoms of anxiety (Creamer, Foran, & Bell, 1994). Participants are asked, on a scale of zero to three, how much each item bothers them (zero represents "not at all" and three represents "severely.") Statements such as "numbness or tingling" and "feeling hot" are included in the questionnaire. In past research, the BAI is reliable in discriminating anxious from non-anxious in undergraduate populations with $\alpha = 0.91$ (Creamer et al., 1994).

The Center for Epidemiologic Studies Depression Scale. We utilized the Center for Epidemiologic Studies Depression Scale (CES-D) to measure participants self-reported symptoms associated with depression that occurred over the past week (Radloff, 1977). This questionnaire consists of 20 statements that encompass six subscales. These six subscales reflect the major dimensions of depression: depressed mood, feelings of guilt or worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance (Radloff, 1977). The CES-D uses a Likert-like method to define how often the participant has felt or behaved within the past week, with one being "rarely or none of the time" and four being "most or all of the time." The CES-D has been reliable in past research, with the alpha coefficients ranging from 0.85 to 0.90 (Radloff, 1977).

The Visual Analogue Scale. A Visual Analogue Scale (VAS) is a psychometric scale used to determine stress, relaxation, happiness, and sadness levels in participants in the moment. Four items were framed as "how stressed (relaxed/happy/sad) are you currently?" Below each question appears a 100mm line. The right end of the line is anchored with "not stressed (relaxed/happy/sad) at all" the left side is anchored with "extremely stressed (relaxed/happy/sad)". Participants are asked to place a mark on the 100mm line to indicate the level at which they felt that emotion at the current moment. These lines were measured from the left and length of mark was used to indicate the intensity of each emotional state given, such that higher numbers indicate higher intensity.

Procedure

The appropriate institutional review board approved this study. Participants were recruited from Introductory to Psychology courses. Recruitment strategies included professors promoting student participation in psychology studies during class time and students being informed of this study via e-mails from psychology professors. College students in Introductory to Psychology voluntarily signed up for this study in order to receive course credit for their participation. A research assistant was present and available to answer any questions the participants may have had about the study.

When potential participants arrived at the data collection site, they were provided with information about the study. Those who provided informed consent then immediately attended the first of two sessions for this study. Informed consent was obtained from all

individual participants included in the study. In addition to providing demographic information, participants completed baseline questionnaires that assessed mood, anxiety, depression, stress and mindfulness (BAI, CES-D, PANAS, PSS-14, FFMQ, VAS) prior to engaging in one of two tasks that lasted for 20 minutes. The scales were counterbalanced to control for effects of order on answering questions.

Participants were randomly assigned to read a cognition textbook or to color a Mandala design image for 20 minutes. By assigning students to the control condition of reading a textbook, we are able to examine whether this distraction activity leads to results different from the coloring condition (Drake & Winner, 2012). Participants left their belongings in a separate room while completing the task to avoid and reduce any distraction. After the 20-minute time period, participants were asked to leave the room and again complete questionnaires assessing current mood (VAS and PANAS). After participants completed the post-questionnaires, the research assistant explained the second part of the study to the participant.

For the second part of the study, all participants were offered a coloring packet and colored pencils with a log-book to record time of coloring sessions. Participants were asked to color for 20 minutes each day over the next week and to record the time and page that they colored in the log-book. Research assistants instructed the participants to record the start and end times they spent coloring each day on the log-booklet that was provided to them. The coloring activity for the second part was considered complete by research assistants if the participant recorded 20 minutes of coloring each day in the past week and the coloring pages were colored satisfactorily. Participants returned exactly one week later to complete the second data collection session of the study. Coloring assignments were checked to be sure they were completed. In this session, participants returned their completed coloring log-books and were asked to color for 20 minutes before again completing the questionnaires on mood, anxiety, depression, stress and mindfulness described previously. Participants were then debriefed.

Statistical Analyses

After data collection was complete, data was entered into SPSS. To test our hypotheses in the short-term study (Study 1) about the immediate effects of coloring on stress and mood, we conducted mixed-methods ANOVAs with pre- and post-intervention stress and mood levels as repeated measures and the condition participants were assigned (coloring or reading) as between measures. By analyzing our data using mixed-methods ANOVAs (which take into account both the repeated measures and the conditions within the same analysis), we were able to examine the way the data may interact across the two independent variables in the most parsimonious way possible. To test our hypotheses in the week-long study (Study 2) on the longer-term effects of coloring on mood and stress, we calculated various repeated-measures t-tests (one for each dependent variable of stress, mood, and mindfulness) to determine if there were changes in these areas from before to

after the week of coloring. We chose to analyze the data in Study 2 with these t-tests so that we could examine the change in each dependent variable over time independent of the other variables (recall that our hypotheses deal with the change in stress, mood, and mindfulness rather than how these variables interact with each other). Due to the relatively large number of t-tests we computed (eight in total), we decided to use a Bonferroni-like technique to divide the criterion of 0.05 by eight to get a new criterion level of .006. By doing this, we avoid committing a Type I error in our analyses.

RESULTS

Study 1

Visual Analog Scale (VAS). To determine if there were significant differences between the coloring condition and the reading (control) condition on stress before the intervention and stress after the intervention, we conducted a mixed methods ANOVA, with pre- and post-intervention stress levels as the repeated measures factor and condition (reading or coloring) as the between-subjects factor. There was not a main effect of condition, but there was a significant difference between the pre-intervention and the post-intervention stress levels, regardless of the condition participants were assigned [F(1, 64) = 25.07, partial η^2 = 0.28], with stress scores being lower after the intervention ($M = 34.71$, $SD = 21.65$) than before ($M = 46.77$, $SD = 21.61$). Most importantly, there was a significant interaction effect between pre- and post-intervention and condition on stress levels, with post-intervention scores ($M = 30.55$, $SD = 21.78$) being significantly lower than pre-intervention scores ($M = 52.31$, $SD = 22.36$) for the coloring condition but not the reading condition. See Table 1 for more information about this ANOVA.

Table 1 also shows that we conducted the same analysis as described above for the pre- and post-intervention and condition effects on sadness, happiness, and relaxation levels. These results indicated that there was no main effect of condition for any of the dependent variables (i.e., stress, sadness, happiness, or relaxation). For the dependent variable of sadness, there was a significant decrease from the pre-intervention ($M = 27.71$, $SD = 20.61$) to post-intervention measure ($M = 23.58$, $SD = 16.73$), but there was not a significant interaction effect. This suggests that coloring did not impact sadness scores differently than did reading.

When exploring the dependent variable of happiness, there was not a significant difference between pre- and post-intervention scores in general, but there was a significant interaction effect: people had higher happiness scores before reading ($M = 62.68$, $SD = 16.28$) than they did after reading ($M = 56.73$, $SD = 20.73$; i.e., reading the textbook made people less happy); however, coloring had no impact on happiness levels. Finally, for the dependent variable of relaxation, there was a significant difference between pre-intervention ($M = 54.41$, $SD = 20.99$) and post-intervention levels ($M = 62.62$, $SD = 21.71$),

with people being more relaxed after the intervention than before it. There was also a significant interaction effect: people in the coloring condition had significantly greater relaxation scores after coloring than before coloring; however, reading did not affect relaxation scores.

Table 1. **Condition and Pre- and Post-Intervention Effects on Visual Analog Scale (n = 66)**

	Coloring	Reading	Pre	Post	Coloring Pre	Coloring Post	Reading Pre	Reading Post
Stress (*M, SD*)			46.77 (21.61)	34.71 (21.65)	52.31[a^] (22.36)	30.55[a^] (21.78)	42.43[b] (20.25)	37.97[b] (21.27)
	$F(1, 64) = 0.071$ (ns) partial $\eta^2 = 0.001$		$F(1, 64) = 25.07$*** partial $\eta^2 = 0.28$		[a]$F(1, 64) = 30.80$*** [b]$F(1, 64) = 1.65$ (ns)			
Sadness (*M, SD*)			27.71 (20.61)	23.58 (16.73)	31.45[a] (22.52)	25.93[a] (18.19	24.78[b] (18.78)	21.73[b] (15.48)
	$F(1, 64) = 1.68$ (ns) partial $\eta^2 = 0.03$		$F(1, 64) = 4.60$* partial $\eta^2 = 0.07$		[a]$F(1, 64) = 3.40$ (ns) [b]$F(1, 64) = 1.33$ (ns)			
Happiness (M, SD)			59.72 (16.79)	58.74 (18.43	55.97[a] (16.94	61.31[a] (14.96	62.68[b^] (16.28	56.73[b^] (20.73)
	$F(1, 64) = 0.75$ (ns) partial $\eta^2 = 0.001$		$F(1, 64) = .024$ (ns) partial $\eta^2 = 0.00$		[a]$F(1, 64) = 3.37$ (ns) [b]$F(1, 64) = 5.32$*			
Relaxation (M, SD)			54.41 (20.99)	62.62 (21.71)	47.10[a^] (20.34)	62.79[a^] (21.56)	60.14[b] (19.93	62.49[b] (22.13)
	$F(1, 64) = 2.11$ (ns) partial $\eta^2 = 0.3$		$F(1, 64) = 10.17$** partial $\eta^2 = 0.14$		[a]$F(1, 64) = 13.72$*** [b]$F(1, 64) = 0.39$ (ns)			

Note: Coloring and Reading refer to the coloring condition and reading (control) condition, respectively; Pre and Post refer to scores pre-intervention and post-intervention respectively; The simple effects with the same superscript for each DV were compared, and the respective *F* statistic is indicated with a matching superscript. Mean scores with a ^ are significantly different from each other, indicating a significant interaction effect. *$p < .05$, **$p<.01$, ***$p<.001$

The Positive and Negative Affect Schedule (PANAS). To explore the impact that coloring or reading had on positive and negative affect as measured by the PANAS, we followed the same analysis plan as described above for the Visual Analog Scale measure. Details of the following results can be seen in Table 2. Positive affect decreased significantly from the pre- to post-intervention measure, $F(1, 64) = 9.47$, partial $\eta^2 = 0.13$; specifically, those in the reading condition had significantly lower positive affect scores after the intervention ($M = 28.89$, $SD = 10.98$) than they did before the intervention ($M = 33.54$, $SD = 8.20$). There was also a significant decrease in negative affect from the pre- to

post-intervention measure, $F(1, 64) = 28.20$, partial $\eta^2 = 0.31$. This main effect was qualified by a significant interaction as well, where participants in both the coloring condition ($M = 13.66$, $SD = 3.61$) and the reading condition ($M = 13.35$, $SD = 2.99$) had lower negative affect scores after the intervention than they did before the intervention (coloring $M = 18.52$, $SD = 6.57$; reading $M = 16.49$, $SD = 4.51$). [27]

Table 2. **Condition Effects on Positive and Negative Affect as Measured by PANAS (n = 66)**

	Coloring	Reading	Pre	Post	Coloring Pre	Coloring Post	Reading Pre	Reading Post
Positive Affect (*M, SD*)			31.79 (8.70)	29.02 (10.40)	29.55[a] (8.94)	29.17[a] (9.80)	33.54[b] (8.20)	28.89[b] (10.98)
	$F(1, 64) = 0.69$ (ns) partial $\eta^2 = 0.01$		$F(1, 64) = 9.47$** partial $\eta^2 = 0.13$		[a]$F(1, 64) = 0.10$ (ns) [b]$F(1, 64) = 18.43$***			
Negative Affect (*M, SD*)			17.38 (5.56)	13.48 (3.25)	18.52[a^] (6.57)	13.66[a^] (3.61)	16.49[b#] (4.51)	13.35[b#] (2.99)
	$F(1, 64) = 1.96$ (ns) partial $\eta^2 = 0.03$		$F(1, 64) = 28.20$*** partial $\eta^2 = 0.31$		[a]$F(1, 64) = 18.59$*** [b]$F(1, 64) = 9.86$**			

Note: Coloring and Reading refer to the coloring condition and reading (control) condition, respectively; Pre and Post refer to scores pre-intervention and post-intervention respectively; The simple effects with the same superscript for each DV were compared, and the respective *F* statistic is indicated with a matching superscript. Mean scores with a ^ are significantly different from each other, indicating a significant interaction effect. Mean scores with a # are significantly different from each other, indicating a significant interaction effect. *$p < .05$, **$p<.01$, ***$p<.001$

Study 2

Part 2 of the current study investigated the effects of daily coloring sessions over a one-week period on negative mood, mindfulness, and relaxation in this sample of college students. To examine this relationship, research assistants provided each participant with a coloring log-book that included a time log page as well as a number of mandala coloring pages at the baseline session. Participants were asked to color for 20 minutes each day during the next week and record the beginning and ending times of their coloring sessions. For the week-long findings of this study, we hypothesized that negative emotions would decrease while mindfulness scores would increase from the baseline session to the one-week follow-up.

We did not have any drop-outs from Study 1 to Study 2. To explore the week-long effects of coloring as a mindfulness technique, we computed various repeated measures t-tests to determine if scores on the dependent variables had changed over a seven-day period during which participants spent 20 minutes coloring each day. Because we computed eight

different t-tests, we utilized a Bonferroni technique and divided the criterion of 0.05 by eight to get a new criterion level of .006. This way, we avoid committing a Type I error in our analysis. However, as can be seen in Table 3, there were no significant differences on any of the dependent variables before and after the weeklong coloring task.

Table 3. **Effect of Coloring on Well-Being Pre- and Post-Long Term Intervention (n = 66)**

	Pre	Post
Perceived Stress Scale (*M, SD*)	40.65 (5.55)	41.46 (6.34)
	$t(62) = -1.29$, $p = 0.20$, 95% C.I. = -2.06, 0.45; $d = 0.14$	
Center for Epidemiological Scale – Depression (*M, SD*)	38.31 (5.85)	39.00 (7.18)
	$t(57) = -0.22$, $p = 0.83$, 95% C.I. = -1.95, 1.57; $d = 0.11$	
Five Facet Mindfulness Scale		
Observing Subscale (*M, SD*)	24.32 (5.11)	24.75 (5.29)
	$t(64) = -0.69$, $p = 0.50$, 95% C.I. = -1.68, .82; $d = 0.08$	
Describing Subscale (*M, SD*)	26.55 (5.31)	26.32 (6.50)
	$t(65) = 0.40$, $p = 0.69$, 95% C.I. = -0.91, 1.37; $d = 0.04$	
Acting Subscale (*M, SD*)	25.59 (5.60)	25.71 (5.72)
	$t(65) = -0.26$, $p = 0.80$, 95% C.I. = -1.07, 0.83; $d = 0.02$	
Nonjudgment Subscale (*M, SD*)	27.39 (6.37)	27.58 (6.75)
	$t(65) = -0.28$, $p = 0.78$, 95% C.I. = 0.64, -1.46; $d = 0.03$	
Nonreactivity Subscale (*M, SD*)	20.33 (4.01)	19.85 (4.03)
	$t(65) = 0.99$, $p = 0.32$, 95% C.I. = -0.49, 1.46; $d = 0.12$	
Beck Anxiety Inventory (*M, SD*)	34.11 (10.78)	32.74 (10.68)
	$t(61) = 1.45$, $p = 0.15$, 95% C.I. = -0.52, 3.26; $d = 0.13$	

Note: Pre and Post refer to scores pre-intervention and post-intervention respectively.

DISCUSSION

Overall, we found some short-term benefits to coloring. Compared to the control group, after 20 minutes of coloring, levels of stress decreased significantly and relaxation significantly increased, suggesting something other than distraction is at work in the short-term (Drake & Winner, 2012). There were no immediate effects on sadness or happiness (though being in the control group did reduce participants' happiness scores). On the other hand, after one week of daily coloring, we did not see benefits to participants on mood or mindfulness. Given that this is one of the first studies to explore benefits of coloring on mood and mindfulness in college students, we provide some initial support of its benefit on stress and relaxation in the short-term, but provide some contradictory evidence to the claims that coloring on a daily basis have an effect on mood and stress.

Our findings are consistent with past research that found stress-reducing qualities to producing art (Chiu et al., 2015; Eaton & Tieber, 2017; Hill & Lineweaver, 2016). We also add to the literature on coloring, as we found some immediate impacts on mood (Eaton & Tieber, 2017). Although we only found short-term effects for one of our two dependent measures (VAS), this means we did see important benefits for stress and relaxation after coloring. We did not find a short-term impact of coloring on positive mood via our other dependent measure, the PANAS, another measure of mood in the moment. This could be a result of how our control condition (e.g., reading a cognition textbook) affected mood by decreasing both negative and positive affect. Participants who were assigned to the control condition had lower positive and negative affect after reading the book—suggesting that perhaps this condition reduced stress or anxiety, but did not replace them with positive moods. However, recall that participants who were assigned to read had lower happiness scores after reading than before reading on the VAS (which also assessed mood in the moment). These findings could be a result of the length of the intervention session (i.e., 20 minutes) or the type of book participants were assigned to read. Several previous studies utilized longer art sessions (Babouchkina & Robbins, 2015; Eaton & Tieber, 2017; Sandmire et al., 2016), such as 30 minutes. Researchers have found significant reductions in anxiety after 20 minutes of coloring a mandala image; however, they utilized an anxious mood induction prior to the intervention (van der Vennet & Serice, 2012). As mentioned earlier, our attempt was to generalize to real-world situations, which is why we did not enhance negative mood at baseline with a mood induction or give specific instructions to elicit positive mood during art. These may have all affected our ability to find an effect on either measure, yet have important implications for the generalizability of previous research.

We did not find any week-long benefits of coloring on mood in this study as measured by our scales assessing anxiety, depression, and stress. These scales ask participants to evaluate these moods over the last 2 weeks to one month. This was the first study to explore how coloring on a daily basis, in participants' home environments, would

affect mood over a one-week span. It appears that coloring may provide some immediate, short-term effects on mood but do not provide therapeutic benefits to stress, depressive symptoms, or anxiety over a week long period.

Although we did not control when, how, or where coloring took place in Study 2, we did enhance real world application by not artificially placing such limits on participants. While there may have been other external factors that affected participants' moods and any benefits they might have reaped from coloring, the fact that this happened suggests that coloring might not be an effective mindfulness technique over a week-long period. On the other hand, we also did not review the coloring of the participants to examine the quality of their work (only completeness). This could have helped us better understand the validity and reliability of the coloring, and determine whether participants were rushing through the task. Future research may want to explore how assuring greater adherence to the research protocol (beyond the time logs that we utilized and collecting the completed colorings) – but researchers should be careful to balance this control with the need for environmental validity.

Although many coloring books advertise the positive effects that coloring will have on mindfulness, we did not find any changes on mindfulness or any of the five facets (e.g., Observing and Nonjudgment subscales) we discussed previously over a week-long period. Similar to work by Carmody and Baer (2008) on assessing how mindfulness changes after completing a mindfulness-based program, we used the FFMQ to assess changes in mindfulness among our participants (Carmody & Baer, 2008). It may be that unless specifically instructed to be present during such tasks, that any mood or stress benefits from coloring are obtained simply because the participants are being distracted by coloring. As our current college-age students are often multi-tasking in their daily lives, coloring may be a task that they can do while watching TV, using their phone, carrying on conversations with their roommates, or ruminating about stressors in their life.

Several studies support the theory that producing art is a way to distract people from stressful thoughts or events (i.e. emotion based coping) in their lives (Dalebroux et al., 2008; Drake & Winner, 2012; Drake et al., 2016), and it is possible that coloring is a 'mindless' activity rather than a mindful one (Manztios & Giannou, 2018), and may provide support for past findings about these activities being distractions rather than special interventions (Drake & Winner, 2012), at least in the long-term. While our focus here was to determine short versus long-term effects of coloring on mood rather than answer the question of whether coloring serves as a mere distraction, this could be an important question for future research to address.

Limitations

There are limitations to this study that should be addressed in future research. First, our sample size was small. Although several other studies examining art's benefit on mood have had smaller sample sizes (Chiu et al., 2015; De Petrillo & Winner, 2005; Drake et al.,

2016; Hill & Lineweaver, 2016; van der Vennet & Serice, 2012), having more participants would have increased statistical power to find significant differences in mood over time (if those effects actually exist). Several of the measures used in the week-long sessions asked about mood states occurring over a two-week to one-month long span, so therefore may not have been sensitive enough to pick up on changes in mood from the one-week intervention.

Our control condition negatively impacted positive affect and happiness, but also decreased negative moods. This makes it unclear if reading the cognition book was aversive to positive mood and made participants unhappy, or if it reduced stress and anxiety but did not induce happiness. Further studies may want to explore alternative control conditions that will allow them to more clearly determine what, if any, effect the control has on participants' mood. Generalizability of findings is somewhat limited as participants were mostly Caucasian, female and from middle-upper class backgrounds. More work is needed to understand how findings might generalize to more diverse groups that experience a variety of different types of stressors with fewer resources for coping.

In our analyses, we employed a Bonferroni-like technique in Study 2 to avoid committing a Type I error (e.g., incorrectly demonstrating significant effects). While avoiding Type I errors is often considered more important than avoiding Type II errors (e.g., incorrectly determining there are no significant effects), utilizing a Bonferroni-type correction does increase the possibility that we did not find significant effects in Study 2 because of Type II errors. While we have been more concerned with avoiding Type I errors here, it is important that we mention the possibility of these Type II errors.

It is also interesting to note that the participants in the coloring condition appear to have higher stress and lower relaxation levels at the pre-test point than the other three groups (i.e., coloring post-test, control pre-test, and control post-test). While our analysis indicates significant interactions among these different groups, it is curious why those in the coloring pre-test had these scores. Perhaps providing them instructions about coloring the mandala influenced their moods unbeknownst to us, or the random assignment into different conditions produced non-equivalent groups at that point in the study. Finally, the control condition we employed (reading a cognitive psychology textbook) made those participants less happy, possibly raising minor concerns about the choice of such a control intervention. It is important that researchers who do similar work in the future consider such design issues.

Conclusions

Even with these limitations, however, our study provides important information about the veracity of claims that coloring is a mindfulness technique that will improve mood and decrease stress. Our findings suggest that these claims might be true for some moods in the short-term, but that researchers and clinicians should be cautious about using coloring as a long-term mindfulness technique. It is important to note the potential

significance of examining the effects of coloring within specific cultures, ethnicities, and age groups. Because coloring is an activity that is commonly used around the globe, it can act as a tool that brings out commonalities across cultures and groups while also highlighting the diversity that may be present. Researchers in other academic disciplines could further investigate the effects of coloring from a social and cultural perspective. In doing so, we can potentially understand how an activity such as coloring affects not only an individual but also a group at large as well as their reasons for partaking in such art activities. In addition, future research should continue to test the marketing claims of the manufacturers of adult coloring books in order to ensure that the general public as well as those suffering from depression and anxiety are receiving evidence-based interventions.

REFERENCES

Abbott, K. A., Shanahan, M. J., & Neufeld, R. W. (2013). Artistic tasks outperform nonartistic tasks for stress reduction. *Art Therapy, 30*(2), 71-78. doi:10.1080/07421656.2013.787214

Aderkaa, I. M., Hofmanna, S. G., Nickersona, A., Hermeshd, H., Gilboa-Schechtmanb, E., & Maromd, S. (2012). Functional impairment in social anxiety disorder. *Journal of Anxiety Disorders, 26*(3), 393-400. doi:10.1016/j.janxdis.2012.01.003

Babouchkina, A., & Robbins, S. J. (2015). Reducing negative mood through mandala creation: A randomized controlled trial. *Art Therapy, 32*(1), 34-39. doi:10.1080/07421656.2015.994428

Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report: The Kentucky Inventory of Mindfulness Skills. *Assessment, 11*(3), 191-206. doi:10.1177/1073191104268029

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*(1), 27-45. doi:10.1177/1073191105283504

Barrett, C.A. (2015, December). Adult Coloring Books: Patterns for Stress Relief. *Phi Kappa Phi Forum*, *95*(4).

Bell, C. E., & Robbins, S. J. (2007). Effect of art production on negative mood: A randomized, controlled trial. *Art Therapy, 24*(2), 71-75. doi:10.1080/07421656.2007.10129589

Berghoff, C. R., Tulla, M. T., DiLillob, D., Messman-Mooorec, T., & Gratza, K. L. (2017). The role of experiential avoidance in the relation between anxiety disorder diagnoses and future physical health symptoms in a community sample of young

adult women. *Journal of Contextual Behavioral Science, 6*(1), 29-34. doi:10.1016/j.jcbs.2016.11.002

Bodenlos, J. S., Noonan, M., & Wells, S. Y. (2013). Mindfulness and alcohol problems in college students: The mediating effects of stress. *Journal of American College Health, 61*(6), 371-378. doi:10.1080/07448481.2013.805714

Boothby, D. M., & Robbins, S. J. (2011). The effects of music listening and art production on negative mood: A randomized, controlled trial. *The Arts in Psychotherapy, 38*(3), 204-208. doi:10.1016/j.aip.2011.06.002

Brown, J. (2016, October 2). Anxiety: The most common mental health diagnosis in college students. *BU Today*. Retrieved from http://www.bu.edu/today/2016/college-students-anxiety-and-depression/

Carmody, J., & Baer, R. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 31*(1), 23-33. doi:10.1007/s10865-007-9130-7

Chiu, G., Hancock, J., & Waddell, A. (2015). Expressive arts therapy group helps improve mood state in an acute care psychiatric setting (Une thérapie de groupe ouverte en studio basée sur les arts de la scène améliore l'humeur des patients en psychiatrie dans un établissement de soins intensifs). *Canadian Art Therapy Association Journal, 28*(1), 34-42. doi:10.1080/08322473.2015.1100577

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*(4), 385-396. doi:10.2307/2136404

Coholic, D. A., & Eys, M. (2016). Benefits of an arts-based mindfulness group intervention for vulnerable children. *Child and adolescent social work journal*, *33*(1), 1-13. doi:10.1007/s10560-015-0431-3

Creamer, M., Foran, J., & Bell, R. (1994). The Beck Anxiety Inventory in a non-clinical sample. *Behaviour Research and Therapy, 33*(4), 477-485. doi:10.1016/0005-7967(94)00082-U

Curl, K., & Forks, G. (2008). Assessing stress reduction as a function of artistic creation and cognitive focus. *Art Therapy, 25*(4), 164-169. doi:10.1080/07421656.2008.10129550

Dalebroux, A., Goldstein, T. R., & Winner, E. (2008). Short-term mood repair through art-making: Positive emotion is more effective than venting. *Motivation and Emotion, 32*(4), 288-295. doi:10.1007/s11031-008-9105-1

De Petrillo, L., & Winner, E. (2005). Does art improve mood? A test of a key assumption underlying art therapy. *Art Therapy, 22*(4)*,* 205-212. doi:10.1080/07421656.2005.10129521

De Vibe, M. F., Bjørndal, A., Fattah, S., Dyrdal, G. M., Halland, E., & Tanner-Smith, E. E. (2012). Mindfulness-based stress reduction (MBSR) for improving health, quality of life and social functioning in adults: a systematic review and meta-analysis. *Campbell Systematic Reviews, 3*, 1-127. doi:10.4073/csr.2012.3

Diliberto-Macaluso, K. A., & Stubblefield, B. L. (2015). The use of painting for short-term mood and arousal improvement. *Psychology of Aesthetics, Creativity, and the Arts, 9*(3), 228-234. doi:10.1037/a0039237

Drake, J. E., Coleman, K., & Winner, E. (2011). Short-term mood repair through art: Effects of medium and strategy. *Art Therapy, 28*(1), 26-30. doi:10.1080/07421656.2011.557032

Drake, J. E., Hastedt, I., & James, C. (2016). Drawing to distract: Examining the psychological benefits of drawing over time. *Psychology of Aesthetics, Creativity, and the Arts, 10*(3), 325-331. doi:10.1037/aca0000064

Drake, J. E., & Winner, E. (2012). Confronting sadness through art-making: Distraction is more beneficial than venting. *Psychology of Aesthetics, Creativity, and the Arts, 6*(3), 255-261. doi:10.1037/a0026909

Duong, K., Stargell, N. A., & Mauk, G. W. (2018). Effectiveness of Coloring Mandala Designs to Reduce Anxiety in Graduate Counseling Students. *Journal of Creativity in Mental Health*, Online First. doi:10.1080/15401383.2018.1437001

Eaton, J., & Tieber, C. (2017). The effects of coloring on anxiety, mood, and perseverance. *Art Therapy, 34*(1), 42-46. doi:10.1080/07421656.2016.1277113

Gill, C., & Hodgkinson, G. (2007). Development and validation of the Five-Factor Model Questionnaire (FFMQ): An adjectival-based personality inventory for use in occupational settings. *Personnel Psychology, 60*(3), 731-766. doi:10.1111/j.1744-6570.2007.00090.x

Hill, K. E., & Lineweaver, T. T. (2016). Improving the short-term affect of grieving children through art. *Art Therapy, 33*(2), 91-98. doi:10.1080/07421656.2016.1166414

Jensen, J. M., Patel, P. C., & Messersmith, J. G. (2011). High-performance work systems and job control: Consequences for anxiety, role overload, and turnover intentions. *Journal of Management, 39*(6), 1699-1724. doi:10.1177/0149206311419663

Keng, S., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: A review of empirical studies. *Clinical Psychology Review, 31*(6), 1041-1056. doi:10.1016/j.cpr.2011.04.006

Kessler, R. C., Petukhova, M., Sampson, N. A., Zaslavsky, A. M., & Wittchen, H. U. (2012). Twelve-month and lifetime prevalence and lifetime morbid risk of anxiety and mood disorders in the United States. *International Journal of Methods in Psychiatry Research, 21*(3), 169-184. doi:10.1002/mpr.1359

Kimport, E. R., & Robbins, S. J. (2012). Efficacy of creative clay work for reducing negative mood: A randomized controlled trial. *Art Therapy, 29*(2), 74-79. doi:10.1080/07421656.2012.680048

Laurer, M., & van der Vennet, R. (2015). Effect of art production on negative mood and anxiety for adults in treatment for substance abuse. *Art Therapy, 32*(4), 177-183. doi:10.1080/07421656.2015.1092731

Mantzios, M., & Giannou, K. (2018). When did coloring books become mindful? Exploring the effectiveness of a novel method of mindfulness-guided instructions for coloring books to increase mindfulness and decrease anxiety. *Frontiers in Psychology, 9*(56). doi:10.3389/fpsyg.2018.00056

Merikangas, K. R., He, J., Burstein, M., Swanson, S. A., Avenevoli, S., Cui, L., & Swendsen, J. (2010). Lifetime prevalence of mental disorders in US adolescents: Results from the national comorbidity study-adolescent supplement (NCS-A). *Journal of the American Academy of Child and Adolescent Psychiatry, 49*(10), 980-989. doi:10.1016/j.jaac.2010.05.017

Milliot, J. (2016, January 1). Print book sales up again in 2015. *Publishers Weekly*. Retrieved from www.publishersweekly.com/pw/by-topic/industry-news/bookselling/article/69051-print-sales-up-again.html

Miners, R. (2008). *Collected and connected: Mindfulness and the early adolescent.* (Unpublished doctoral dissertation). Concordia University, Quebec, Canada.

Moeini, B., Shafil, F., Hidarnia, A., Babaii, G., & Birasch, B. (2008). Perceived stress, self-efficacy and its relations to the psychological well-being status in Iranian male high school students. *Social Behavior and Personality, 36*(2), 257-266. doi:10.2224/sbp.2008.36.2.257

Palmer, A., & Rodger, S. (2009). Mindfulness, stress, and coping among university students. *Canadian Journal of Counseling, 43*(3), 198-212.

Prior, K., Mills, K., Ross, J., & Teesson, M. (2016). Substance use disorders comorbid with mood and anxiety disorders in the Australian general population. *Drug and Alcohol Review, 36*(3), 317-324. doi:10.1111/dar.12419

Radloff, L. S. (1977). Center for Epidemiologic Studies Depression Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1(*3), 385-401. doi:10.1177/014662167700100306

Rayle, A. D., & Chung, K. (2007). Revisiting first year college students' mattering: Social support, academic stress, and the mattering experience. *Journal of College Student Retention: Research, Theory & Practice, 9*(1), 21-37. doi:10.2190/X126-5606-4G36-8132

Ries, R., Hino, A., & Rodriguez-Anez, C. R. (2010). Perceived Stress Scale: Reliability and validity study in Brazil. *Journal of Health Psychology, 15*(1), 107-114. doi:10.1177/1359105309346343

Sandmire, D. A., Rankin, N. E., Gorham, S. R., Eggleston, D. T., French, C. A., Lodge, E. E., & Grimm, D. R. (2016). Psychological and autonomic effects of art making in college-aged students. *Anxiety, Stress, & Coping, 29*(5), 561-569. doi:10.1080/10615806.2015.1076798

Schutze, R., Rees, C., Preece, M., & Schutze, M. (2010). Low mindfulness predicts pain catastrophizing in a fear-avoidance model of chronic pain. *Pain, 148*(1), 120-127. doi:10.1016/j.pain.2009.10.030

Smolarski, K., Leone, K., & Robbins, S. J. (2015). Reducing negative mood through drawing: Comparing venting, positive expression, and tracing. *Art Therapy, 32*(4), 197-201. doi:10.1080/07421656.2015.1092697

van de Kamp, M. T., Admiraal, W., van Drie, J., & Rijlaarsdam, G. (2015). Enhancing divergent thinking in visual arts education: Effects of explicit instruction of meta-cognition. *British Journal of Educational Psychology*, *85*(1), 47-58. doi:10.1111/bjep.12061

van der Vennet, R., & Serice, S. (2012). Can coloring mandalas reduce anxiety? A replication study. *Art Therapy, 29*(2), 87-92. doi:10.1080/07421656.2012.680047

Volgsten, H., Svanberg, A. S., Ekselius, L., Lundkvist, O., & Poromaa, I. S. (2008). Prevalence of psychiatric disorders in infertile women and men undergoing in vitro fertilization treatment. *Human Reproduction, 23*(9), 2056-2063. doi:10.1093/humrep/den154

Watson, D. (1988). The vicissitudes of mood measurement—Effects of varying descriptors, time frames, and response formats on measures of positive and negative affect. *Journal of Personality and Social Psychology, 55*(1), 128-141. doi:10.1037/0022-3514.55.1.128

Wilkinson, R. A., & Chilton, G. (2013). Positive art therapy: Linking positive psychology to art therapy theory, practice, and research. *Art Therapy, 30*(1), 4-11. doi:10.1080/07421656.2013.757513

Zhou, Y., Li, D., Li, X., Wang, Y., & Zhao, L. (2017). Big Five personality and adolescent Internet addiction: The mediating role of coping style. *Addictive Behaviors, 64*, 42-48. doi:10.1016/j.addbeh.2016.08.009

AUTHOR INFORMATION:

Brien Ashdown is an Associate Professor of Psychology at Hobart & William Smith Colleges in Geneva, NY. His research and teaching focuses on cultural psychology, and explores how cultural group identity influences social behavior, especially among adolescents. As a Latin American specialist, much of his research occurs in Guatemala. Address: Dr. Brien Ashdown, Department of Psychology, Hobart & William Smith Colleges, 300 Pulteney Street, Geneva, NY 14456. Email: ashdown@hws.edu

Jamie S. Bodenlos is an Associate Professor of Psychology at Hobart & William Smith Colleges in Geneva, NY. Her research and teaching focuses on clinical health psychology with an emphasis on ways that mindfulness affect health and well-being. Address: Dr. Jamie Bodenlos, Department of Psychology, Hobart & William Smith Colleges, 300 Pulteney Street, Geneva, NY 14456. Email: bodenlos@hws.edu

Kelsey Arroyo holds a B.S. in Psychology from Hobart and William Smith Colleges. She is currently a graduate student at the University of Connecticut pursuing a Master's degree in Health Promotion Science. She will also be serving as a graduate research assistant at the Institute for Collaboration on Health, Intervention, and Policy (InCHIP) at the University. Address: Kelsey Arroyo, 3647 Galloway Road, Batavia NY, 14020. Email: kelsey.arroyo@uconn.edu

Melanie Patterson is a medical student at Pennsylvania State College of Medicine. She earned a B. S in Biochemistry at Hobart and William Smith Colleges in 2017. She will graduate from Medical school in 2021. Address: Melanie Patterson, 217 Crescent Dr., Hershey PA 17033. Email: melanie.pattersonk@gmail.com

Elena Parkins is a recent graduate of Hobart and William Smith Colleges with a B.A. in Psychology and Music. Her current research interests include interparental conflict and its effect on children's mental health outcomes. Address: Ms. Elena Parkins, 63 Lilac Drive Apt. 2, Rochester, NY 14620, USA. Email: elenaparkins11@gmail.com

Sarah Burstein is currently an undergraduate at Hobart and William Smith Colleges. She is majoring in psychology and is interested in mindfulness research. Address: Sarah Burstein, 33 Old Stone Crossing, West Simsbury, CT 06092, USA. Email: sarah.burstein@hws.edu