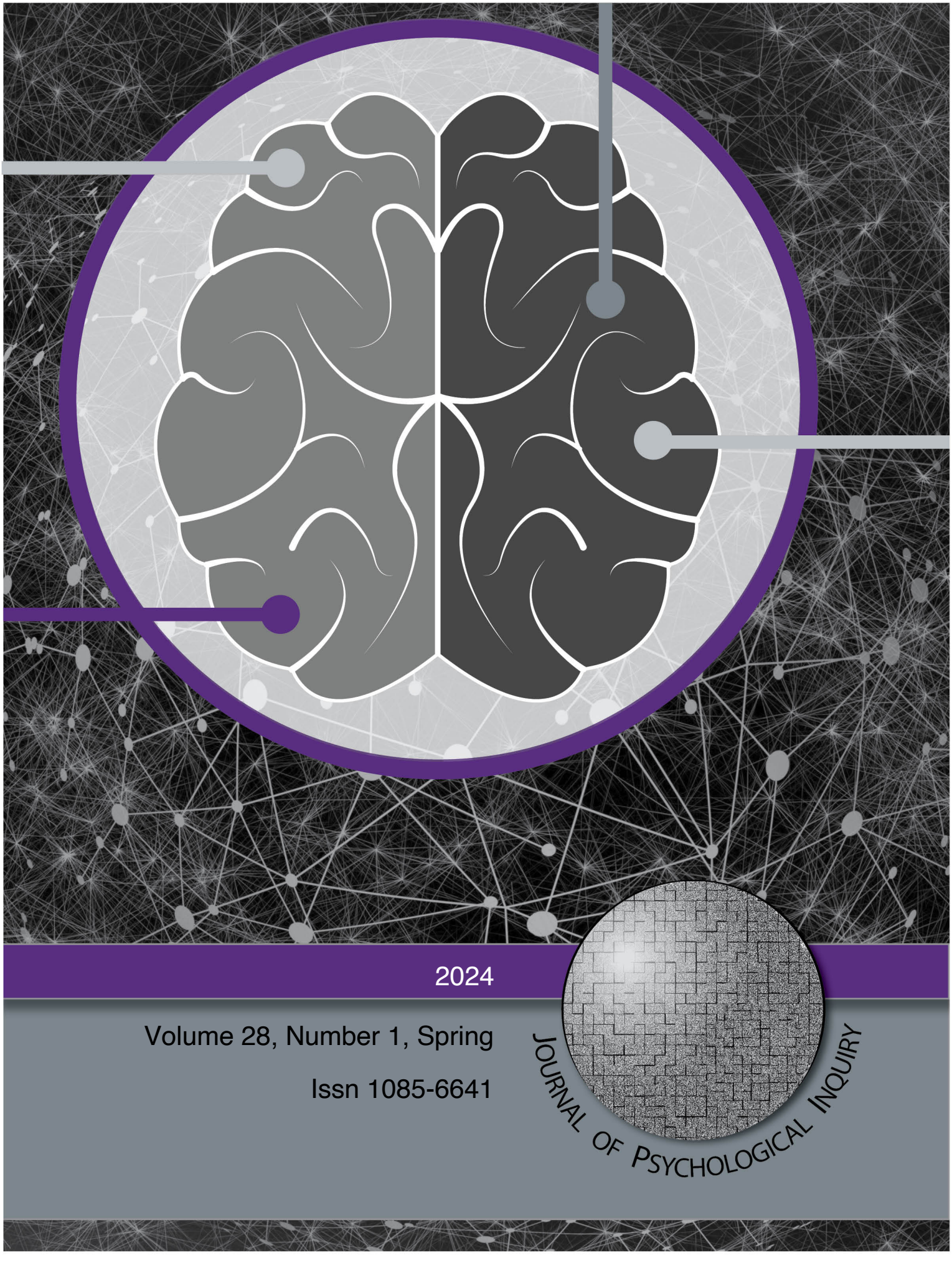

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Journal contents

From the Editor's Desk

As a graduate student in psychology, research is a large portion of our learning and it is important to recognize its value in psychology. This journal reflects that sentiment; research is *valuable*. It is quite crucial that we believe this, as counselors, psychologists, students, etc.

Dr. Sobel pointed out in the Fall 2023 issue that he misses having a GA for contributing to this journal, so I would say that I have some big shoes to fill from previous graduate assistants. I hope that I have managed at least a decent job.

I extend my gratitude to those who submitted for this issue. It takes courage to do something like this, and I believe that we have some great papers in store for you, reader. I hope that they inspire new scholarly endeavors and lead to many more submissions for future issues of this journal.

This issue is my first as copyeditor for Dr. Sobel and it contains some excellent research. I am grateful for the opportunity to collaborate on the journal and I am excited for what the future holds.

Parker Hamilton
Graduate Assistant
University of Central Arkansas

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Elizabeth A. Dahl, Ph.D.,
Best Paper Award

INSECURE ATTACHMENT AND DEPRESSION: SUPPORT FOR MEDIATIONAL ROLE OF SELF-ESTEEM

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Abstract – Insecure attachments to childhood caregivers are associated with later mental health risks, such as depression, but research is less clear on the mechanisms for the relationship between attachment and depression. One potential pathway by which attachment could relate to depression risk is through their respective relationships with self-esteem. The purpose of this study is to examine whether self-esteem mediates the relationship between attachment style and depression symptoms in a sample of college students. Participants included 138 undergraduate students from a small southern university. They completed an online survey that assessed attachment style dimensions, depression, and self-esteem. Results of this study showed a positive relationship between insecure attachment and depression symptoms, with self-esteem partially mediating that relationship. These findings suggest that insecure attachments may increase the risk for depression through an impact on self-esteem. This study adds a theoretical rationale to the body of work that indicates that improving relationship patterns and self-esteem contributes to the prevention and treatment of depression.

The National Health and Nutrition Examination Survey (2009-2012) estimates that approximately 7.6% of individuals aged 12 and over have depression (Pratt & Brody, 2014), but recent studies suggest that rates of mental health problems in college students are climbing. From 2013 to 2021, rates of positive screens for depression from the National Healthy Minds Study (HMS, 2021) increased from 17.4% in 2013 to 40.8% in the 2020-2021 academic year (Lipson et al., 2022). To stem the rising tide of mental health problems in young adults, it is crucial to identify mechanisms that contribute to depression that can be prevented or altered. One such pathway to the development of depression may come from attachment styles developed early in life through experiences with caregivers.

Attachment theory posits that early experiences with caregivers affect later relationships with significant others (Bowlby, 1980). Early in development, caregivers help individuals develop an internal working model of themselves and others that may influence self-esteem and future relationships (Riggs & Han, 2009). The internal working model is a framework through which individuals evaluate their worthiness, others' trustworthiness, and the goodness of the world via memories and experiences established through relationships with caregivers (Ainsworth et al., 1978). Receiving responsive care is likely to foster secure attachment as well as a positive internal working model (Riggs & Han, 2009).

On the other hand, those who receive inconsistent care or are rejected by their caregivers may develop insecure attachments and negative internal working models, characterized either by attachment anxiety or attachment avoidance (Bowlby, 1980). Attachment anxiety refers to the extent to which one is worried about being unloved or abandoned, and attachment avoidance refers to the extent to which one is comfortable with emotional closeness and interdependence (Zhu et al., 2016).

Insecure attachment styles may affect later relationships. Those with more attachment avoidance may be less affected by the feedback of others, including positive feedback. Those with higher attachment anxiety, however, may be more affected by negative opinions and feedback of attachment figures. Insensitivity to positive feedback and/or high sensitivity to negative feedback could contribute to a higher risk of depression and/or low self-esteem. Consistent with this theory, Hepper and Carnelley (2012) had adults keep a diary for 14 days and found that those with high anxious attachment scores were more affected by negative interpersonal feedback with romantic partners compared to adults low in anxious attachment, whereas those with high avoidant attachment were less impacted by positive interpersonal

feedback compared to those low in avoidant attachment. Insecure attachments may predispose individuals to interpret social feedback in a way that maintains low self-esteem and depression.

Insecure attachment styles are associated with greater depressive symptoms. Those with attachment anxiety believe that they are unworthy and are concerned that their attachment figure will abandon them, whereas those with avoidant attachment believe that others are not trustworthy and close relationships are unimportant (Riggs & Han, 2009). These negative cognitions about oneself and others could be contributing factors in the development of depression, particularly during adolescence when individuals are self-critical and aware of others' appraisals of them. Indeed, research has found that insecure attachment styles are associated with depression, and more secure attachments are linked to fewer depressive symptoms (e.g., Dagan et al., 2018; Erozkan, 2011). Erozkan's (2011) study specifically focused on college students and found that insecure attachment style was positively associated with depression and loneliness. Dagan et al. (2018) published a meta-analysis of 55 studies that assessed the relationship between adult attachment styles and depressive symptoms and concluded that there is a relatively consistent positive relationship between insecure attachment and depression.

Although the link between insecure attachments and depression has been well-established, less is known about the mechanisms by which insecure attachment styles are tied to depression risks in young adults. However, in adolescents, poorer relationships with parents are linked to higher depression (e.g., Hu & Ai, 2016; Kamkar et al., 2012), and these relationships were mediated by self-esteem. Similarly, self-esteem emerged as a mediator between parental conflict and depression in children (Ying et al., 2018). Identifying intervening mechanisms in the relationship between attachment and depression would provide more targets for intervention.

Previous research has identified variables that mediate insecure attachment and depression to be an increased need for reassurance from others and a lower capacity for self-reinforcement (Wei et al., 2005), dysfunctional attitudes about one's self (Lee & Hankin, 2009), and lower perceived social support (Zhu et al., 2016). These mediating variables have been linked to low self-esteem in other studies. For example, Clerkin et al. (2013) found greater need for reassurance on Facebook to be linked to lower self-esteem, and Kocouski and Endler (2000) found lower frequency of self-reinforcement to be linked to lower self-esteem in undergraduate students. Low self-esteem has also been linked to dysfunctional attitudes, such as maladaptive perfectionism (Ashby & Rice, 2002), and lower perceived social support (Ikiz & Cakar, 2010). Low self-esteem may be a common feature of mediators that have thus far have been linked to insecure attachment and depression.

Low self-esteem is both a symptom of depression (American Psychological Association, 2013) as well as a risk factor for depression (Beck, 1976). This is what Orth and Robins (2013) call the reciprocal relation model; low self-esteem makes one vulnerable to depression, and depression further erodes self-esteem. Low self-esteem was found to be a vulnerability factor for later depression in a longitudinal study of Mexican youth, even when controlling for extraneous variables (Orth et al., 2013). The negative view of self that is associated with insecure attachment (Roberts et al., 1996) could increase vulnerability to depression through lowered self-esteem. Those with secure attachments to caregivers likely have supportive caregivers who help them foster a positive self-concept. Insecurely attached individuals do not have this constant support from caregivers to buffer life stress and reinforce a positive self-concept. The way that people feel about themselves may be influenced by internal working models about the value of oneself that developed in the context of the relationship with the primary caregiver. Consistent with this theory, perceptions of a positive parental attachment are linked to higher self-esteem in adults (Foster et al., 2007), as well as fewer depressive symptoms (Kenny & Sirin, 2006).

With low self-esteem being both a risk factor for depression and a possible result of insecure attachment, it is likely to be a mediating factor between adult attachment and depression. To the best of our knowledge, there are no recent large-scale studies of self-esteem in college students, but a study published by Sprecher et al. (2013) that included a sample of 7,552 college students from 1990 to 2012 found that students generally had a relatively high level of self-esteem (mean score of 3.94 out of 5). Sprecher et al. reported that self-esteem remained consistent across the years of the study, but some other researchers have found that self-esteem rose between 1998 and 2008 (see meta-analysis by Gentile et al., 2010). Although self-esteem is relatively high in college students, at least up until 2012, low self-esteem is associated with problems, such as an increased vulnerability to depression and anxiety (Sowislo & Orth, 2013).

Studies are unclear whether interventions can change attachment style, but research has shown that self-esteem is amenable to change. Although a person's sense of security can be changed in the short-term in laboratory experiments (e.g., Mikulincer & Shaver, 2007),

longer-term attachment style changes seem to happen in the context of long-term romantic relationships (Arriaga et al., 2018). Self-esteem, however, is more directly changeable through targeted interventions. Niveau et al. (2021) published a meta-analysis that examined 119 published studies involving interventions to increase self-esteem. They found that interventions are generally effective across formats (online versus in-person, group versus individual, and shorter versus longer interventions). Larger effect sizes were found for cognitive-behavioral interventions compared to other types of interventions, and improvements to self-esteem after an intervention were generally maintained for up to one year after the intervention was completed.

The goal of this study is to determine whether there is support for a mediating role of self-esteem in the relationships between insecure attachment dimensions and depressive symptoms. This study aims to answer the following questions: (a) Are higher scores on measures of insecure attachment (anxious and avoidant) linked to lower self-esteem and greater depression symptoms? (b) Does self-esteem mediate the relationship between anxious attachment and depression? (c) Does self-esteem mediate the relationship between avoidant attachment and depression? We hypothesize that all research questions will be answered in the affirmative.

Method

Participants and Procedure

The sample consisted of 138 college students who completed measures of attachment style, self-esteem, and depression symptoms through the online survey website Qualtrics. Participants were aged 18 to 47 and collected from a convenience sample at a small, southern university. Informed consent was obtained prior to each person's participation. Participants were not directly compensated, though some may have been given extra credit in a course for participation. Participants completed all surveys in one 10–15-minute session at their own convenience. A demographics questionnaire was presented first to all participants, but the other measures were presented by Qualtrics in a randomized order. The sample consisted of 87% women, 11.6% men, and 1.4% who selected a response option listed as "other" or chose not to answer. The average age of the participants was 20 years old (SD = 3.6). A majority identified as white/Caucasian (52.9%; n = 73), followed by black/African American (32.6%; n = 45) and the response option "other"/biracial (13.7%; n = 19).

Measures

Adult Attachment Scale (AAS)

The 18-item AAS (Collins & Read, 1990) was used to assess participants' feelings about relationships. The measure presented statements to assess how comfortable the participant is with being close to others and depending on others as well as how much the participant worries about abandonment. Participants were asked to rate the extent to which the statement described them on a Likert-type scale from 1 (not at all characteristic) to 7 (extremely characteristic). Examples of statements included "I find it relatively easy to get close to others," "I find that people are never there when you need them," and "I want to merge completely with another person." In the current study, responses were scored using a scoring method developed by the authors of the measure consisting of two subscales, anxiety and avoid. The anxiety subscale measured the extent to which one worries about abandonment or unrequited love. The avoid scale measured the extent to which one is comfortable with intimacy and depending on others to be there when needed. Item scores were summed (after reverse-scoring certain items) and then divided by the number of items in the scale to yield an item average. Higher scores represent more insecure attachments (avoidant and anxious). The AAS was found to have an internal consistency greater than .58 for the subscales and a test-retest reliability of .70 over a period of two months (Ravitz et al., 2010). In our sample, the internal consistency of the AAS anxiety subscale was acceptable (α = .73) and the internal consistency of the avoid subscale was good (α = .84).

Beck Depression Inventory (BDI)

The BDI (Beck et al., 1961) consists of 21 self-report items and was administered to assess depressive symptoms. Participants were instructed to indicate the statement that best described their thoughts and feelings in the past month. Responses were numbered with higher numbers indicating greater severity of symptoms (e.g., 0 = I do not feel like a failure to 3 = I feel I am a complete failure as a person). Scores were summed to indicate the severity of depressive symptoms that may be present. Higher scores represented greater endorsement of depression symptoms. Internal consistency of the BDI has been found to be good, with a Cronbach's alpha of .86 for psychiatric populations and .81 for non-psychiatric populations (Beck et al., 1988). BDI total scores can be used to detect depressive symptoms in clinical patients as well as nonclinical populations, with clinical patients having higher scores (Kim & Park, 2010). The internal consistency of BDI scores was high in our sample (α = .92).

Rosenberg Self Esteem Scale (RSE)

The 10-item RSE (Rosenberg, 1965) was used to assess self-esteem. The measure presented statements regarding self-worth and self-image, and participants were asked to indicate the extent to which they agree or disagree with a statement on a Likert-type range from 1 (strongly disagree) to 4 (strongly agree). Sample items include "On the whole, I am satisfied with myself" and "At times I think I am no good at all." After reverse-scoring appropriate items, item scores were summed. Higher scores indicated higher self-esteem. Robins et al. (2001) found the RSE to have high internal consistency (α = .88) and to be stable through a 4-year period (r = .69). Internal consistency of RSE scores in our sample was high (α = .91).

Results

Descriptive Statistics

First, we calculated descriptive statistics for scores on all measures to understand how participants scored on the measures of depression, self-esteem, avoidance attachment, and anxious attachment. Participants' average scores on the avoid and anxiety attachment subscales were similar (2.82 and 2.75, respectively). Item scores can range from 1 to 5 with higher scores indicating more insecure attachment. The item means in our sample show that attachment tended to be slightly more secure than insecure, but there was sufficient variability in scores to be able to test our hypotheses. Self-esteem was fairly high with a mean score of 28 out of a possible range of 10 to 40. Participants reported a relatively low level of depression. Using Beck et al.'s (1988) recommended cut-off scores on the BDI, 46% reported no or minimal depression (scores of 0 to 9). However, 24.8% reported mild depression (scores of 10 to 18), 22.6% reported moderate depression (scores of 19 to 29), and 6.6% reported severe depression (scores of 31 to 63). Table 1 summarizes descriptive statistics on the BDI, RSE, and AAS.

Next, we calculated correlations between our variables to ensure that our variables related to each other in the expected directions based on previous research. This also served as a check to ensure that we had scored all measures correctly. All measures were significantly correlated with each other in the expected directions. Higher scores on measures of insecure attachment dimensions were associated with lower self-esteem and greater depressive symptoms. Table 2 summarizes correlations for BDI scores, RSE scores, anxious attachment, and avoidant attachment.

Table 1
Summary of Descriptive Statistics

	Mean	*SD*	Range
Anxious Attachment Item Average	2.75	0.87	1 – 5
Avoidant Attachment Item Average	2.82	0.70	1 – 5
Self-Esteem Total Score	28.38	6.14	13 – 40

Table 2
Correlations among Variables

	Depression	Self-Esteem	Anxious Attachment
Self-Esteem	-.72		
Anxious Attachment	.39	-.43	
Avoidant Attachment	.41	-.42	.30

Note. All results were statistically significant at a level of $p < .001$.

Table 3
Indirect Effects of Attachment on Depression through Self-Esteem

Attachment Dimension	Point Estimate	Standard Error	Lower CI	Upper CI
Anxious	.59	.11	.38	.83
Avoidant	.35	.07	.22	.52

Note. Results are statistically significant.

Self-Esteem as a Mediator between Insecure Attachment Dimensions and Depression

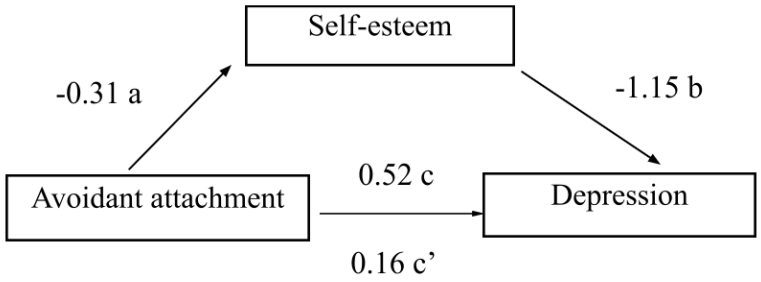
To address our research questions, we conducted mediation analyses to examine whether the relationships between insecure attachment dimensions and depression could be partially explained by self-esteem. Mediation analyses were conducted using the SPSS v.22 software with the PROCESS v2.16 macro for mediation (Hayes, 2013) with 5000 random bootstrap samples to address our hypothesis that self-esteem would mediate the relationship between adult insecure attachment styles and depression. A mediation analysis was conducted for each insecure attachment dimension (anxious and avoidant).

A bias-corrected 95% bootstrap confidence interval (CI) was calculated (See Table 3) for each

mediation analysis, and statistical significance was indicated when the CIs did not include zero. There was a significant indirect effect from avoidant attachment to depression symptoms through self-esteem (κ^2 = .30) and a significant indirect effect from anxious attachment to depression symptoms through self-esteem (κ^2 = .31).

Figure 1

Mediation Model of the Indirect Effect of Avoidant Attachment Scores on Depression Scores through Self-esteem Scores



Note. Path a demonstrates that greater avoidant attachment scores predict lower self-esteem, and path b shows that greater self-esteem corresponds to lower depression symptoms. There was a direct effect of attachment on depression scores (path c), but self-esteem was a significant partial mediator between attachment and depression. Self-esteem accounted for about one-third of the direct effect between avoidant attachment scores and depression scores (path c'). All paths were significant at $p < .01$.

Results supported our hypothesis of a significant indirect path from avoidant attachment scores to depression symptoms through self-esteem. As depicted in Figure 1, the overall model was significant, $F(2, 134) = 77.34$, $p < .001$, $R^2 = .54$. Higher avoidant attachment scores predicted lower self-esteem scores, and lower self-esteem scores were associated with higher depression scores. There was still a direct effect of avoidant attachment on depression scores when self-esteem was included in the model, but the indirect effect of avoidant attachment on depression through self-esteem was also significant. These results indicate support for a model of partial mediation of self-esteem in the relationship between avoidant attachment and depression.

Results also supported our hypothesis of a significant indirect path from anxious attachment to depression symptoms. As illustrated in Figure 2, the overall model was significant, $F(2, 133) = 75.18$, $p < .001$, $R^2 = .53$. Higher anxious attachment scores predicted lower self-esteem scores, and lower self-esteem scores were associated with higher depression scores. There was still a direct effect of anxious attachment on depression scores when self-esteem was included in the model, but the indirect effect of anxious attachment on depression through self-esteem was also significant. These results indicate support for a model of partial mediation of self-esteem in the relationship between anxious attachment and depression.

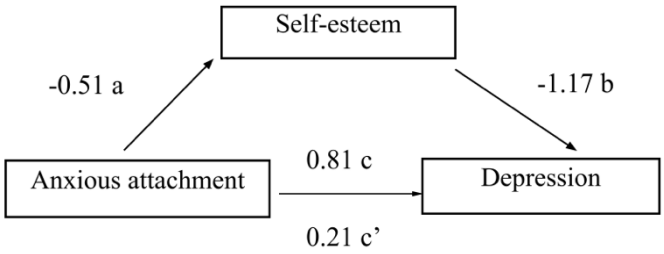
Discussion

This study examined the relationships among adult insecure attachment dimensions, self-esteem, and depressive symptoms. Results supported the hypothesis that more insecure attachment (anxious and avoidant) is associated with lower self-esteem and greater depression symptoms. We also found evidence to support the hypothesis that self-esteem partially explains the relationship between anxious and avoidant attachment styles and depression, so targeting self-esteem may be impactful in the treatment and prevention of depression.

Our descriptive data for self-esteem, anxious and avoidance attachment dimensions, and depression are consistent with scores in other non-clinical samples. The relatively high self-esteem scores in our sample are consistent with Sprecher et al.'s

Figure 2

Mediation Model of the Indirect Effect of Anxious Attachment Scores on Depression Scores through Self-esteem Scores



Note. Path a demonstrates that greater anxious attachment scores predict lower self-esteem, and path b shows that greater self-esteem corresponds to lower depression symptoms. There was a direct effect of attachment on depression scores (path c), but self-esteem was a significant partial mediator between attachment and depression. Self-esteem accounted for about one-fourth of the direct effect between anxious attachment scores and depression scores (path c'). All paths were significant at $p < .01$.

(2013) analysis of self-esteem in college students over a 22-year period. Similarly, the mean anxious and avoidant attachment item ratings that were mid-way between the anchors representing the highest and lowest ratings are similar to average item ratings in other studies (e.g., Collins & Read, 1990). Although the mean score for depression in our sample was relatively low (12.97 out of a possible high score of 63), over half of the sample (54%) screened positive for at least mild depression, with 29.2% of the sample screening positive for moderate to severe depression. This is consistent with other studies of college students conducted prior to Covid-19. A meta-analysis by Ibrahim et al. (2013) found reported prevalence rates of depression to be 10 to 85% in studies with college students, with a weighted mean prevalence of 30.6%. It is important to note that data collection for our study occurred prior to the Covid-19 pandemic. Numerous studies indicate that mental health problems rose across all segments of the population during the Covid-19 pandemic (e.g. Czeisler et al., 2020). It would be beneficial to repeat this study to determine if the effect sizes for relationships among insecure attachment dimensions, self-esteem, and depression would be even higher than what we found in our data that were collected prior to the Covid-19 pandemic.

The findings of this study are consistent with previous research that finds greater depressive symptoms and lower self-esteem to be associated with higher scores on measures of insecure attachment (e.g., Erozkan, 2011; Orth & Robins, 2013). Like other studies that assessed possible mediators of the relationship between insecure attachment and depression (e.g., Lee & Hankin, 2009; Roberts et al., 1996), attachment insecurity in our study was linked to more depressive symptoms partially through an association with other variables. In our study, low self-esteem was a partial mediator of the relationship between insecure attachment dimensions and depression symptoms. Low self-esteem was also found to have a direct link with depressive symptoms, consistent with past studies (Kenny & Sirin, 2006; Orth & Robins, 2013; Roberts et al., 1996).

The main findings of this study that support a mediational role of self-esteem between anxious and avoidant attachment and depression are important because self-esteem is amenable to change following short-term interventions (Niveau et al., 2021), whereas changes to attachment style take longer and seem to happen in the context of long-term romantic relationships (Arriaga et al., 2018). To our knowledge, there are no studies that demonstrate that attachment style can be changed by interventions that target low self-esteem, but the research on the general stability of attachment style over time (Zang & Labouvie-Vief, 2010) would suggest that it is unlikely that a short-term intervention to improve self-esteem would also change a person's attachment style. There is ample research, however, that demonstrates that improved self-esteem reduces the risk of depression (e.g., Orth et al., 2013). Furthermore, interventions to increase self-esteem usually decrease depressive symptoms at the same time (see systematic review and meta-analysis by Kolubinski et al., 2018). Identifying changeable mediating factors in the relationship between more intractable variables and mental health outcomes is important in efforts to reduce depression. Although attachment style does not change easily, knowing that insecure attachment styles may increase depressive symptoms through lowered self-esteem gives us an avenue for prevention and treatment of depression in people with insecure attachments.

This study is limited by use of self-report measures, few male participants, and its cross-sectional sample Though low self-esteem is linked to higher depression, our cross-sectional sample cannot determine that low self-esteem contributed to depression symptoms as opposed to depression depleting self-esteem. It is also difficult to determine if insecure attachment contributes to depression or if depression causes attachment problems in adults. Our findings, however, are consistent with studies that suggest that low self-esteem predicts later depression (e.g., Kenny & Sirin, 2006; Lee & Hankin, 2009). Additionally, self-esteem was found to be stable over a 4-year period (Rosenberg, 1965), supporting theories that self-esteem is a stable construct and not simply a product of depression. Our support for a mediational role of self-esteem between dimensions of insecure attachment and depression in our cross-sectional sample is bolstered by the stability of self-esteem and its ability to predict later depression. This study uses a non-clinical sample with a good range of scores on the BDI and RSE, and the predominantly female sample reflects the reality that women are about two times more likely to be diagnosed with major depressive disorder compared to men (Li et al., 2022). This sample is appropriate for examining factors that may contribute to depression and resilience.

Future studies should examine additional mediating factors to better understand how insecure adult attachment relates to depression symptoms. In our sample, self-esteem only accounted for a third or less of the relationship between attachment and depression symptoms. Adding perceived social support and traumatic life events as additional mediators could further explain the relationship between attachment and depression, as they can activate attachment behavior

(Riggs & Han, 2009) and affect one's utilization of supportive resources (Zhu et al., 2016), thereby affecting depressive symptoms. Future research should utilize longitudinal studies to establish more definitively whether self-esteem mediates the relationship between insecure attachment and later depression symptoms.

It is important to identify possible factors contributing to the development of depression and the mechanisms through which they operate. Insecure attachment is a risk factor for depression symptoms, and this study suggests that low self-esteem may be an intervening variable. Improving self-esteem in individuals with insecure attachments may be a salient target for preventing depression.

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EFFECT OF WARM AND COOL COLORS ON EMOTIONS

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Abstract – Colors can evoke different emotions and affect how individuals perceive images. Previous research on colors and emotions suggests that warm colors are more stimulating than cool colors. This study explored if warm and cool colors evoke different types of emotions, particularly low and high arousal emotions. It was hypothesized that warm colors will be associated with high arousal emotions, whereas cool colors will be associated with low arousal emotions. Using a within-subjects quasi-experimental design, participants viewed warm, cool, and gray-colored images. While viewing each image, participants recorded their emotional responses using a modified Affect Grid (Russell et al., 1989). Results from two one-way repeated measures ANOVAs showed that warm colors had significantly higher arousal scores than cool and gray colors, suggesting that warm colors elicit higher emotions of arousal. This study has important implications for color psychology, marketing, and design. Implications and suggestions for further research are discussed.

According to Carl Jung, "Who must God have loved in order to have given birth to…this sacred spectrum of colors" (Jung, 1983, p. 97). Colors play a vital role in influencing emotions, communication, behaviors, art, and design. They help humans navigate the world as well as add richness to life. Individuals can experience different emotions under the influence of colors. For instance, the color blue has been shown to evoke emotions of sadness, comfort, or relaxation (Valdez & Mehrabian, 1994). Colors can elicit various emotions and affect how individuals perceive objects and images. People tend to associate certain colors with particular emotions. For example, red has been associated with dominance, aggression, anger, and even attractiveness (Mentzel et al., 2017; Wiedemann et al., 2015). The color red has also been associated with luck and prosperity in Chinese culture, which is recognizable in traditions such as posting red couplets on doors and windows during the Spring Festival (Ibekwe, 2021). However, there appears to be little consensus on which types of colors, warm and cool, evoke particular emotions. Studies show that certain colors have been shown to elicit different levels of emotional arousal (Leichsenring, 2004; Valdez & Mehrabian, 1994). Previous research on colors and emotional affect suggest that warm colors, particularly red, are found to be more stimulating than cool colors (AL-Ayash et al., 2016; Briki & Hue, 2016; de Villemor-Amaral & Yazigi, 2022; Duan et al., 2018). However, there is a lack of investigation exploring the role of all warm and cool colors in eliciting different levels of emotional arousal. The purpose of this research is to explore if warm and cool colors evoke different types of emotions, particularly low and high arousal emotions, using a within-subjects quasi-experimental design.

Background

Emotional arousal has an important role in producing emotion and emotion processing. Arousal can be defined as the degree of excitement or motivational activation a person experiences as a reaction to emotional stimuli (Deckert et al., 2020; Russell, 1994). Emotional arousal can be divided into two main levels. High-arousal emotions include emotions of anger and joy or excitement, while low-arousal emotions include sadness and relaxation (Russell et al., 1989). In addition to defining emotional arousal, experimental evidence suggests that emotions elicit different types of emotional arousal. Deckert et al. (2020) found that particular emotional stimuli such as words and facial expressions can elicit various emotional arousal responses. Similarly, research has shown that certain colors have been shown to elicit different levels of emotional arousal. Leichsenring (2004) found that the color red is more likely to elicit the high-arousal emotion of anger compared to green, blue, yellow, and non-chromatic colors (black and gray) when investigating the influence of color on emotions using the Holtzman Inkblot Technique. This technique is an inkblot test that can be used to detect personality and diagnose mental health

illnesses by having subjects answer what they think each inkblot reminds them of (Holtzman et al., 1961). Other research using emotional measures such as the Pleasure, Arousal, and Dominance scale (Mehrabian, 1996) has found that yellow hues evoke higher arousal states than blue and purple (Valdez & Mehrabian, 1994). Furthermore, experimental evidence using physiological measures (e.g. heart rate and skin conductance) observed that red caused increased arousal reactions compared to green and blue (Wilms & Oberfeld, 2018). Therefore, different colors can elicit higher or lower levels of emotional arousal and simulate physiological responses.

Warm colors have been found to be more stimulating than cooler colors. Specifically, warm colors elicit higher arousal reactions while cool colors are more calming (de Villemor-Amaral & Yazigi, 2022). Research indicates that the warm color red is more stimulating than cooler colors (AL-Ayash et al., 2016; Briki & Hue, 2016; Buechner et al., 2014; Duan et al., 2018). For example, Buechner et al. (2014) found that red-colored stimuli have been shown to be more stimulating and receive attentional advantage compared to blue when looking at facial expressions. Similarly, in a psychophysical experiment, Duan et al. (2018) noted that participants reacted faster with more accuracy when viewing red and orange backgrounds, suggesting that these colors are highly arousing. Different research has found that arousal was significantly higher when individuals viewed red and lower when viewing cool colors such as blue and green (Briki & Hue, 2016). Furthermore, AL-Ayash et al. (2016) observed that red and yellow conditions caused increases in heart rate while blue caused decreases, suggesting that warmer colors give rise to higher arousal states. Along with being more physiologically stimulating, warmer colors tend to evoke more intense emotions.

Warm colors, particularly red, are more likely to elicit higher emotions of arousal. Red has been found to elicit more high-arousal emotions such as anger compared to other colors (Leichsenring, 2004). For instance, Wilms and Oberfeld (2018) found red was the most emotionally arousing color followed by green and then blue when participants rated their emotional states while viewing LED color stimuli. While there is substantial research on the color red, other research has focused on other warm colors. In an experimental study assessing the relationship between music, color, and emotion, Valdés-Aleman et al. (2022) observed that yellow was associated with pleasant high-arousal emotions of joy and excitement. This finding suggests that yellow tends to elicit pleasant high-arousal emotions. In addition, AL-Ayash et al. (2016) noticed that participants reported that yellow elicited emotions of cheerfulness and joy while blue elicited pleasant low-arousal emotions, such as relaxation. Therefore, warmer colors, particularly red and yellow, tend to evoke high arousal emotions (Leichsenring, 2004; Valdés-Aleman et al., 2022; Wilms & Oberfeld, 2018) while cool colors, specifically blue, tend to stimulate low arousal emotions (AL-Ayash et al., 2016).

The Present Study

Previous research has examined the role of colors in physiological arousal (AL-Ayash et al., 2016; Briki & Hue, 2016; Buechner et al., 2014; Duan et al., 2018; Wilms & Oberfeld, 2018) and emotional arousal (AL-Ayash et al., 2016; Leichsenring, 2004; Valdés-Aleman et al., 2022; Wilms & Oberfeld, 2018). Although this research suggests that warmer colors tend to elicit higher arousal than cool colors, it does not specifically explore if warm and cool colors elicit different levels of emotional arousal. Substantial amounts of experimental evidence have focused on the emotional reactions that the colors red, yellow, and blue elicit. However, despite considerable research on emotions and colors, studies have yet to provide thorough research on emotional arousal responses for the colors orange, green, and purple. The present study will build on previous work that looked at particular colors and emotional arousal, and expand to explore if warm colors and cool colors evoke distinct levels of emotional arousal. Explicitly, the purpose of this study is to explore if warm and cool colors evoke different emotions, particularly high and low arousal emotions. It is hypothesized that warm colors will be associated with high arousal emotions, whereas cool colors will be associated with low arousal emotions. The dependent variable was the emotional responses of participants when viewing warm, cool, and gray-colored images. Emotional responses were measured using a modified version of the Affect Grid (Russell et al., 1989).

Method

Participants

The participants of this study included undergraduate students currently attending a small, mostly residential private university. Participants were required to be at least 19 years of age or older and enrolled at the university ($M = 20.73$, $SD = 3.68$). Convenience sampling was used to recruit participants. Participants were recruited through an announcement email sent through the Student Life Office, in-class announcements in various undergraduate courses, and flyers placed around campus in various locations. Each method of recruitment included information about the study. Some participants were compensated with extra

credit, while other participants volunteered to participate without receiving compensation. A total of 146 students responded to the Qualtrics survey, and 15 were excluded from the data analysis because of incomplete responses. The final sample size consisted of 131 participants. Of the total responses, 93 participants self-identified as female (70.99%), and 35 participants self-identified as male (26.72%). One participant self-identified as non-binary (0.76%) and the other two participants preferred not to report their gender (1.53%).

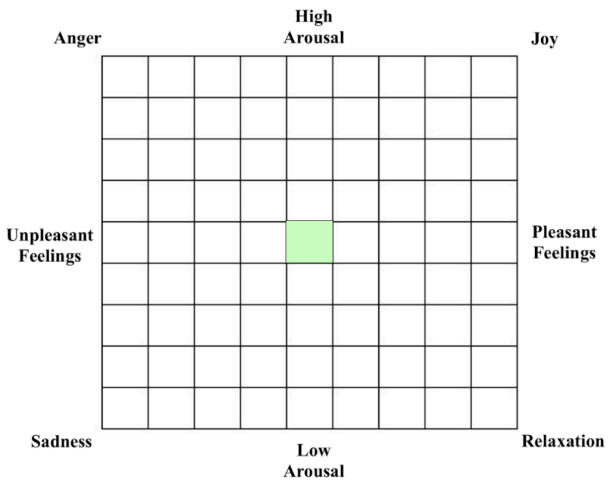
Measures

Affect Grid

Emotional responses were measured using a modified 9 x 9 Affect Grid (Russell et al., 1989) within Qualtrics (see Figure 1). Participants were tasked with selecting one square within the grid according to the labels shown. The emotion labels for the original Affect Grid (Russell et al., 1989) were modified for this study to help eliminate possible confusion for participants. For example, "sadness" replaced the word "depression" from the original grid to represent the unpleasant low arousal emotion. "Anger" replaced "stress" to represent the unpleasant high arousal emotion and "joy" replaced "excitement" to represent the pleasant high arousal emotion. These changes to the emotion labels helped make the grid easier to understand for participants. Furthermore, the "sleepiness" label on the x-axis was changed to "low-arousal." No other modifications were made to the original grid. In order to record participants' responses within Qualtrics, an image of the grid was displayed to participants below each color image. Participants' selections were recorded using a blocked heat map plot (Qualtrics, 2023). Therefore, any mouse click within the white region of a particular square was considered a selection for that square (see Figure 1).

Figure 1

Modified Affect Grid



Note. The grid includes four different emotions ranging from anger, sadness, joy, and relaxation. The center of the grid represents a neutral emotion. Above is an example of what the grid looks like when the center box in the grid is selected. A participant would receive an arousal score of 5 and a pleasantness score of 5 if the center box was their final selection (A = 5, P = 5).

The Affect Grid specifically assessed two dimensions of emotional affect: pleasure (pleasantness) and arousal. A pleasantness (P) score was recorded as the location of the selected square that aligned with the pleasantness scale on the x-axis ranging from 1 (far left of the grid) to 9 (far right of the grid). The arousal (A) score was recorded as the location of the selected square that aligned with the arousal scale on the y-axis, ranging from 1 (bottom of the grid) to 9 (top of the grid; Russell et al., 1989). High-arousal emotions included anger and joy. Low-arousal emotions included sadness and relaxation as labeled on the modified Affect Grid. Participants were asked to select one box in the grid according to the intensity and degree they experienced a particular emotion after viewing the warm, cool, and gray-colored images. Following data collection, participants' affect grid data were loaded into a Microsoft Excel spreadsheet that coded participants' final selections into two P and A scores for each of the six color images that they saw (via random selection) and all three of gray images.

Procedure

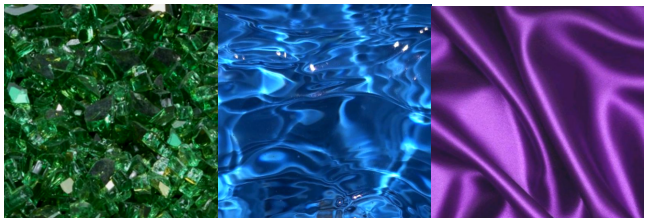
The Qualtrics survey created for this study followed a specific script and block formation that began with informed consent information. All participants were encouraged to take the survey on a computer before continuing; however, testing of the survey revealed that respondents could also take the survey on their smartphones without difficulty. Those who agreed to participate proceeded to a page to complete a short training task with a rainbow-colored image. When viewing the rainbow-colored image, the training task asked participants to use the modified Affect Grid and "click one box in the grid where it best represents what you feel when looking at the image above." Participants then had to confirm their emotional response to the rainbow-colored image before moving on to the rest of the survey. Next, participants were shown a total of nine images that were partially randomly selected from 27 abstract, colored photos (See Figure 2). Consistent with the rainbow color pattern, images were presented in the

same sequence as they appear in the visual light spectrum. Three warm-colored images (red, orange, and yellow), three cool-colored images (green, blue, and purple), and then three grayscale images were shown. To ensure effects were not due to image content, each participant was randomly assigned to view one of three images for each color. As shown in Figure 2, images were primarily one color from one hexadecimal code: red (#E91C16, RGB [223, 28, 22]), orange (#FA8305, RGB [250, 131, 5]), yellow (#FFDF00, RGB [255, 221, 0]), green (#3BA464, RGB [59, 164, 76]), blue (#2683E2, RGB [38, 132, 226]), purple (#8422BA, RGB [133, 34, 186]), and gray (#808080, RGB [128, 128, 128]). When viewing each image, participants were asked to assess how intense and to what degree they feel a certain emotion by selecting a single box in the modified Affect Grid (Russell et al., 1989). At the end of the survey, participants were asked a series of demographic questions including academic year, age, gender identity, and ethnicity. A thank-you page was shown after the completion of the survey. Information on the researcher's contact information was provided. If participants were offered extra credit by their professors, they were directed to a separate form to provide their name, course name, and professor. The entire study took participants no longer than 15 minutes to complete and there were no follow-up procedures.

Figure 2
Colored Image Examples

Warm Colors (red, orange, and yellow)

Cool Colors (green, blue, and purple)



Gray Colors

Note. Examples of 9 colored images that a participant might view during the survey.

Design and Analysis

The design for this study was a within-subjects quasi-experimental design with image color (warm, cool, gray) as the within-subjects factor. Image color (warm, cool, and gray) was presented to participants in three blocks of three images. The warm block included one red, one orange, and one yellow image. The cool block included one green, one blue, and one purple image. The grayscale block included three grayscale images. The warm block was presented to each participant first followed by the cool and gray blocks. The blocks were presented in the following order to all participants: red, orange, yellow, green, blue, purple, and gray. Although this introduced the nuisance variable of temporal sequence, the order was the same for all participants and consistent with the familiar six-pattern rainbow pattern that starts with a warm color (red) and ends with cool (purple) color. Given the sample size, this approach was preferred over other designs such as the Latin square design that would have required 36 different order conditions (9 colors x 9 colors). According to Gamst et al. (2008), these designs can be statistically complex, and therefore, were considered beyond the scope of this study.

The modified Affect Grid (Russell et al., 1989) was used to measure emotional responses. The grid assessed two dimensions of emotional affect: pleasantness (1 = unpleasant feelings; 9 = pleasant feelings) and arousal (1 = low arousal; 9 = high arousal). The arousal (A) scores and the pleasantness (P) scores were calculated for each image presented to participants. In a three-step process, individual scores for both arousal and pleasantness were collected for all warm, cool, and gray-colored images. First, the arousal and pleasantness scores for each color (red, orange, yellow, green, blue, purple, and gray) were calculated. Next, the scores of the red, orange, and yellow images were averaged to compute participants' overall warm arousal and pleasantness scores. The scores of the green, blue, and purple images

were then averaged to compute participants' overall cool arousal and pleasantness scores. Finally, total arousal and pleasantness scores were calculated by averaging all participant's warm and cool scores from the previous step. The responses of the participants' three gray images were used to produce the gray average scores for arousal and pleasantness.

A one-way repeated measures ANOVA was used to compare the average arousal (A) scores for the warm, cool, and gray-colored images. Another one-way repeated measures ANOVA was conducted for the pleasantness (P) average scores. Therefore, two one-way repeated measures ANOVAs were conducted to determine if warm and cool colors elicit different emotions using the scores from the grid.

Results

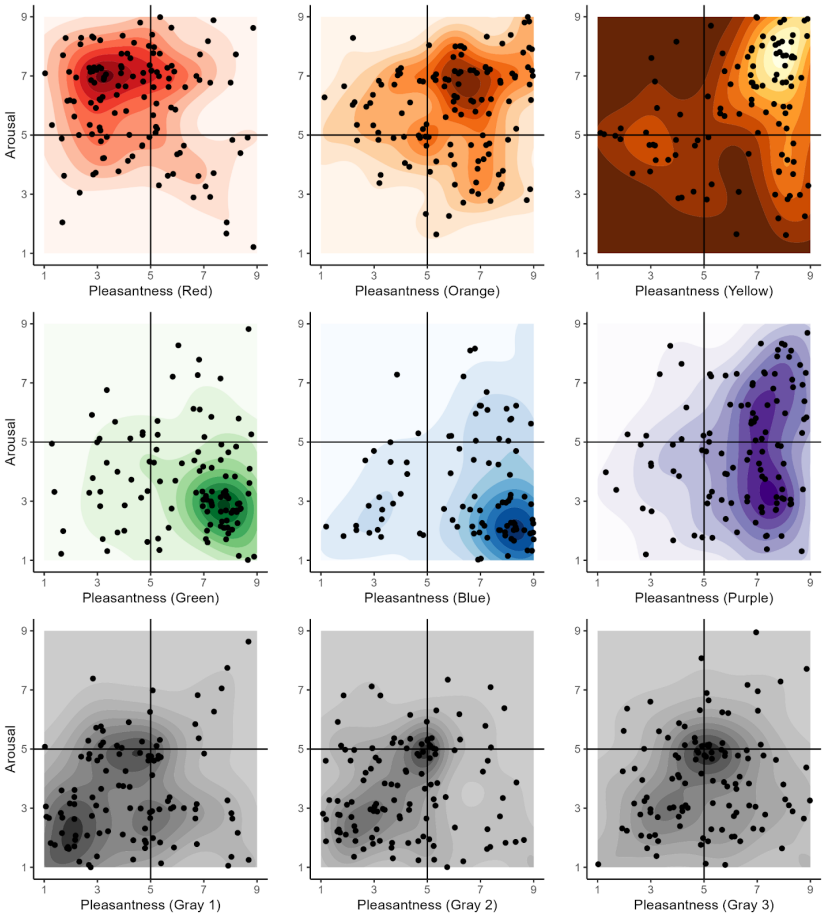
Descriptive statistics for arousal and pleasantness scores for each color were calculated.

Red arousal scores had a mean of 6.12 (SD = 1.78), orange arousal scores had a mean of 5.85 (SD = 1.74), and yellow arousal scores had a mean of 6.17 (SD = 2.05). Green arousal scores had a mean of 3.46 (SD = 1.72), blue arousal scores had a mean of 3.32 (SD = 2.07), and purple arousal scores had a mean of 4.63 (SD = 2.23). Participants' total average arousal scores for the three gray images were 3.58 (SD = 1.29). For the pleasantness scores, red pleasantness scores had a mean of 4.41 (SD = 1.95), orange pleasantness scores had a mean of 5.95 (SD = 2.12), and yellow pleasantness scores had a mean of 6.89 (SD = 2.11). Green pleasantness scores had a mean of 6.63 (SD = 2.10), blue pleasantness scores had a mean of 7.02 (SD = 2.18), and purple pleasantness scores had a mean of 6.60 (SD = 1.96). Participants' total average pleasantness scores for the three gray images were 4.42 (SD = 1. 57).

To further inspect the distribution of participants' responses to the color images, participants' arousal and pleasantness scores were plotted onto a grid using the ggplot2 package in R version 4.3.0. Figure 3 displays participants' responses, as well as the two-dimensional density contours bands. With the exception of yellow, darker colors represent more frequent responses (i.e., higher probabilities of data occurring within the bands). To account for the discreteness of responses, points on the graph were randomly positioned around the common value using the "position = jitter" argument in R. As shown in the top row of warm-color plots, participants perceived orange and yellow images similarly (high arousal and pleasantness) with red being perceived as high arousal and low pleasantness. The middle row of cool-color plots display similar responses with green and blue being perceived as low arousal and high pleasantness (i.e., close to the "relaxation" label), whereas purple is perceived as high pleasantness with a range spanning both arousal quadrants. For comparison, responses to each of the three gray images were plotted on the bottom row of Figure 3. Responses to these images tended to be in the midpoints of both scales with higher density levels occurring in the low arousal and low pleasantness quadrant.

Figure 3

Two-dimensional Density Plots of Arousal and Pleasantness Scores



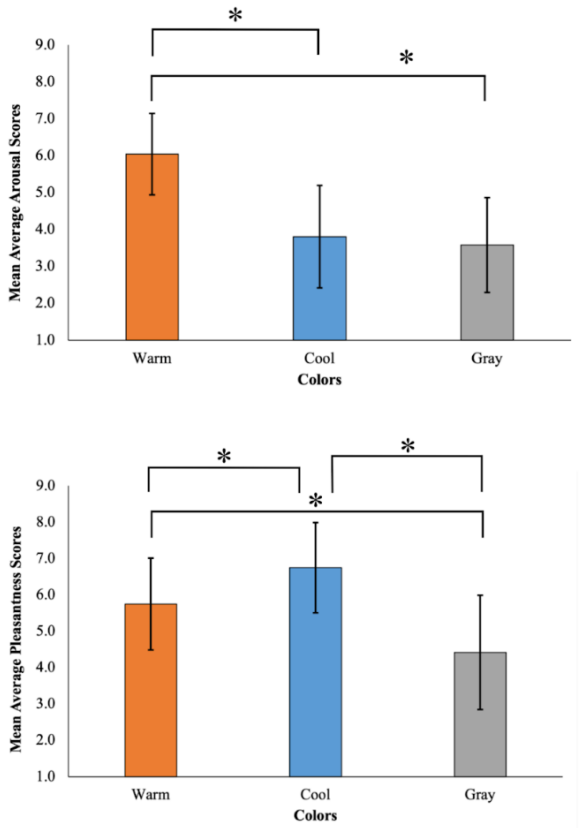
Note. With the exception of yellow, darker bands indicate higher probabilities of data points occurring within the band. Images for each of the six colors (red, orange, yellow, green, blue, and purple) were randomly selected from a set of three possible images. All participants saw all three gray images.

A one-way repeated measures ANOVA was conducted to determine if emotional arousal scores differed by colors (warm, cool, and gray). As shown in Figure 4, results revealed a significant difference of colors on arousal scores, $F(2, 260) = 152.81$, $p < .001$, $\eta 2p = .540$. Three separate Bonferroni-adjusted post hoc tests revealed that warm colors had significantly higher arousal scores ($M = 6.04$, $SD = 1.12$) than cool colors ($M = 3.80$, $SD = 1.39$), $t(130) = 14.37$, $p < .001$, $pbonf < .001$, $d = 1.77$. Additionally, warm colors had significantly higher arousal scores than gray ($M = 3.58$, $SD = 1.29$), $t(130) = 15.81$, $p < .001$, $pbonf < .001$, $d = 1.95$. Arousal scores did not differ among cool colors and gray, $t(130) = 1.44$, $p = .152$, $pbonf = .456$, $d = 0.18$. These results suggest that participants had higher emotional arousal scores for warm colors than cool colors and gray. In particular, yellow appeared to elicit the highest emotional arousal ($M = 6.17$, $SD = 2.05$) followed by red ($M = 6.11$, $SD = 1.78$) and then orange ($M = 5.85$, $SD = 1.74$). Blue elicited the lowest emotional arousal scores ($M = 3.32$, $SD = 2.07$). Arousal scores were similar across participants for cool colors and gray.

A different one-way repeated measures ANOVA was conducted to determine if emotional pleasantness scores differed by colors (warm, cool, and gray). Results revealed a significant difference of colors on pleasantness scores, $F(2, 260) = 96.92$, $p < .001$, $\eta 2p = .427$ (see Figure 4). Three separate Bonferroni-adjusted post hoc tests revealed that cool colors had significantly higher pleasantness scores ($M = 6.75$, $SD = 1.24$) than warm colors ($M = 5.75$, $SD = 1.26$), $t(130) = -5.94$, $p < .001$, $pbonf < .001$, $d = -0.73$. Cool colors were also rated higher in pleasantness than gray colors ($M = 4.42$, $SD = 1.57$), $t(130) = 13.88$, $p < .001$, $pbonf < .001$, $d = 1.70$. Additionally, warm colors had significantly higher pleasantness scores than gray, $t(130) = 7.94$, $p < .001$, $pbonf < .001$, $d = 1.98$. These results suggest that participants had higher pleasantness scores for cool colors compared to warm and gray. Specifically, blue appeared to elicit the highest pleasantness scores ($M = 7.02$, $SD = 2.18$). Yellow, however, evoked higher emotional pleasantness scores ($M = 6.89$, $SD = 2.11$) than green ($M = 6.63$, $SD = 2.10$) and purple ($M = 5.60$, $SD = 1.96$).

Figure 4

Means and Standard Deviations from Repeated Measures ANOVA for Average Arousal and Pleasantness Scores



*$p < .001$

Note. Average arousal and pleasantness scores by warm, cool, and gray colors.

Discussion

The purpose of this study was to explore if warm and cool colors evoke different types of emotions, particularly low and high-arousal emotions. We hypothesized that warm colors would be associated with high arousal emotions, whereas cool colors would be associated with low arousal emotions. The present study found that warm colors, particularly yellow and red, elicited higher emotional arousal than cool colors. Specifically, warm colors had significantly higher emotional arousal scores than cool and gray colors. Therefore, the hypothesis is supported by the results. The present study also found that cool colors, particularly blue, elicited more pleasant emotions compared to warm colors. Participants had higher pleasantness scores for cool colors than warm or gray. This study has implications for color psychology as well as future research and includes methodological limitations.

Implications

The present study found support for the hypothesis that warm colors evoke high arousal emotions and cool colors evoke lower arousal emotions. Previous research has also supported that warm colors are more likely to elicit higher emotions of arousal (AL-Ayash et

al., 2016; Leichsenring, 2004; Valdés-Aleman et al., 2022; Wilms & Oberfeld, 2018). Furthermore, AL-Ayash et al. (2016) found that the warm colors red and yellow elicited higher emotional arousal and physiological responses (e.g. heart rate) than blue in controlled learning environments.

Similarly, the present study found that warm colors yellow and red elicited higher emotional arousal than blue. In particular, the color yellow elicited the highest emotional arousal responses followed by red and then orange. This finding is different from previous research that suggests that red gives rise to higher arousal states than other warm colors (Duan et al., 2018; AL-Ayash et al., 2016). As mentioned in the results section above, it is interesting to note that yellow was the most emotionally arousing color and the second most pleasant color after blue, suggesting that yellow elicits emotions of joy. This finding is supported by Valdés-Alemán et al. (2022) who found that yellow was associated with joy, excitement, and pleasantness. The results of the present study may be beneficial for individuals in marketing, branding, and design. For example, designers and marketers could use this study to guide how they use color for branding, logos, or environments. Warm colors, particularly yellow or red, would be preferred over cool colors if an individual wants their logo to be emotionally stimulating and arousing to customers.

While warm colors were found to elicit high arousal emotions, the results of this study suggest that cool colors are associated with low arousal emotions. Previous literature supports that cool colors elicit pleasant low-arousal emotions (AL-Ayash et al., 2016; Briki & Hue, 2016; Valdez & Mehrabian, 1994). In the present study, blue elicited the lowest emotional arousal, but the highest pleasantness. This suggests that blue elicits emotions of relaxation, which is supported by the findings of AL-Ayash et al. (2016). This result may be useful for individuals who want to communicate information, designs, or ideas that are relaxing or calming. Having awareness of the role warm and cool colors have in eliciting different emotions may allow a deeper understanding of their importance in color psychology, design, marketing, and communication. The present study focused on exploring if warm and cool colors elicit different emotions, particularly low and high arousal emotions. Results supported the claim that warm colors elicit higher emotions of arousal than cool colors, however, more research will need to be done to figure out which specific emotions the colors red, orange, green, and purple elicit on the modified affect grid.

Limitations and Future Research Directions

Although this study contributes to the current literature on colors and emotions, there are several limitations to the present study. One limitation to this study is that the colors presented were not counterbalanced. Colors were presented in the following order to all participants: red, orange, yellow, green, blue, purple, and gray. While the blocks of images within each color were randomly presented, the color order was not. This presents a confound in the study as responses of one color could have influenced responses for another color. This confound was a constant across all subjects. Therefore, the sequencing of colors was consistent such that the presentation of a warmer color could have carried over to the responses of the following color. However, the purpose of this research was to understand warm vs. cool colors, which is why the three warm colors were presented first followed by the three cool colors.

The purpose of this study, however, was not to explore differences among the six main colors. The purpose of this research was to understand warm vs. cool colors. If the results were due to carryover effects caused by the temporal confound, similarities or contrast effects should have been observed such that colors presented sequentially should have been rated similarly or dissimilarly given their comparisons with the previous color. Demonstrating a similarity effect, we found that some colors were rated similar to the color previously shown. For example, orange was rated similarly to red in pleasantness. However, this similarity effect was not consistent, because orange was rated lower in pleasantness than yellow. Demonstrating a contrast effect, green was rated very differently than yellow in arousal despite being next to each other on the visual color spectrum. Yet, green and blue were rated very similarly in both pleasantness and arousal. If the temporal confound caused similarity or contrasts effect, these effects were not consistent across the data. Despite the limitation of not fully controlling for temporal sequence, this study is a sensible first step to analyzing how the six basic colors influence emotional responses. Future research should randomize the color presentation to determine if color order affected participants' emotional responses, present more than one hue of each color, and present video images as opposed to static images. Future research would also benefit from a true between-subjects experimental design. For example, participants could be randomly assigned to view warm or cool colors with the individual colors being a random factor using stimuli from multiple warm and cool color palettes.

Another limitation of the method is that participants were not in a controlled environment or monitored when taking the survey. Participants took the survey on their own time and in their own chosen environment, rather than a controlled space. AL-Ayash et al. (2016) found that different colored learning environments (e.g. red, yellow, and blue) elicited different kinds of emotional arousal and pleasantness among college-aged participants. For example, participants from that study reported that blue learning environments were calming, while red environments were very arousing and made it difficult to concentrate. Because of this finding, there is an increased chance of participants being influenced by different colors in their environment and getting distracted by their surroundings in this study. This could have impacted emotional responses to the colored photos. Future research related to the present study would include controlling the environment where participants take the survey. Participants should be brought into a controlled area with neutral-colored walls to control for environmental variables. This could help limit possible distractions and might impact emotional responses to the warm, cool, and gray-colored images.

A further limitation of this study is that color preferences and associations are not accounted for. Individuals could have preferences for particular colors and these preferences could impact emotional responses. For example, if an individual had a positive preference for the color green, they might select a box in the grid with a higher pleasantness score. Additionally, color associations (e.g. blue represents the ocean or yellow represents the sun) might have impacted emotional response results. Valdés-Alemán et al. (2020) noted that participants' emotional responses to color and music were linked to specific associations of objects that had that same color. In particular, the color yellow was associated with objects that tend to signify pleasant sensations (e.g. warmth and sun) in contrast to the color blue (e.g. cold and ice). An idea for future research would be to account for color preferences and associations by including another section of the survey. This section could directly ask participants about their color preferences or associations. Kawai et al. (2022) conducted experimental research on implicit color-valence associations using positive words shown in either red or green and negative words shown in either white or red. Future research could include an Implicit Association Test (IAT) similar to Kawai et al. (2022), but explore different associations between nature or particular object images and colors. It would be interesting to see if color preferences or color associations had an impact on participants' emotional arousal and pleasantness scores. However, it is important to note that color associations may vary individually and culturally (Jonauskaite et al., 2019; Kawai et al., 2022).

Cultural differences in regard to color associations were not taken into account for this study. Participants were all from the same geographical area in the United States. Different cultures may have different color associations that can impact emotional responses to stimuli. Jonauskaite et al. (2019) assessed yellow-joy associations from 55 countries and found that participants who lived further away from the equator and those in rainier countries were more likely to associate yellow with joy. In a different study, Kawai et al. (2022) found that Western cultures (e.g., Austria and Germany) had stronger green-positive and red-negative associations than Eastern cultures (e.g., Mainland China and Macau). These findings help illustrate that different cultures may have different color associations. Future research would benefit from exploring the effect of individual differences of color associations as well as cultural color associations on emotional arousal and pleasantness responses to color.

This study also did not account for potential color blindness, which could significantly impact emotional response scores to the colored photos. Those who are color blind may have lower emotional arousal responses to colored stimuli than those who are not color blind. Previous research on colors and emotions has included the Ishihara Color Blindness Test (AL-Ayash et al., 2016; Duan et al., 2018; Kawai et al., 2022; Wilms & Oberfeld, 2018). Therefore, further research related to the present study should include the Ishihara Color Blindness Test (Clark, 1924) at the beginning of the survey before allowing participants to assess their emotional responses to the warm, cool, and gray-colored images.

Conclusion

This study explored if warm and cool colors evoke different emotions, particularly low and high arousal emotions. The results were statistically significant and indicated that warm colors elicited higher emotions of arousal than cool and gray colors. However, cool colors evoked more pleasant emotions than warm and gray colors. This study provided important implications for the role of warm and cool colors in eliciting emotions. Future research is needed to indicate specific emotions for each color, which may provide more insight into color psychology, communication, and design.

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EFFECT OF CAPTIONS AND POLITICAL IDEOLOGY ON INITIAL EMOTIONAL RESPONSE TO IMAGES

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Abstract – In the current media climate, news items are presented in a way to grab attention and clicks by connecting with the public's attitudes. There are multiple ways in which this is achieved. This study focuses on how the media changes the verbal message associated with images to be relevant to their audience and agenda. The manipulation of the verbal framing feeds the political ideology of the media outlet's target audience. These ideological differences could elicit different emotional responses. The current study explored how image captions and political ideology predict the emotional response to news images. We distributed an online script to a convenience sample of undergraduate university students, then obtained a Psi Chi grant to fund the acquisition of a more representative sample from across the United States. We found that different captions associated with a single image induced different emotional responses, depending on the image. The generalizability between the convenience and community samples was modest, but future studies that redress the limitations of our experiment will contribute to the discussion of whether convenience samples generalize to the overall population.

Keywords: captions, emotional response, political ideology, political attitudes, image processing

In past decades, American news broadcasts were dominated by the three major television networks, but the rapid proliferation of news outlets in more recent years has fragmented the market to the point that each outlet needs to cater to a narrower slice of the audience. In today's news climate, several trends are apparent: the use of images, different stories about the same events, and stories catering to certain audiences. We wanted to see if we could manipulate how people respond to politically charged images by varying the captions associated with the images. By doing so we hoped to study a phenomenon that is commonly observed in the media's presentation of news: two different media outlets can present the same video footage, but the verbal description of the video varies such that it conforms to each outlet's political stance.

The Role of Cognition

Through everyday experiences, people create and revise structures in long-term memory called schemas that contain their overall knowledge on particular topics. These schemas help people to recognize common objects, behave appropriately in various situations, and predict what is likely to happen in those situations filled with those objects (Axelsson, 2007). Allen and Allison (2016) describe two processes, conscious and unconscious, that help explain how schemas are created and how the responses to the schemas occur. The first process is effortful, limited in capacity, and consciously mediated, and the second is unconscious and automatic. These two processes correspond to Kahneman's well-known distinction between system one and system two, respectively (Kahneman, 2011). System one determines when new information should be transferred to the conscious mind to make sense of it. When a stimulus is changed, it can change the schema that is retrieved from memory. In a study on jury trial reactions, when the testimony was changed to elicit a more emotional response, there was a great change in the reaction (Salerno, 2017). In another study (Bertrams et al., 2020), presenting feedback in a red font resulted in a temporary decline in cognitive performance relative to feedback presented in a neutral color.

These and other studies suggest that emotion affects the cognitive and behavioral reactions to stimuli. Yang et al. (2012) argued that emotional processing operates faster than cognitive functioning, and Kim and

Oh (2020) suggest that emotional responses trigger changes in judgment and behavior. Because emotion is processed faster it lays the foundation of our thoughts, and could influence the way someone interprets a situation.

Political Ideology

Political ideology is a great influence on people's thoughts and behaviors in today's society (Habib et al., 2020). Emotion and political ideology work side by side to affect cognition and behavior (Aubin, 1996). This is the stance that the current study will be evaluating. McHugo et al. (1985) mentions how political identification and beliefs play a role in emotional reactions to news and political leaders. Participants' political attitudes prior to seeing an image of a political leader expressing an emotion affected their reaction to the image of the political leader. When participants identified with a similar attitude as the political leader they showed more attitudes of warmth and joy regardless of the emotional display of the political leader. This is consistent with Habib et al.'s (2020) argument that people are motivated by evidence that supports their view over opposing views. Applying this principle to political ideology, when confronted by an issue that supports one's own political perspective, the individual feels happier and more supported than when confronted by an issue that does not support that political perspective, and which could cause negative emotions like anger.

Liberals and conservatives differ in their views, and tend to use different language to describe their perspectives and experiences. Conservatives tend to be conscientious and desire order, whereas liberals tend to be more open to new experiences (Laverghetta et al., 2007). Liberals prefer words like "triumph, innovation and privilege" while conservatives prefer words like "authority, security and law" to describe different social issues (Sterling et al., 2020). These differences in values that are shown through language could play a role in why news networks use certain diction and tactics to draw in the attention of the viewer. Partisans from both sides of the political spectrum see neutral news as biased (Emily & Vraga, 2015). This suggests the reason that media outlets have an incentive to slant their coverage to match the values of their target viewers (Emily & Vraga, 2015). We hoped to study a phenomenon that is commonly observed in the media's presentation of news: two different media outlets can present the same video footage, but the verbal description of the footage varies between the outlets to conform to each outlet's political orientation.

In our experiment we selected three politically charged images: one depicting people wearing masks in the time of COVID, a second depicting anti-abortion protestors, and a third depicting a confrontation between Black Lives Matter protesters and police. The images appeared either by themselves or accompanied by a caption, and when a caption was present, it was slanted toward a liberal or conservative viewpoint. Thus, the independent variable was the type of caption, with three levels: no caption, liberal caption, and conservative caption. After viewing each image, participants reported their emotional state; this was the dependent variable. Finally, after participants viewed the three images, they completed a political attitudes inventory.

We had two hypotheses. First, we expected liberal and conservative captions to elicit different emotional responses, and the emotional responses for images without captions to lie between the extremes staked out by the liberal and conservative captions. Second, we expected the congruity between political ideology and the caption to drive an emotional response, such that participants with a relatively liberal ideology should have a more positively valenced emotional reaction to liberal captions than to conservative captions, and participants with a relatively conservative ideology should have a more positively valenced emotional reaction to conservative captions than to liberal captions.

Method

Participants

We submitted an application for review to our university's Institutional Review Board entitled Effects of Descriptive Captions on Initial Emotional Response to Images: Political Ideology Predictors. After the IRB informed us that our application was accepted, we began to collect data, and treated all participants in accordance with the ethical guidelines established by the American Psychological Association (2017).

We distributed an online questionnaire to two samples of participants. The first sample was drawn from the undergraduate student population at a mid-sized university in the southwestern United States, who received course credit in exchange for their participation. Although it is convenient to sample from undergraduate students who have an experimental participation requirement in various psychology courses, the results may not generalize to the overall population (Hanel & Vione, 2016; Peterson & Marunka, 2014). For that reason, after we gathered data from undergraduate students, we wanted a more representative sample. To that end, the first author applied for an undergraduate research grant from Psi Chi, the international honor society in psychology. With monetary support from the Psi Chi Undergraduate Research Grant, we paid Qualtrics to recruit a diverse sample of participants from across the

United States. We did not specify any constraints on the demographics of the sample, except that all participants should be at least 18 years old.

The first sample consisted of 205 undergraduate students enrolled in psychology courses between the ages of 17 and 51 (M = 20.28, SD = 4.13); 157 identified as female, 42 as male, two as nonbinary, two as transgender, and two preferred not to report their gender. In response to the question about race, 142 participants described themselves as White, 28 as Black, 16 as mixed race, eight as Hispanic, seven as Asian, and four preferred not to report their race. The second sample consisted of 350 participants from across the country between the ages of 18 and 100 (M = 38.44, SD = 12.94); 191 identified as female, 155 as male, one as transgender female, one as genderfluid transmasc and two preferred not to respond. In terms of race, 225 described themselves as White, 48 as Black, 25 as mixed race, 24 as Asian, 22 as Hispanic, three as American Indian or Alaska Native, two as Native Hawaiian, and one preferred not to respond.

Materials

Script

Participants used their own electronic devices to access a script we wrote and posted on Qualtrics.com. The undergraduate students connected to their accounts on Sona (ourUniversity.sona-systems.com), which redirected them to the Qualtrics script. When participants completed the script, Qualtrics directed Sona to grant them credit for their participation. To coordinate Sona accounts with the Qualtrics script, we used instructions available at the Sona website. For the nationwide sample, we paid Qualtrics with the funds from the Psi Chi grant, which Qualtrics used to recruit and pay participants.

Images and Captions

We found three politically charged images on the internet: one depicts people in public wearing masks, the second depicts antiabortion protestors, and the third depicts Black Lives Matter (BLM) protestors confronting police. Participants viewed the three images in that order, with images of abstract art between every two political images, to provide a break from any intense emotional arousal the politically charged images may have induced. Each political image was presented either alone or with a caption. Based on a study of linguistics of political ideologies (Sterling et al., 2020), we wrote the captions to express either a liberal (e.g., U.S. citizens choose to wear masks for public safety) or conservative (e.g., U.S. citizens are ordered to wear face masks for COVID protection) perspective. We identified language used amongst conservative and liberal Twitter users found within this study and paired them with extreme views of conservative and liberal politics. The images and associated captions in each of three between-subjects conditions are depicted in Appendix A.

Scales

Positive and Negative Affect Scale. To measure emotional reaction to the images, participants completed a revised version of the Positive and Negative Affect Scale (PANAS; Watson, 1988). From the 20 emotions in the PANAS, we selected five pairs of words that express opposing emotional valence: Disgusted-Interested, Ashamed-Proud, Upset-Inspired, Jittery-Strong, and Irritable-Enthusiastic. Below each image (and caption if there was one) was a series of five sliders that could each be moved horizontally to any of five positions from -2 to +2. The -2 position for each slider was labeled with that slider's negative valence emotion, the 0 position was labeled with "Neutral", and the +2 position was labeled with that slider's positive valence emotion. All five sliders were initially positioned at "Neutral."

Ideological Consistencies Scale. To measure political ideology, participants completed the Ideological Consistency Scale (ICS; Pew Research, 2015). Questions in the ICS are organized in pairs, with the first in each pair being consistent with a conservative viewpoint (e.g., Government is almost always wasteful) and the second consistent with a liberal viewpoint (e.g., Government often does a better job than people give it credit for). Participants reported their reaction to each statement by clicking on one of five radio buttons with the following labels: Strongly disagree, Disagree, Neutral, Agree, and Strongly agree. All statements for this scale appear in Appendix B.

Procedure

The Qualtrics script began by presenting an informed consent letter. In the bottom right corner of each Qualtrics page is a button emblazoned with an arrow pointing to the right that participants click when they want to proceed to the next page. After participants advanced from the informed consent letter, they were presented with a page containing demographics questions. Following the demographics questionnaire was a series of five pages presented one at a time. Each page contained one image and a PANAS questionnaire. The first, third, and fifth pages contained the mask, abortion protest, and BLM images, respectively, and the second and fourth pages contained images of abstract art. Participants were randomly assigned to one of three conditions that dictated whether each image was accompanied by a caption, and what the caption was, as depicted in Appendix A. Participants could advance to the

next page only after completing the condensed version of the PANAS by positioning the five slider controls to represent their current affective state. After proceeding through the five pages that each contained an image and PANAS with slider controls, all participants completed the Ideological Consistency Scale. Finally, a debriefing message described the purpose of the study and our hypotheses, and provided contact information if participants had any questions.

Results

We planned to analyze the data as follows. Mean PANAS responses were submitted to a 3 x 3 ANOVA with Image as a within-participants factor and Caption as a between-participants factor. To see if the results supported the first hypothesis that the caption should influence PANAS responses, planned contrasts examined the difference between the liberal and conservative captions.

The second hypothesis predicted that participants with a relatively liberal ideology should have a more positively valenced emotional reaction to liberal captions than to conservative captions, and participants with a relatively conservative ideology should have a more negatively valenced emotional reaction to liberal captions than to conservative captions. The first step in testing the second hypothesis was to calculate an ICS score for each participant. The five responses from "strongly disagree" to "strongly agree" were assigned the numbers from one to five, respectively, for the conservative statements (e.g., Government is almost always wasteful and inefficient), and reverse coded from five to one, respectively, for the liberal statements (e.g., Government often does a better job than people give it credit for). The sum of all responses to the twenty statements yielded an overall score for each participant. As a result, participants with relatively liberal attitudes should have numerically smaller ICS scores than participants with relatively conservative attitudes. We submitted the ICS scores to an independent samples t-test with sample (undergraduate versus nationwide) as the grouping variable to determine if the undergraduate student sample was more liberal or conservative than the nationwide sample.

For participants who viewed a conservative caption for one of the images, our second hypothesis predicts that liberal participants (i.e., those with numerically low ICS scores) should have a lower PANAS score than conservative participants (i.e., numerically high ICS scores). In other words, the correlation between ICS and PANAS should be positive. On the other hand, for participants who viewed a liberal caption, liberal participants (low ICS) should have a higher PANAS than conservative participants (high ICS), which should yield a negative correlation between ICS and PANAS. Thus, our second hypothesis predicts that the correlation coefficient for ICS and PANAS should be higher for conservative captions than for liberal captions.

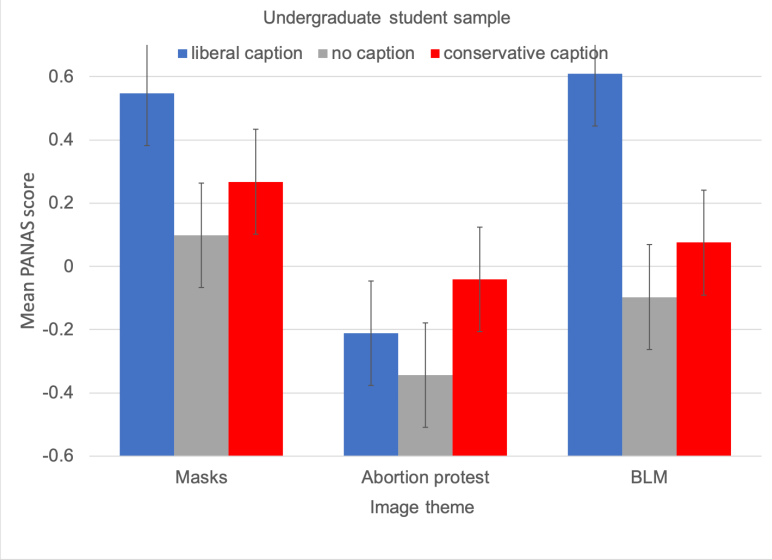
To determine if our results supported the second hypothesis, for each of the three images we calculated correlation coefficients for participants who viewed the conservative caption for that image and participants who viewed the liberal caption for that image. Then we submitted the two correlation coefficients to a Fisher's r to z transformation. A significant z in the right tail would support our second hypothesis.

Undergraduate Student Sample

PANAS. The internal consistency of the PANAS was acceptable ($\propto$ = .69). Mean PANAS scores (depicted in Figure 1) were submitted to a 3 x 3 ANOVA with Image as a within-participants factor and Caption as a between-participants factor. The main effect of Image, $F(2, 404) = 10.25$, $p < .001$, $\eta_p^2 = .048$, and the interaction between Image and Caption, $F(4, 404) = 4.36$, $p = .002$, $\eta_p^2 = .041$, were significant, but the main effect of Caption, $F(2, 202) = 2.1$, $p = .12$, $\eta_p^2 = .021$, was not. As can be seen in Figure 1, the effect of Image appears to be driven by higher

Figure 1

Mean PANAS responses as a function of Image and Caption for undergraduate student sample



Note. Error bars represent 95% confidence intervals, calculated as described in Loftus & Masson (1994).

PANAS values for the mask and BLM images than for the abortion protest image.

We had not expected any difference in PANAS scores between different images, so we had not planned to calculate contrasts. Nevertheless, we wanted to determine what was driving the main effect of Image so we calculated pairwise contrasts for each pair of levels of image using Bonferroni adjusted alpha levels of .017 per test (.05/3). Contrasts confirmed that the reported PANAS values for the mask image, $F(1, 204) = 19.14$, $p < .001$, $\eta_p^2 = .086$, and the BLM image, $F(1, 204) = 7.28$, $p = .008$, $\eta_p^2 = .034$, were significantly higher than for the abortion protest image, but the values for the mask and BLM images, $F(1, 204) = 1.48$, $p = .22$, $\eta_p^2 = .007$, were not significantly different.

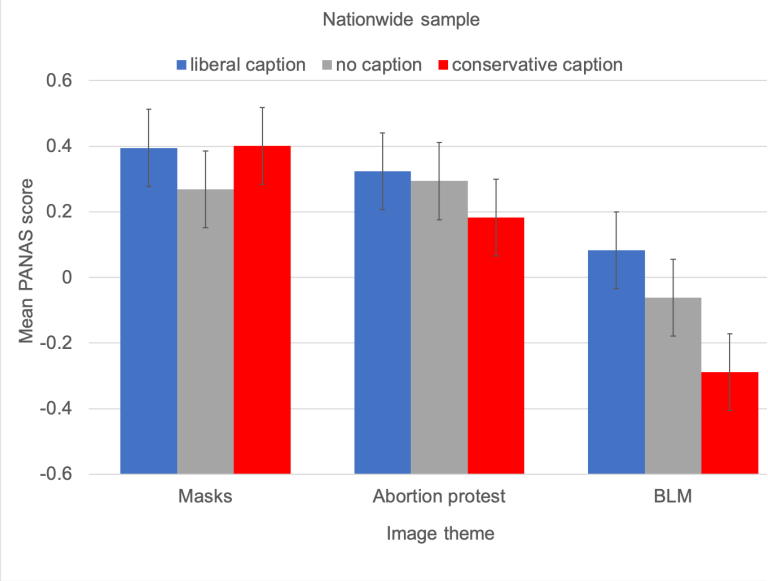
To test our first hypothesis that different captions associated with a particular image would cause different emotional responses to that image, we had planned to calculate simple effects contrasts (i.e., at a single level of the factor image) to determine the differences in PANAS scores between the liberal and conservative captions for each image using Bonferroni adjusted alpha levels of .017 per test (.05/3). The planned contrasts confirmed that the PANAS responses to the liberal caption were significantly higher than to the conservative caption only for the BLM image, $F(1, 135) = 6.49$, $p = .012$, $\eta_p^2 = .046$, but were not significantly different for the mask image, $F(1, 134) = 4.03$, $p = .047$, $\eta_p^2 = .029$, or the abortion protest image, $F(1, 135) = .62$, $p = .43$, $\eta_p^2 = .005$.

ICS. The internal consistency of the ICS was reliable ($\propto = .83$). We submitted the ICS scores from both samples to an independent samples t-test, which showed that the student sample ($M = 71.45$) were significantly more conservative than the nationwide sample ($M = 63.53$), $t(553) = 7.92$, $p < .001$, $d = .70$. This outcome was surprising, given the widespread claim expressed in the popular culture that university populations are more liberal than the overall population. One possible explanation for this surprising outcome is that our university is located in the southwestern United States, so the population from which our university's students are drawn is more conservative than the overall American population.

To test the second hypothesis that congruence between political ideology and caption would drive emotional responses, we calculated two Pearson's correlation coefficients for each image; one for the participants who were presented with the liberal caption, and one for the participants who were presented with the conservative caption. The correlation coefficients for all three images were consistent with the prediction made by our second hypothesis that the correlation coefficient for the conservative caption should be higher than for the liberal caption. For the mask image, the correlation coefficient for the conservative caption, $r(66) = .41$, $p = .001$ was greater than for the liberal caption, $r(66) = .29$, $p = .019$; for the abortion protest image, the correlation coefficient for the conservative caption, $r(66) = -.50$, $p < .001$ was greater than for the liberal caption, $r(67) = -.68$, $p < .001$; and for the BLM image, the correlation coefficient for the conservative caption, $r(67) = .39$, $p = .001$ was greater than for the liberal caption, $r(66) = .38$, $p = .001$. To see if the differences were statistically significant, we submitted the two correlation coefficients for each image to a Fisher's r to z transformation. Although the direction of the difference in correlation coefficients was consistent with our second hypothesis, none were significant, and the only one that approached significance was for the abortion protest image, $z = 1.58$, $p = .06$. For the mask image, $z = 0.77$, $p = .22$, and for the BLM image, $z = -0.07$, $p = .47$.

Figure 2

Mean PANAS responses as a function of Image and Caption for nationwide sample



Nationwide Sample

PANAS. The internal consistency of the PANAS ($\propto = .86$) was reliable. Mean PANAS responses (depicted in Figure 2) were submitted to a 3 x 3 ANOVA with Image as a within-participants factor and Caption as a between-participants factor. The main effect of Image, $F(2, 694) =$

15.68, $p < .001$, $\eta_p^2 = .043$, was significant, but the main effect of Caption, $F(2, 347) = 1.20$, $p = .30$, $\eta_p^2 = .007$, and the interaction, $F(4, 694) = 1.26$, $p = .29$, $\eta_p^2 = .007$, were not. As can be seen in Figure 2, the effect of Image appears to be driven by higher values for the mask and abortion protest images than for the BLM image.

As with the undergraduate student sample, the main effect of Image was unexpected, but we wanted to see what was driving this effect. Using Bonferroni adjusted alpha levels of .017 per test (.05/3), contrasts confirmed that the reported PANAS values for the mask image, $F(1, 349) = 45.61$, $p < .001$, $\eta_p^2 = .116$, and the abortion protest image, $F(1, 349) = 13.69$, $p < .001$, $\eta_p^2 = .038$, were significantly higher than for the BLM image, but the values for the mask and abortion protest images, $F(1, 349) = 1.05$, $p = .31$, $\eta_p^2 = .003$, were not significantly different.

To test our first hypothesis that different captions associated with a particular image would cause different emotional responses to that image, the same contrasts were planned for the differences between liberal and conservative captions as for the student sample. Using Bonferroni adjusted alpha levels of .017 per test (.05/3), only the difference for the BLM image approached significance: $F(1, 230) = 4.93$, $p = .027$, $\eta_p^2 = .021$. The PANAS responses were not significantly different for the mask image, $F(1, 240) = .002$, $p = .96$, $\eta_p^2 < .001$, or the abortion protest image, $F(1, 224) = .66$, $p = .42$, $\eta_p^2 = .003$.

ICS. The internal consistency of ICS ($\propto = .85$) was reliable. In contrast to the results from the undergraduate student sample, the correlation coefficients for the conservative captions were not higher than for the liberal captions for any of the images. For the mask image, the correlation coefficient for the conservative caption, $r(122) = .40$, $p < .001$ was less than for the liberal caption, $r(116) = .42$, $p < .001$; for the abortion protest image, the correlation coefficient for the conservative caption, $r(116) = -.47$, $p < .001$ was the same as for the liberal caption, $r(106) = -.47$, $p < .001$; and for the BLM image, the correlation coefficient for the conservative caption, $r(106) = .34$, $p < .001$ was the same as for the liberal caption, $r(122) = .34$, $p < .001$. As could be expected from such small differences between correlation coefficients, none of the Fisher's r to z transformations were significant: all ps > .05.

Discussion

Undergraduate Student Sample

Each level of the study supplies context into the relationships that may be occurring between political ideology, image and caption manipulation and emotional response, and they each have their implications and limitations that can be improved in further research. Within the undergraduate student sample we found that there were differences in PANAS scores between the image types. This finding was unexpected insofar as we believed caption type would be the factor driving an emotional response, not image type. Although the three images we selected were all politically charged, the abortion issue has more religious overtones than mask wearing and BLM, and students at a university in the southwestern U.S. can be expected to have stronger religious (and specifically Christian) affiliations than elsewhere in the country. Another possible explanation for this unexpected effect is that due to their relatively young age, university students are simultaneously more concerned with, and less experienced with, issues of reproductive health than the overall population. Thus, abortion may elicit more feelings of fear and confusion for members of our university sample than mask wearing and BLM.

Further, the political significance of abortion has radically shifted recently. At the time of data collection in late 2021 and early 2022, abortion was not as high of a political priority as it became in the summer of 2022. New developments such as the U.S. Supreme Court's suspension of the landmark Roe v. Wade decision and the subsequent defeat of a Kansas state referendum to remove abortion protection from the state constitution have propelled reproductive rights to the forefront of the nation's consciousness. Specifically, the defeat of the referendum in such a politically and religiously conservative state as Kansas suggests that the Roe v. Wade decision has inspired outspoken demands to allow women to have the right to protect their own bodily autonomy (Edelman, 2022). The fluidity of the political significance of abortion highlights one of the pitfalls associated with the kinds of questions we tried to answer in our research: political attitudes can shift suddenly and unexpectedly.

Although results from the abortion image did not support the first hypothesis claim that captions would affect emotional responses, results from the BLM image did, and the mask image came close. For the BLM image and mask image, the main effect of caption confirmed that conservative captions tended to have less positive emotional reactions than liberal captions across participants. Although we had phrased the captions with an eye to political ideology, the conservative captions emphasized conflict (mask image: "U.S. citizens ordered…", BLM: "…threatening police authority"), while the liberal captions emphasized freedom (mask: "U.S. citizens choose…", BLM: "…triumph over police power").

Although this confound between political ideology and conflict versus freedom was unintentional, it could indicate an inherent bias existing between the two ideological poles. Investigating whether the phrasing of issues for one political ideology elicits more negative emotional valence is the subject for further research. The language used in conservative captions could be inherently negative versus liberal captions, but an underlying shared belief could also be present: freedom. The liberal captions showcase either the act of freedom or the process of obtaining it while conservative captions show the opposite.

The results from images without captions did not support the first hypothesis. Instead of falling somewhere in between liberal and conservative captions, emotional responses were lower than for the captioned images. Participants are constantly exposed to information about these political subjects, so it is understandable that they would come into the study with preconceived thoughts on the political subjects. Including noncaptioned images in the study may have been a limitation which could be eliminated by omitting them from future studies.

National Sample

With a sample of a much greater spread of diversity we can see a stark difference in the results of the study. As with the university students, one of the images elicited emotional responses with more negative valence than the other two images, but for the national sample it was the BLM image rather than the abortion protest image. As with the student sample, this image may have more immediacy for the community sample than the other two images. In contrast to the student sample for whom reproductive issues elicit more negative emotions, the community sample may be more sensitive to issues of public safety. The noncaptioned images supported the first hypothesis more for the national sample than the student sample. For the BLM and abortion images, emotional responses to the noncaptioned images was between the response to the liberal and conservative captions, but not for the mask image. As with the student sample, the BLM image elicited higher positive emotional response to liberal captions than conservative captions. A possible explanation for the null effect of the mask image for the national sample, in relation to undergraduate student sample, is that the national sample was collected after the undergraduate student sample, so wearing masks had become less of a political matter and more of a public health matter. Therefore, the participants from the national sample may have had less polarized views on the topic than the undergraduate students.

The BLM image is the only image that elicited general agreement across the two samples, with more positive emotional reactions for liberal captions and less positive emotional reactions for conservative captions. We believe this may be due to the different ways people confront these subjects. Abortion is a subject that is political, but also has religious significance. Wearing masks is an issue of public health and safety that became a political subject in a time of intense public health threat. The BLM movement is the only overtly political movement of the three as it focuses on political and social rights of a group of people. It would be interesting to take this study and narrow down subjects to raw political significance to see if the same relationship occurs as the BLM images.

While there was some agreement between the two samples in their support of the first hypothesis, both samples failed to support the second hypothesis. For the undergraduate students sample, although results from all three images were consistent with the second hypothesis claim that relatively liberal participants would have a more positive response to liberal captions, and more negative response to conservative captions, than relatively conservative participants, none of these results reached significance. For the national sample, results from none of the three images supported this hypothesis, and again, none of the results reached significance.

Generalizability of Student Samples

As our results indicate, there was modest agreement between the student and national samples. This led us to consider how our study extends on previous work examining the generalizability of convenience samples of university students to community samples. Hanel and Vione (2016) gathered personality and attitudinal responses from 59 countries, and found discrepancies between the student and community sample. They concluded that generalizing from a student sample may be problematic for a study such as theirs that examined personality and attitude variables. On the other hand, Smith et.al. (2022) looked at the classic asymmetry between the Stroop (1935) and reverse Stroop effects, which reflect differences in basic perceptual and cognitive processing. The Stroop and reverse Stroop effects were consistent between the student sample and national sample.

Because Smith et al. (2022) focused on basic perceptual and cognitive processing, their questions had objectively right and wrong answers. When a participant in Smith et al. was asked to report the pixel color of the word “Red” written in blue pixels, the correct answer was “Blue,” not “Red.” As a result, when participants provided an incorrect response, the script could provide feedback indicating an incorrect response, and the experimenters could exclude the incorrect responses from their

analyses. As in Hanel and Vione (2016), our study focused on variables that reflect subjective quantities (e.g., personality, attitudes, emotions), and as a result we could not determine if participants were providing the correct answers.

Thus it seems that our results contribute to the question about whether the results from convenience samples of students generalize to the overall population. Perhaps for experiments that examine basic perceptual and cognitive processing, and ask questions for which only one answer is objectively correct (as in Smith et al., 2022), the results from convenience and community samples might be expected to enjoy favorable agreement. On the other hand, for experiments that examine higher level cognitive processing, and ask participants to report their personal subjective experiences (as in our experiment, and in Hanel & Vione, 2016), the agreement between the convenience and community samples might be expected to be modest. We argue that a key tool in addressing the question of whether the results from convenience samples of students generalize to the overall population would be experiments such as ours that present identical materials to both kinds of samples.

Limitations and Future Directions

Although our study contributes to the ongoing discussion of the generalizability of convenience samples, it also has limitations that we should acknowledge. First, all participants were exposed to the three images in the same order: the mask image, then the abortion protesters, then the confrontation between BLM and police. We manipulated the captions between participants with the expectation that any differences in emotional responses to the images would be attributable to the captions. But the fixed presentation order between participants might have introduced carryover effects from previous images that are confounded with the caption effects. Second, the captions we wrote may have failed to elicit the emotional reactions we had intended. And even worse, while a caption such as "Protestors conform towards taking rights from women" seemed clear to us when we wrote it, in retrospect its interpretation is not as clear as we intended. Perhaps the main defect with our captions is their brevity, which could have obscured their meaning. Of course, when we developed our materials, we deliberately wrote brief captions in the hope that participants would be more likely to read them than if the accompanying text were longer.

While the primary contribution of our study is what it adds to the discussion about the generalizability of the results from convenience samples, the limitations we identify here reduce its importance. Nevertheless, a future study could build on ours by exploiting its strengths while redressing its defects. As we argued above, the key to determining what kinds of experimental results generalize from convenience samples would be to deliver identical experimental materials to both kinds of samples. A study that looks at the effects of captions on emotional reactions should present the images in random order to eliminate the confounding order effects. The accompanying text should be longer than the brief but ambiguous captions we created. Then, to ensure that participants actually read the longer text that accompanies the images, the experimental script could ask participants to respond to questions that have objectively correct answers. Ultimately, if researchers compare the results from convenience and community samples across a diverse swath of experimental methods, it may reveal what kinds of experimental methods generalize from convenience samples, thereby validating the widespread use of college sophomores as participants in psychological science.

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Appendix A
Stimulus Conditions for Survey

This appendix shows the images and caption stimuli for the three conditions in the survey.

Condition One	Condition Two	Condition Three
U.S. citizens choose to wear face masks for public safety. 		U.S. citizens ordered to wear face masks for COVID protection. 
		
Protesters work towards accomplishing rights for unborn children. 	Protesters conform towards taking rights from women. 	
		
	BLM protesters threaten police authority. 	BLM protesters triumph over police power. 

Appendix B
Ideological Consistencies Scale statements

Conservative	Liberal
Government is almost always wasteful and inefficient.	Government often does a better job than people give it credit for.
Government regulations of business usually does more harm than good.	Government regulation of business is necessary to protect public interest.
Poor people today have it easy because they can get government benefits without doing anything in return.	Poor people have hard lives because government benefits don't go far enough to help them live decently.
Blacks who can't get ahead in this country are mostly responsible for their own condition.	Racial discrimination is the main reason why many black people can't get ahead these days.
Immigrants today are a burden on our country because they take our jobs, housing and healthcare.	Immigrants today strengthen our country because of their hard work and talents.
The best way to ensure peace is through military strength.	Good diplomacy is the best way to ensure peace.
Most corporations make a fair and reasonable amount of profit.	Business corporations make too much profit.
Stricter environmental laws and regulations cost too many jobs and hurt the economy.	Stricter environmental laws and regulations are worth the cost.
Homosexuality should be discouraged by society.	Homosexuality should be accepted by society.
The government today can't afford to do much more to help the needy.	The government should do more to help needy Americans even if it means going deeper into debt.

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TRAUMA AND MORTALITY SALIENCE INCREASE COVID FEAR AND DEFENSIVE STRATEGIES

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Abstract – We conducted an experiment to test the effect of mortality salience on in-group bias and COVID fear in a non-clinical population of college students with differing prior exposure to trauma. Our results revealed trauma exposure combined with reminders of mortality increased political in-group favoritism. These findings are consistent with defensive reactions proposed by Terror Management Theory and commonly observed in the general population. However, these same participants reported the highest levels of COVID-19 fear and anxiety, suggesting a deficit in their defensive strategy. Such emotional responses are consistent with reactions observed in persons suffering from PTSD and may reflect trauma-induced deficits in their anxiety buffering system. Our findings suggest that reminders about the fragility of life may be especially painful for those with a history of trauma; however, the nature of reactions to such reminders seems to depend on the intensity and impact of the trauma experienced. We identified a group of adults whose reaction to reminders of death is distinctive. While they exhibit some emotional reactions common among trauma survivors with severe PTSD symptoms, they simultaneously enact behavior not typical of PTSD populations, but rather characteristic of the general population. An awareness of this previously unstudied group will not only inform future research but may provide helpful insight that can be applied to anticipate and mitigate circumstances that set the stage for anxiety, defensiveness, and intergroup conflict.

Keywords: trauma, terror management theory, COVID fear

The recent COVID-19 pandemic created unprecedented health threats and social disruption that dramatically impacted the day-to-day life of people across the globe (Pakpour & Griffiths, 2020). The large-scale social isolation that resulted from masking and quarantine protocols has been linked to negative mental health outcomes for the general population (Kauhanen et al., 2023; Pennix et al., 2022; Satici et al., 2020). There also is reason to believe that the unremitting reminders of death which accompany epidemics such as the COVID-19 pandemic (Firestone, 2020; Menzies & Menzies, 2020) have noteworthy effects on the mental state, behavior, and social functioning of individuals. Terror Management Theory (TMT; e.g., Greenberg et al., 1986; Solomon et al., 1991) provides a framework to explain how individuals react when reminded of their own mortality and how they protect themselves from the anxiety that accompanies concerns about death. According to this theory, people have an inherent need for their existence to have significance and purpose, but the realization of the inevitability of their own mortality causes fear and discomfort. When death is made salient (e.g., when mortality salience is activated), anxiety about one's own mortality is increased and the need to reduce this fear becomes pressing. Individuals are then prompted to engage in a variety of defensive processes. For example, some people consciously deny their physical vulnerability when confronted with threats concerning death. Pyszcynski et al. (1999) found support for this idea by demonstrating that reminders of personal mortality elicited increased thoughts about one's excellent personal health and family longevity.

These findings may help to explain some individuals' behavior in response to reminders of mortality activated by the COVID-19 pandemic (Özgüç et al., 2021; Rupprecht et al., 2022). The pervasive

resistance to masking and distancing protocols observed in some individuals during the pandemic may reflect their defensive belief in their own hardiness and refusal to acknowledge their own risk of contracting the virus.[1]

TMT also argues that when faced with threats about mortality, individuals may cope by engaging in unconscious defensive strategies that serve to bolster their self-esteem and cultural worldview. Specifically, by aligning themselves with cultural belief systems, individuals derive a sense of meaning and significance to their lives, providing self-esteem and protection from mortality-related anxiety. TMT suggests that without this protective anxiety-buffering system, individuals feel vulnerable and overwhelmed when confronted with reminders of death (e.g., Greenberg et al., 1986). Thus, people are motivated to preserve this system of defense and tend to respond favorably to others who reinforce their cultural worldview and unfavorably to those who violate it. A robust body of empirical studies have confirmed that reminders of mortality elicit in-group bias reflected in more favorable attitudes toward members of in-groups (e.g., Arndt et al., 2002; Castano et al., 2011) and decidedly unfavorable attitudes toward outgroup members (Arndt et al., 2002; Gailliot et al., 2007). These biases are consistent with the polarized attitudes that characterize the current U.S. political climate, evidenced by the emotionally charged political disputes often observed between Democrats and Republicans. This persistent political discord may have been exacerbated by fears invoked by the COVID-19 pandemic.[2]

Although TMT provides a framework to understand defensive processes evoked in the general population in response to mortality salience, individuals who have experienced a history of significant trauma seem to respond differently. Research findings suggest that people who report severe PTSD symptoms fail to enact the typical responses predicted by TMT when confronted with reminders of mortality, responding instead with increased anxiety (Abdollahi et al., 2011; Vail et al., 2019). Researchers exploring connections between PTSD and responses to reminders of mortality argue that Anxiety Buffer Disruption Theory (ABDT) provides a useful framework for understanding the atypical reactions commonly observed in individuals with severe PTSD. According to ABDT, traumatic event exposure disrupts the typical anxiety-buffering system invoked by individuals when confronted with reminders of death (Pyszcynski & Kesebir, 2011). This disruption occurs because trauma violates their assumptions about the safety and benevolence of the world, thereby decreasing perceptions of meaning in life and harming self-esteem. (e.g., Herman, 1997; Horowitz, 1976; Janoff-Bulman, 1992; Park & Folkman, 1997). If one's worldview is undermined to the point that it fails to provide sufficient protection, the individual may be left vulnerable and terrorized in the face of mortality salience.

Thus, previous research suggests that TMT may be a framework to understand the general population's reaction to serious public health threats, such as the COVID-19 pandemic. However, TMT does not seem to accurately predict the reactions of individuals with a history of severe trauma leading to a PTSD diagnosis. The question remains as to how individuals with exposure to stress or trauma that does not rise to the level of PTSD might respond to mortality threats in the context of the COVID-19 pandemic. This non-clinical group may experience greater sensitivity to fear-related stimuli, compared to persons without trauma exposure, as a result of their prior experiences and the negative aftermath. They may therefore report greater death-related anxiety and fear associated with COVID-19. This is consistent with ABDT and would provide evidence of trauma-induced deficits in their anxiety-buffering system. However, because these individuals have experienced some trauma, but not enough to rise to the level of PTSD, their anxiety-buffering system is unlikely to have been undermined to the point of collapse. Thus, they may exhibit intensified defensive responses proposed by TMT when reminded of death (even more so than the general population due to their heightened anxiety). Specifically, they may more vigorously cling to their worldview in an attempt to re-establish a sense of security when confronted with the inevitability of death. This, in turn, may lead to increased positive in-group bias for individuals with a prior history of trauma when confronted with threats about death.

We examined these possibilities by manipulating mortality salience in a non-clinical population of college

[1]Although we have a particular interest in examining defensive behavior in relation to COVID anxiety, there are alterative possible interpretations of this resistant behavior (e.g., some individuals may not have perceived the threat to be as strong as what was publicized in the media).

[2]Although in this context in-group bias may have problematic implications, it should be noted that in-group favoritism is adaptive in some contexts and may have originated in part, from evolutionary survival pressures.

students with differing prior exposure to trauma and stress. We examined political in-group bias as well as reported anxiety and fear about death in relation to the COVID-19 virus. We chose this operationalization of death-related anxiety due to the salient, life-threatening reality of COVID-19 at the time of data collection. We tested the following hypotheses:

1) Consistent with TMT theory, the highest levels of positive in-group bias would be reported by participants with a history of relatively high trauma exposure, when reminded of mortality.

2) Consistent with ABDT, the highest levels of fear about COVID-19 would be reported by participants with a history of relatively high trauma exposure, when reminded of mortality.

3) Consistent with TMT, no significant differences in positive in-group bias would occur as a function of prior trauma exposure when mortality salience was not heightened.

4) Consistent with TMT, no significant differences in fear about COVID-19 would occur as a function of prior trauma exposure when mortality salience was not heightened.

5) In line with the application of TMT to the general population, individuals both high and low in reported stress, would report heightened positive in-group bias in the mortality salience condition but not in the control condition.

6) In line with the application of TMT to the general population, individuals both high and low in reported stress, would report lowered fear about COVID-19 in the mortality salience condition but not in the control condition.

Method

Participants

Data was collected during the Fall of 2020, during a highly stressful time period of the COVID-19 pandemic. The University Institutional Review Board deemed the project to be exempt from oversight. Federal guidelines for the ethical treatment of human participants were followed. Participants were recruited through college classrooms and tested in group settings. No participants self-identified as having a diagnosis of PTSD. Participants were 19 men and 54 women with a mean age of 19.86 (SD = 2.28). Participants self-reported their racial identity as Caucasian (n = 34), African American (n = 26), Hispanic (n = 10), and other (n = 3). Eighty percent identified as heterosexual, while the remainder identified as non-heterosexual. Participants received extra credit for taking part in the study.

Materials

Participants read an informed consent document and after agreeing to take part, began by responding to the 21-item University Stress Scale (Stallman, 2008). This scale measures the number of stressful life events an individual had experienced in the past year, specifically focused on typical stressors experienced by young adults. Examples were failing an important class, experiencing a serious illness or injury, and losing someone close to them. Participants indicated their exposure to each stressor on a 4-point scale where 1 represented "not at all" and 4 represented "constantly." Responses were summed (with possible sums ranging from 21 to 84) and then averaged to create a composite stress score for each participant. Cronbach's α for this measure was .79, suggesting acceptable internal reliability.

Next, participants responded to the 18-item Trauma and Life Events Checklist (Carr et al., 2018). This scale measures the extent to which individuals experienced traumatic events at some time in their past. Events included exposure to war, bullying or harassment at school, and witnessing physical violence in the home. Participants indicated whether they had never experienced, only witnessed, or personally experienced each event. Participants earned two points for each event experienced and one point for each event witnessed. These points were summed (with possible sums ranging from zero to 40) and then averaged to achieve a trauma score for each participant, with higher scores indicating greater exposure to trauma. Cronbach's α for this measure was .88, suggesting acceptable internal reliability.

Afterward, participants were randomly assigned to either write about what would happen to them if they died (mortality salience condition) or experienced physical pain (control condition; based on Rosenblatt et al., 1989). Next, participants responded to the 20-item Positive and Negative Affect Scale (Watson et al., 1988) whereby they indicated the extent to which they were feeling a series of 10 positive and 10 negative emotions, such as enthusiastic, excited, irritable, and anxious. This scale is the most commonly used task in TMT experiments to create a delay between the manipulation and the dependent measures, strategically moving the thoughts of death to a subconscious level while still being highly accessible (Burke et al., 2010). Thus, this scale was used only as a distractor task and not included in data analysis.

Participants were provided brief narratives of two fictitious people created by the researchers. The first narrative described a person who agreed with their political viewpoint, and the second narrative described a

person who disagreed with their political viewpoint. The narrative read "Please imagine a person who agrees (disagrees) with your political stance and plans to vote the way you do (opposite of you) in the upcoming election." After each narrative, participants responded to 13 descriptors derived from Byrne (1971) and Greenberg et al. (1990). Participants used a 5-point scale, ranging from 1 "very slightly or not at all" to 5 "extremely" to indicate to what extent each descriptor matched the imagined person. Descriptors included 13 positive attributes such as intelligent, knowledgeable about current events, kind and trustworthy. Ratings of positive descriptors in relation to the individual who matched participants' political views were summed (with possible sums ranging from 13 to 65) and then averaged to create a composite score for each participant that we defined as "positive ingroup bias". Cronbach's α for this measure was .87, suggesting acceptable internal reliability.

Next, participants responded to two sub-scales (Death Acceptance and Thoughts about Death) from the Death Anxiety Scale-R (Thomás-Sábado et al., 2006). We modified the scale such that references to death were changed to refer to COVID-19 anxiety specifically. For example, the item "I think I am more afraid of death than most people" was modified to read "I am more afraid of dying from COVID-19 than most people." Participants responded to nine statements on a 5-point scale where 1 represented "totally disagree" and 5 represented "totally agree." Responses were summed (with possible sums ranging from 9 to 45) and then averaged to create a composite score for each participant that we defined as "COVID fear." Cronbach's α for this measure was .76, suggesting acceptable internal reliability. Participants also responded to four demographic items including sexual orientation, age, race, and gender.

Results

We conducted a median split on the composite trauma scores to create high trauma and low trauma groups. We followed the same procedure to create low stress and high stress groups. The mean score for COVID fear was 2.68 (SD = .76), representing "neutral" on our scale.

We ran a 2(trauma level) X 2(experimental condition) MANOVA to examine positive in-group bias, and COVID fear. Compared to the other three categories, participants with high trauma in the mortality salience condition reported the highest levels of positive in-group bias [$F(3, 70) = 4.06$, $p = .049$] and the highest levels of COVID fear [$F(3, 70) = 6.47$, $p = .013$].

A 2(stress level) X 2(experimental condition) MANOVA on the same dependent variables revealed no significant interactions ($p > .05$ in all cases).

Discussion

We found support for our hypothesis that adults who had experienced high trauma would exhibit the highest levels of in-group bias when reminded of their own mortality. Trauma exposure combined with reminders of mortality increased adults' political in-group favoritism. These findings are consistent with the defense mechanism proposed by TMT that reflects an effort to bolster one's worldview as a means of protection from terror associated with awareness of the inevitability of death. As we hypothesized, these same adults reported the highest levels of COVID fear, suggesting a deficit in their defensive strategy predicted by ABDT. In other words, reminders of mortality elicited some of the defense mechanisms proposed by TMT; however, these strategies failed to successfully decrease the individual's anxiety, as evidenced by their reported heightened fear of COVID. This non-clinical cohort represents a combination of the behaviors seen in the general population and among PTSD sufferers, likely reflecting their status of experiencing trauma levels greater than that of the general population but less than individuals with PTSD.

Participants in the low trauma condition reported similar levels of in-group favoritism and fear of COVID regardless of whether they were reminded of their mortality or not. Similarly, and contradicting our hypothesis, we did not see differences in favoritism or COVID fear across individuals in high and low stress categories whether they were reminded of their mortality or not. One take-home message is that adults who had experienced high levels of trauma functioned differently than others in our sample. This finding suggests that those with a non-clinical history of trauma may possess a unique sensitivity to threatening stimuli, rendering them vulnerable to terror about the possibility of death in a way that simple stress does not. At the same time, this non-clinical high trauma group responded to threatening stimuli in a way that individuals with PTSD do not, as prior research shows those with PTSD fail to invoke defensive reactions in response to mortality salience (e.g., (Abdollahi et al., 2011; Vail et al., 2019). Our findings provide evidence of the influential role that specific levels of trauma might play in TMT.

The question remains as to why morality reminders did not consistently elicit in-group favoritism and anxiety for our low and high stress participants as might be expected according to TMT theory and as we hypothesized. One possible explanation is that our mortality reminder occurred in the context of the COVID-19 pandemic. Social media and daily life experiences may have created a mild but chronic mortality saliency

condition, which was more influential than our short-lived exercise for all of our participants except those who had experienced high levels of prior trauma. Indeed, collective health crises, including the COVID-19 pandemic, increase social media usage and reliance (Freberg et al., 2013; Pérez-Escoda et al., 2020).

In sum, our data suggests that reminders about the fragility of life may be especially painful for those with a history of trauma; however, the extent to which adults react to such reminders seems to depend on the intensity and impact of the trauma experienced. Our study suggests that there may be a group of adults whose reaction to reminders of death is not entirely accounted for by either TMT or ABDT. Rather, they fall in the gap between TMT theory which explains the reactionary behavior of the general population when faced with mortality threats and ABDT theory which explains the reactionary behavior of individuals with PTSD when faced with mortality threats. An awareness of this previously unstudied group will not only inform future research but may provide helpful insight that can be applied to anticipate and mitigate circumstances that set the stage for anxiety, defensiveness, and intergroup conflict. This insight might be especially applicable to young adults, given that research (e.g., Cusack et al., 2019) suggests that exposure to traumatic events, without an accompanying diagnosis of PTSD, is common amongst college students.

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CANNABIS AND SCHIZOPHRENIA THROUGH A GENETIC LENS: A SYSTEMATIC REVIEW

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Abstract – Cannabis use is associated with subsequent development of schizophrenia. In this systematic review we focus on the role of genetic variation in the relationship between cannabis usage and schizophrenia onset and severity. We searched the PubMed database with the search terms schizophrenia AND cannabis AND genetics and identified 40 studies that investigated associations between genetics, cannabis use, and schizophrenia in humans. In reviewing these studies, we present evidence that genetics can increase the likelihood of cannabis usage, moderate whether cannabis usage results in schizophrenia development, increase the severity of schizophrenia that develops, and may result in unique symptom profiles. We specifically note a significant gene by environmental interaction that results in dramatically increased risk of schizophrenia development, as well as several genes of interest such as the *COMT*, *CNR1*, or *NRXN1*. The discussion of the evidence presented in this review draws attention to candidate genes for continued focus and some gaps in methodology in this research area, as cannabis research continues to draw increased attention due to increased legalization for recreational marijuana.

The Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) states that schizophrenia (SCZ) is a chronic psychiatric condition characterized by positive and negative symptoms (American Psychiatric Association, 2013). It further estimates that the lifetime prevalence of SCZ is about 0.3% – 0.7%, and it is more common in men than women. Onset is typically between the mid-teens and the mid-thirties, most commonly early to mid 20s in males and late 20s in females. SCZ can often impair the patient's ability to maintain a job or continue education, and most patients do not marry and have limited social interaction, and approximately 5% of SCZ patients die by suicide (American Psychiatric Association, 2013). The burden of SCZ falls on the individual, the family, and society, and due to its public nature and obvious impact it has been a common point of study for those interested in psychiatric conditions.

SCZ is characterized by several different clusters of symptoms. The DSM-5 defines five categories: Delusions, hallucinations, disorganized speech, grossly disorganized or catatonic behavior (these four are collectively referred to as positive symptoms), and negative symptoms. Delusions are strongly held beliefs that are unchanged in light of conflicting evidence (American Psychiatric Association, 2013). These can involve nihilistic, persecutory, grandiose, erotomanic, or referential delusions. The manual further classifies delusions as bizarre or nonbizarre depending on their plausibility to a peer. Hallucinations are defined as perceived experiences without stimulus that can occur through any sense. Disorganized speech is an outward sign of disorganized thinking and can be ascertained by a pattern of switching topics in conversation with no clear connection between them. Grossly disorganized behavior is often manifested as wildly inappropriate behavior. Catatonic behavior is a clear reduction in reactivity to external stimulus.

Despite the characteristic portrayal of SCZ focusing on the obvious symptoms such as hallucinations and disorganized thinking, it is commonly believed that the negative symptoms lead to much of the difficulty that SCZ patients experience (Wojciak & Rybakowski, 2018). Negative symptoms are the loss of a normal function, such as motivation to socialize. Common SCZ negative symptoms are diminished emotional expression and avolition (a decrease in motivation; American Psychiatric Association, 2013).

Cannabis

Cannabis originated in Central or South-East Asia around 12,000 years ago, and the first evidence of use by humans dates to a little over 10,000 years ago in Southern Japan (Clarke & Merlin, 2013; Okazaki et al., 2011; Tarasov et al., 2007). It was used for ritual and medical purposes for thousands of years, spreading from Asia through the Mediterranean and into Europe (Pisanti & Bifulco, 2019). Recreational cannabis use is believed to have fallen out of favor in Europe during the middle ages, as its psychoactive properties were demonized and seen as unholy (Pisanti & Bifulco, 2019). However, it was continuously used medically as a treatment for pain, even referenced in Saint Hildegard's *Physica* (Throop, 1998). Recreational usage became popular in France again during the 1800s, while its medical application was still employed through the industrial revolution around the world (Pisanti & Bifulco, 2019). In the mid 1900s, the marijuana tax act was passed, placing heavy taxes on companies who sold cannabis for recreational use, with milder taxes for medical use, but as the drug fell out of favor, it was used less in medical practices, and subsequently became labeled as a drug of abuse in 1960 (Pisanti & Bifulco, 2019).

The recent push towards legalization has brought the question of cannabis safety and mechanism of action into the forefront of political conversation (Green, 2022). Cannabis targets the endocannabinoid system, which is the endogenous system using cannabinoid molecules the brain naturally produces for regulatory purposes in the brain (Lu & Mackie, 2021). The most well studied cannabinoid receptors are CB1 and CB2. Although CB1 is most abundant in the central nervous system in GABAergic interneurons they can be found in a plethora of neuron types, most commonly at the presynaptic density (Bodor et al., 2005; Hu & Mackie, 2015; Nyiri et al., 2005). CB1 activation leads to long term depotentiation, and is usually activated by retrograde signaling (Lu & Mackie, 2021). CB2 is primarily located in microglia and is involved in anti-inflammatory signaling (Cabral et al., 2015; Stella, 2010; Tanaka et al., 2020). Both CB1 and CB2 are g-protein coupled receptors and signal through inhibitory g proteins (Howlett et al., 2002).

Within cannabis are two primary psychoactive chemicals: Cannabidiol (CBD) and Δ^9-tetrahydrocannabinol (THC), both of which bind to CB1 and CB2 (Rock & Parker, 2021). THC is the major psychotropic molecule, and is a low efficiency CB1 agonist (Lu & Mackie, 2021). CBD is an allosteric inhibitor of CB1, and therefore mitigates the effect of THC (Laprairie et al., 2015). Because CB1 regulates through an inhibitory g protein, THC leads inhibition of the cells affected and CBD presence leads to less inhibition. Depending on the cell type, this can lead to varying effects in different sub-populations of cellular networks based on which cells express CB1.

The gap

The purpose of this paper is to provide an updated, systematic review of the primary literature regarding the relationship between cannabis and SCZ and the role genetics may play in that interaction. Although the relationship between SCZ and cannabis usage has been reviewed many times in the last 20 years (Bartoli et al., 2021; Diaz-Soto et al., 2020; Moustafa et al., 2017; Patel et al., 2020; Rault et al., 2022), the rapid rate of discovery results in readily shifting debates and therefore warrants regular updates. To this end, only six reviews have been written since 2018 that include the terms "schizophrenia" and "cannabis" in their title, according to PubMed. Of these, two were systematic reviews with similar objectives, but one was published in 2018 which warrants updating (Ortiz-Medina et al., 2018) and the other largely focused on the main effects of CBD and THC on SCZ and brain development (Patel et al., 2020). This review instead focuses on the genetic factors the influence the effects of cannabis on SCZ development.

Methods

This systematic review was conducted in PubMed using the search terms: Schizophrenia AND cannabis AND genetics. PubMed's search engine automatically converts those search terms into the following query: ("Schizophrenia"[MeSH Terms] OR "schizophrenia"[All Fields] OR "schizophrenias"[All Fields] OR "schizophrenia s"[All Fields]) AND ("cannabis"[MeSH Terms] OR "cannabis"[All Fields] OR "cannabi"[All Fields] OR "cannabis s"[All Fields]) AND ("genetic"[All Fields] OR "genetical"[All Fields] OR "genetically"[All Fields] OR "genetics"[MeSH Subheading] OR "genetics"[All Fields] OR "genetics"[MeSH Terms]). There were 378 hits on February 20, 2023.

The first round of filtering was performed based on the following exclusion criteria: Articles were written in a language other than English and/or the article was a review and/or the article was a meta-analysis. There were 245 remaining articles which can be viewed using this link: https://www.ncbi.nlm.nih.gov/sites/myncbi/stephen.vaughn.1/collections/62571467/public/

The articles were then subject to the following inclusion criteria: The article must be a human study, some participants must be diagnosed with SCZ, the article must investigate cannabis in some manner, and must account for genetics in some way (a family history is

sufficient). The articles were also screened for the following exclusion criteria: The article is specifically investigating the relationship between SCZ, cannabis, and another disorder (the most common example was bipolar disorder), there was no data associated with the article on PubMed, and/or the article was a case study. There were 40 remaining articles which can be viewed using this link: https://www.ncbi.nlm.nih.gov/sites/myncbi/stephen.vaughn.1/collections/62847880/public/

Fourteen of these were published in 2019 or later. Therefore, these articles are particularly relevant for an updated review from Ortiz-Medena and colleagues' previous paper (2018).

Results

Main effects of cannabis on schizophrenia

There is strong evidence of an association between cannabis usage (defined as having used cannabis) and SCZ, and studying the relationship between these is a particularly promising research endeavor. Early evidence noted a significantly higher lifetime morbid risk of SCZ in first degree relatives of individuals who tested positive for cannabis while presenting to the hospital for psychosis (McGuire et al., 1995). Additionally, as high as 66.7% of self-identified cannabis users with SCZ admit to having begun usage before the onset of symptoms, providing a window for the cannabis to have a causal relationship with SCZ (Bersani et al., 2002), and approximately half of individuals treated for cannabis induced psychosis have been found to develop SCZ within 7 years (Arendt et al., 2008).

Correlations among genetics, cannabis usage, and schizophrenia

Polygenic risk scores (PGS) for SCZ have consistently shown a positive correlation with cannabis use, which argues for a common genetic predisposition rather than cannabis causing SCZ (Aas et al., 2018; Harper et al., 2021; Jones et al., 2022; Power et al., 2014; Verweij et al., 2017), although one large study found no evidence of this correlation in the general population, but a small effect in individuals diagnosed with SCZ (Hjorthoj et al., 2021). This same study, though, also found that cannabis use disorder (the DSM-5 diagnosis for a cannabis dependency) was five times higher in the mothers and three times higher in the fathers of individuals with SCZ, so there is still a clear association, if not a specific underlying genetic risk (Hjorthoj et al., 2021). Another study estimated that up to 8.6% of SCZ heritability could be explained by shared SCZ and cannabis/tobacco smoking genetics (Song et al., 2022). Furthermore, PGS for SCZ has been significantly correlated ($\alpha < 0.05$) with five cannabis use metrics including lifetime use, regular use, and lifetime frequency of use (Verweij et al., 2017). Mendelian randomization studies have provided strong evidence for a relationship between cannabis use increasing SCZ risk (Vaucher et al., 2018), however one study found stronger evidence of SCZ genetic risk leading to cannabis use (Gage et al., 2017). Taken together this evidence indicates cannabis usage likely increases the risk of SCZ (Vaucher et al., 2018); however, underlying genetic risk for SCZ also likely relates to cannabis usage (Gage et al., 2017; Verweij et al., 2017).

Although some have proposed common genetic underpinning of SCZ and cannabis usage, another hypothesis includes a gene-environment interaction. There is evidence of an additional effect of environmental factors, namely cannabis usage, which when combined with a high PGS resulted in disproportionately increased odds of SCZ development (Guloksuz et al., 2019). Another study found no difference in likelihood of SCZ development in users with cannabis use disorder based on PGS for SCZ, but this may be due to the already very high hazard ratio (4.91) of developing SCZ in the cannabis use disorder group (Hjorthoj et al., 2021). There also may be a meaningful difference between cannabis use disorder and cannabis use in interactions with PGS for SCZ. In a twin study, only cannabis usage was robust enough to predict whether monozygotic twins would be concordant in SCZ diagnosis; additionally, cannabis and childhood trauma were particularly effective predictors when occurring in combination (Lemvigh et al., 2021). Cannabis usage, however, is most likely to lead to an SCZ diagnosis when occurring before or during the ages of 16-20 (Hiemstra et al., 2018). Structurally, cannabis usage during development was found to decrease cortical thickness, and this effect was exacerbated if the individual had SCZ, which likely relates to the underlying genetics, as individuals with or without SCZ when controlling for cannabis use had no difference in cortical thickness (Habets et al., 2011). By measuring a series of binary environmental factors, researchers can use accurate predictive modeling to determine the odds of an individual developing SCZ, termed the individual's exposome (Pries et al., 2019). These environmental factors may also be influenced by the individual's genetics. For example, there is an established genetic predisposition towards externalizing behaviors such as aggression, risk-taking, or hyperactivity, which makes an individual's exposome not necessarily completely independent of their genome (Wormington et al., 2022).

Age of onset

There appears to be a difference in the age of onset of SCZ in individuals who used cannabis prior to SCZ development versus non-users. A follow up to the initial observation of SCZ in the Swedish conscript study observed a more sudden onset of symptoms (Andreasson et al., 1989). Individuals who use cannabis prior to the development of SCZ on average have been regularly shown to have a significantly earlier age of onset (n=403; n=100; n=750; n= 109,308; De Sousa et al., 2013; Scherr et al., 2012; Stepniak et al., 2014; Wainberg et al., 2021). This effect has been contested, as one study has shown the earlier onset only in males (n=622; Neill et al., 2020) and another found no effect of cannabis usage on age of onset (n=190; Goldberger et al., 2010). However, the total lack of effect may be explained by a lack of statistical power of the study. A third study indicated the opposite effect of cannabis usage, but this was attenuated by when using twin studies to control for genetic and environmental variance (n=5456; Giordano et al., 2015). Additionally, cannabis users with SCZ who are sensitive to the psychotogenic effects of the substance (as defined by onset of psychotic symptoms within 1 month of cannabis consumption initiation) on average have been shown to have an age of onset 2.6 years earlier than cannabis users with SCZ that were insensitive to its psychotogenic effects (Goldberger et al., 2010). When these groups were combined, they showed no effect, which may further explain the studies reporting no effect of cannabis on SCZ onset age. Furthermore, in SCZ patients with large (greater than 500kb) deletions, cannabis abuse (the DSM-IV diagnosis for the non-dependency symptoms of what is now called cannabis use disorder) was less common than other SCZ patients, but those who used it had a significantly earlier age of onset (Martin et al., 2014). This pattern of cannabis abuse connecting to earlier age of onset held true for all other groups in the analysis except for individuals with large duplications, who had no statistically significant deviation in age of onset based on cannabis abuse (Martin et al., 2014). This shows some complex interactions between an individual's specific genetics and the effect cannabis has on their risk and manifestation of SCZ.

Phenotypic differences in cannabis-associated schizophrenia

Other than the age of onset, there is mixed evidence regarding whether SCZ resulting from cannabis use is phenotypically different than non-cannabis-SCZ. SCZ patients who used cannabis prior to the onset of symptoms have been shown to have fewer positive symptoms than those who began cannabis usage after symptom onset (Bersani et al., 2002). This implies that cannabis associated SCZ may be less severe than SCZ that arises independently. However, a contrasting study found similar symptom patterns and family history in patients with or without pre-onset cannabis usage (Sarrazin et al., 2015). A further contrasting report found that cannabis users with high PGS had more severe auditory and visual hallucinations and delusions of reference, while users with low PGS had a much milder response (Wainberg et al., 2021). This indicates that cannabis usage may push an individual farther along the psychosis spectrum, and if the individual has a low PGS, they may end up being a very mild case of SCZ, but if the individual has a high PGS, they may have a more severe case (Wainberg et al., 2021). This is further shown by cannabis usage being correlated with better performance in facial emotion recognition tasks, except in individuals with a high genetic risk for SCZ (SCZ patients and siblings), who averaged better performance than non-users only if the usage started after age 16 (Fusar-Poli et al., 2022).

Genes of interest

Several genes of interest have been associated with cannabis use and subsequent SCZ development. One such gene codes for catechol-O-methyltransferase (COMT). A *COMT* Val158Met mutation has been proposed as being involved in a gene-environment interaction making an individual particularly susceptible to cannabis usage in a gene dosage dependent manner (Bosia et al., 2019; Ermis et al., 2015; Estrada et al., 2011; Gutierrez et al., 2009). However, once again, other studies have failed to replicate the specifics of this association, with results varying from no correlation between the Val158Met mutation and SCZ (Zammit et al., 2007) to a correlation with the gene but entirely independent of cannabis usage (De Sousa et al., 2013; Nawaz & Siddiqui, 2015).

Mutations in *CNR1*, the gene encoding for CB1, have been associated with decreased white matter volume, with a possible gene environment interaction with cannabis resulting in further white matter reduction as well as cognitive performance deficits (Ho et al., 2011). However, another study failed to replicate the association between and SCZ phenotype and *CNR1* mutations and cannabis (Zammit et al., 2007). *CNR2* has also been associated with comorbid cannabis dependence and SCZ (Horcajadas et al., 2023). *NCAM1* has been identified as a common risk factor for both SCZ and tobacco/cannabis smoking (Pasman et al., 2018; Song et al., 2022), and *NRXN1* and *MAPT* were differentially methylated in user versus non-user SCZ patient blood samples (Jahn et al., 2021). Other significant genes identified in a massive (n=184,765) genome wide association study relating

cannabis usage to SCZ were *CADM2*, *ZNF704*, *SDK1*, *RABEP2/ATP2A1*, and *SMG6* (Pasman et al., 2018).

Discussion

In the literature, there is a firmly established relationship between cannabis use and SCZ, but the interest lies in disentangling the nature of this association and the role of genetics. The Mendelian randomization studies found a bidirectional relationship between PGS for SCZ and cannabis use (Gage et al., 2017; Vaucher et al., 2018). In genetically at-risk populations, cannabis usage seems to lead to an earlier age of onset, and cannabis initiation after psychosis onset leads to worse symptoms. However, individuals with low genetic risk who develop SCZ after cannabis usage seem to have less severe symptoms. Therefore, there are likely a set of genetic variants that make an individual more likely to begin using cannabis (Aas et al., 2018; Harper et al., 2021; Jones et al., 2022; Power et al., 2014; Verweij et al., 2017), and there may be a separate, but at least partially overlapping, set of genetic variants that make an individual more likely develop SCZ symptoms if exposed to THC (Guloksuz et al., 2019). Furthermore, the individual's genetic risk of SCZ likely also moderates the effect of cannabis on the severity of SCZ that they experience (Fusar-Poli et al., 2022; Wainberg et al., 2021). In short, genetics may increase the likelihood of cannabis usage, and cannabis usage pushes any individual farther along the psychosis spectrum, but individuals with a high PGS for SCZ are particularly susceptible.

Several of the specific proposed genes are especially interesting research prospects due to their understood roles in normal brain functioning. For example, mutations in *CNR1* leading to decreased white matter volume with an additional effect after cannabis exposure (Ho et al., 2011) makes logical sense after noting that cannabis's main mechanism of action is understood to be mediated by this receptor (Lu & Mackie, 2021; Rock & Parker, 2021). Furthermore, CNR1 has been found to be upregulated along with dopamine D2 receptor (DRD2) in response to THC exposure in mouse models, which suggests a mechanism for a *CNR1* mutation that increases affinity for THC to have an effect on overall brain function (Di Bartolomeo et al., 2021). This is especially interesting as the dopamine hypothesis has been one of the longest standing and best supported etiological hypotheses in SCZ research, and DRD2 is believed to play an important role in that paradigm (Howes et al., 2017; Luykx et al., 2017). Furthermore, this coincides with the results regarding COMT, which is a protein that degrades catecholamines such as dopamine (Tunbridge et al., 2006). THC exposure has been further shown to lead to structural changes in adolescent rats, resulting in premature dendritic pruning in the prefrontal cortex (Miller et al., 2019). Perhaps most interestingly, rodent models have also shown the effects of CBD on this system. For example, CBD has been shown to recover the behavioral and transcriptional effects of THC exposure (Di Bartolomeo et al., 2021). This has clinical implications in that CBD could be used as a treatment for cannabis induced psychosis, or even in individuals at risk of psychosis more broadly, although further clinical studies are necessary for this to be broadly applicable (Batalla et al., 2019).

SCZ research still must continue to examine the biological pathways leading to psychosis onset following cannabis usage. Although much progress has been made on mouse models and observational studies in humans, there is a need for the development of therapeutic approaches to mitigate the effects of cannabis. This may be accomplished via the usage of human induced pluripotent stem cell lines, which offer a promising avenue for recapitulating human specific interactions that may not occur in mouse models (Brandao-Teles et al., 2022; Wang et al., 2020). When combined with early risk detection methods, this may allow for more effective intervention strategies (Lieberman et al., 2019). Considering the number of states within the United States and countries around the world where marijuana is legal, as well as continual efforts to increase legalization, the number of people with easy access to marijuana is likely to continue growing (Bahji & Stephenson, 2019; Green, 2022); thus, research to better understand the role of cannabis use in psychosis risk is continually important. CBD and other allosteric inhibitors of CB1 and CB2 may prove to be effective tools in preventing cannabis-induced psychosis, but further research is necessary to firmly establish these compounds in a clinician's arsenal.

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KAREN HORNEY'S PERSONALITY THEORY IN FRODO BAGGINS' LIFE

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Abstract – The purpose of this essay is to use a psychological personality theory created by psychologist Karen Horney as a lens to view and analyze Frodo Baggins, a popular fictional character in the *Lord of the Rings*. Through a digestible analysis of a familiar fictional character's experiences, this paper will introduce concepts about personality, anxiety, and neurosis according to Karen Horney. It will follow Frodo through his journey in the saga and offer a rich application of theory in an ethical way. Horney's personality theory is useful for Frodo as he experiences basic anxiety and must navigate it through the mechanisms of the primary modes of relating and the basic orientations of life. He demonstrates neurotic behaviors but is ultimately able to achieve self-actualization following his triumphant return home.

Keywords: Karen Horney, Frodo Baggins, personality, neurosis, anxiety, psychology

Oftentimes in popular media, anxiety is portrayed as a disorder that causes sweating, heart palpitations, racing thoughts, nervousness, and more. "Anxiety, it is true, often appears simultaneously with physiological symptoms such as palpitations, perspiration, diarrhea, and quick breathing. These physical concomitants may appear with or without awareness of anxiety" (Horney, 1999, p. 193). Karen Horney, a respectable personality theorist, describes these feelings as a social and environmental force. Anxiety is a fundamental concept that is defined as a feeling of helplessness in a hostile world. Horney's theory on personality centers on anxiety and its potential growth to neurosis, yet it also describes some of the coping strategies and orientations of life that are instrumental for that anxiety to be contained. Frodo Baggins, a humble Hobbit from the Shire in Middle Earth, is a character from the *Lord of the Rings* (Tolkien, 1954a). A tragic event resulting in the loss of both his parents early in his life, as well as other social and environmental factors, cause Frodo Baggins to feel continual anxiety. As his story progresses, Frodo becomes less humble, reserved, and kind-hearted and more angry, neurotic, and anxious. While the story explains that a magic ring (created by an evil being) influences Frodo and causes this change, this plot device may serve as a tangible symbol and metaphor for the deeper, amorphous sources of uncertainty in an individual's life, which can be explained through the lens of personality as delineated by Karen Horney.

In *The Lord of the Rings*, Frodo lives a peaceful life. After inheriting his uncle's home and a magic ring, he was alerted to the dangerous and evil nature of the ring by his friend, a wizard named Gandalf. This wise wizard encouraged Frodo to take the ring to a grand council where it was decided that the ring must be destroyed in the fires of the volcano where the ring was formed, far away in the land of the enemy. Chosen as the ring bearer due to his innate sense of duty, bravery, and humility, Frodo then was given eight other companions, called the Fellowship of the Ring, to aid his quest. After traveling through dangerous mountains, mines, and forests, one companion tried to take the ring from Frodo. He narrowly escaped, however, and decided that he must continue his journey alone to not further burden the company. Another loyal Hobbit named Samwise Gamgee found and continued the journey with Frodo as his direct support, saving Frodo's life numerous times in their adventure. Though they fight and part ways due to another companion named Gollum later in the story, Samwise and Frodo reunite in the end. Frodo's arduous travels finish at the end of the films when he enters the Undying Lands, a place of eternal peace and happiness, free from anxiety and worry.

Anxiety

As a result of various cultural and social interactions, anxiety is a universal experience, leaving every individual to feel its effects at various points throughout the lifespan (Horney, 1962). Even as small children, we will all have situations in life that create and perpetuate feelings of anxiety. Basic anxiety is the pervading feeling of being lonely and helpless in a hostile world (Horney, 1945). This concept is very similar to Alfred Adler's concept of feelings of inferiority. Inferiority feelings arise from childhood dependence since we all begin life as inferior beings who are completely dependent on others for survival. This creates anxiety, which leads to fundamental experiences wherein we strive to overcome that sense of anxiety (Hjertaas, 2009). Both psychologists recognize the basic anxieties that plague the life experience of humans. Horney theorized that basic anxiety is anxiety about the environment as a whole, and that the environment is seen as a potential danger, differentiating between potential dangers and manifest dangers. The helplessness implicit in basic anxiety also works to motivate a person to seek out safety devices and coping strategies (Horney, 1999).

Towards the beginning of the film *The Lord of the Rings*, Frodo Baggins is chosen as the ring bearer to carry the One Ring to Mount Doom in Mordor. This is partly due to his generally stable and healthy personality traits and demeanor. Frodo is humble, simple, strong, and reliable. Though he is the least experienced in anything adventurous amongst the Fellowship of the Ring, Frodo has developed humility and social interest, which qualifies him to be the bearer of that ring. However, with such a demanding request, Frodo began to feel insecure. His uncertainty is evident as he states, "I will take the ring, though I do not know the way" (Tolkien, 1954a, p. 247). Karen Horney might label this insecurity as basic anxiety, or the sense of loneliness and despair from this very daunting task ahead of him. This anxiety remained evident in Frodo's journey throughout the films, and it ultimately progressed to an unhealthy level. The power of the ring, alongside his early life experiences, can explain the changes in Frodo's personality as he ages into young adulthood.

Some of the basic anxiety Frodo felt was due to another concept called basic evil. The concept of basic evil is an extension of and elaboration on Horney's concepts of anxiety and basic anxiety. A basic evil is any negative factor that provokes insecurity, makes a person feel alone, and is the result of a negative experience within social and environmental forces (Horney, 1937). These factors are not only malicious, but also those things that can allow you to feel helpless in the hostile world.

Even Frodo Baggins, a Hobbit from the Shire who lived a monotonous, safe life growing up, experienced basic evil. Because the Shire is quite secluded and peaceful, he did not experience much strife until a tragic event happened in his early childhood. At the age of 12, Frodo learned of a horrific boating accident that killed both of his parents, Drogo Baggins and Primula Brandybuck (Tolkien, 1954a). One interpretation of Horney's theory would suggest that the untimely death of his parents was a basic evil that altered his personality, and his desire to be loved and to matter. The normal warmth and affection that parents should give their children was missing in Frodo's life, which is what contributed to his basic anxiety (Horney, 1937). Following the accident that drastically altered his life, Frodo lived with his maternal family for the next nine years. At the age of 21 years old, Frodo was adopted by Bilbo Baggins, and he then moved in with his uncle to live at his home, Bag End (Tolkien, 1954a). The basic evil Frodo experiences as a result of this event is explained by Horney's theory. However, he would soon be led on an adventure full of mischief and danger that would uproot this new home life completely.

Frodo also sought out coping strategies in order to deal with the challenges that accompanied him. Coping strategies are plans that allow a person to endure the feelings of anxiety and to continue living in a normal way. These defensive attitudes that come from coping strategies may become exaggerated and can lead to inappropriate strivings, however. The prominent coping strategies in Karen Horney's theory are called the primary modes of relating.

Primary Modes of Relating

According to Horney, the primary modes of relating function as a way to relate to and connect with others in an attempt to evade the feelings of helplessness and continual anxiety, and there are three types (Horney, 1950). They are moving away, moving towards, and moving against. Moving away is when a person is retracting from the situation, and they are detached from the environmental or social influence. This is their way of coping with anxiety. Moving towards is when an individual is compliant and makes efforts to seek other people out to fulfill needs for affirmation and acceptance. These people desire to be loved in an attempt to cope with those feelings of anxiety. Moving against is a more aggressive approach, and this is when a person is more contentious, controlling, and hostile than the other orientations. They are also driven to succeed (Horney, 1945). All three of these modes of relating act as coping strategies to deal with anxiety and prevent neurosis.

These coping strategies are demonstrated in Frodo's life. When his parents died in a tragic boating accident, Frodo's basic orientation of life was to move towards his uncle Bilbo Baggins. Frodo had to rely on his uncle completely, and he sought out love and affirmation from Bilbo, and later his friends, particularly Sam. The next coping strategy Frodo used was moving away. At one point in the film, Frodo felt that he must continue the journey alone to not endanger or hurt any of the remaining members of the Fellowship of the Ring. To accomplish this goal, he begins rowing a boat into the depths of the sea alone, leaving behind all his companions. Frodo laments that the evil of the Ring is already at work in the Company, and he knows that the Ring needs to be separated from them before it continues to put the others in danger (Tolkien, 1954a). These actions demonstrate moving away needs because of the detachment and seclusion Frodo seeks out in this scene. On the other hand, in a scene showing Frodo, Samwise Gamgee, and Gollum traversing the dangerous world of Middle Earth, Frodo becomes irritated at Sam. After being woken up by Samwise Gamgee, who suggested they keep moving, Frodo is startled to see that there is no bread left for them to eat. This leads to an argument amongst the three companions. Ultimately, Frodo becomes mad at Samwise Gamgee and yells at him to get away and leave his presence (Tolkien, 1955). Frodo wanted to control the situation and felt threatened when Samwise offered to carry the ring for a little while. This led to Frodo exhibiting moving against coping strategies by getting angry and telling Samwise to go home. As mentioned, Frodo's life examples are a good representation of Horney's concept of primary modes of relating.

Orientations of Life

Underlying these primary modes of relating, which are primarily behavioral patterns in relationships, are Horney's concepts of the basic orientations of life. These are the self-effacing solution, which is an appeal to be loved, the self-expansive solution, which is an attempt at mastery, and the resignation solution, which is a desire to be free from others (Horney, 1987). These three orientations are the broader categories that the primary modes of relating fall under (Horney, 1950). These solutions are also coping strategies and can ultimately help a person have a healthy personality as they move between each of these solutions. Horney may suggest that Frodo Baggins uses a resignation solution when he moves away from the other members of the Fellowship and seeks to be on his own for the rest of the journey. He uses a self-expansive solution when he shows an exaggerated need for power and personal achievement at the end of the film at Mount Doom. When he finally gets to the mountain to throw the ring into the fire, he hesitates because of his weaknesses and succumbs to the craving for power from the ring. And lastly, he demonstrates the self-effacing solution at the end of the films when he accompanies more dominant friends to the Undying Lands, which shows his need for a dominant partner (Tolkien, 1955). These basic orientations of life intend to help each individual cope with anxiety and prevent neurosis.

Neurosis

Neurosis is caused by basic anxiety from interpersonal relationships (Horney, 1942). Neurotic patterns, which are persistent maladaptive behaviors, also come from basic anxiety or the overuse of the primary modes of relating. Neurotic individuals express one mode at the expense of other parts of their personality. They actively repress tendencies to react according to the other orientations. This repression is not successful, and those repressed tendencies continue to seek manifestation and increase the neurotic individual's anxiety. As the neurotic individual continues to choose one need or mode and overlook the others, a "vicious circle" develops, and the anxiety is never completely resolved (Horney, 1942). Normal and healthy individuals are able to balance orientations and express the primary modes of relating at the appropriate times. Those who succumb to neurosis are individuals who have been more severely hit by existing difficulties, particularly in their childhood. "A great frequency of neuroses and psychoses in a given culture is one of the indicators showing that something is seriously wrong with the conditions under which people live" (Horney, 1999, pp. 178–179). Frodo's loss of his parents is one such difficulty.

At an extraordinarily challenging time, Frodo expresses deep sadness that reveals the difficulties of taking the ring. He even wishes the ring never entered his possession and that the entire journey never happened (Tolkien, 1954a). In this scene from the films, Frodo dreams that he didn't have to endure the struggles and challenges of being hungry, being hunted by many groups of people, suffering from the ring, and more. At this point in time, Frodo also is becoming quite neurotic and damaged. Horney stated that neuroses are disturbances in an individual's relationships to oneself and others (Horney, 1950). Her theory might suggest that neuroses were very prevalent in his life and can be seen when Frodo tells Sam to leave his presence, and even when his relationships with Gollum and his own self become strained.

Neurotic Trends

From the ideas of neurosis and neuroticism, Karen Horney determined that 10 neurotic trends exist and can be used by any individual throughout the lifespan to prevent neurosis. According to her concept, the neurotic trends are not the source of danger, but the thing endangered, inasmuch as safety rests on their normally functioning operation. Anxiety emerges as soon as they fail to operate (Horney, 1999). These trends can be divided into categories that are contained by the three basic orientations of life. The first trend is an exaggerated need for affection and approval. The second trend is a need for a dominant partner. These two trends can fall under needing a self-effacing solution, which is an appeal to be loved, as well as relating to the moving toward mode of relating. The next five neurotic trends are an exaggerated need for power, a need to exploit others, an exaggerated need for social recognition and prestige, an exaggerated need for personal admiration, and an exaggerated ambition for personal achievement. These fall under the self-expansive solution, which is again a striving for mastery, and is related to the mode of relating by moving against others. The final three trends are a need to restrict one's life within narrow boundaries, an exaggerated need for self-sufficiency and independence, and a need for perfection and unassailability. These trends fall under the resignation solution, which is the desire to be free from others, as well as the moving away mode of relating (Horney, 1950). At certain times in the movies, Frodo relies on some trends more than the others, like the self-expansive solution trends where he moves away from others. This leads to the development of neurotic tendencies towards the middle and end of the films.

Real and Idealized Self

If engaging in neurotic trends, one may have a difficult time differentiating between the real self and idealized self, or in other words knowing who you truly are. If an individual is able to cope with the basic anxieties and challenges of life, they may be able to have a closely aligned real self and idealized self. This is similar to Carl Rogers' concept of congruence from humanistic psychology (Rogers, 1957). Karen Horney, too, theorizes about this, stating that the real self is how a person truly is, and that the idealized self is what an individual thinks they should be. The idealized self is useful as a motivating principle to help individuals achieve self-actualization. In a healthy and normal individual, the idealized self and the real self closely align because the idealized self is based on a realistic assessment of one's potential. In the neurotic individual, the real self and the idealized self are separated, leading to a difficulty in managing the anxieties that come from not being consistent with the idealized self (Horney, 1950). This makes it very difficult to achieve self-actualization. Additionally, as neurosis becomes more severe, a large number of potentialities of the real self may be useless for improvement. In an extreme neurosis, the individual may completely abandon the real self for an idealized glorified self. Horney termed this as alienation, or otherwise known as the devil's pact (Engler, 2014). In this state of alienation, a person identifies with the ideal self but also loses their strength in the real self. Also, when neurotic, individuals may place false needs in front of actual needs, which leads to a concept called the tyranny of the should. Under this condition of high anxiety, neurotic individuals deny the real self and become estranged from their true identity. The false needs create an idealized self that can be, at times, unattainable and unrealistic. This does not lead to a healthy personality, according to Karen Horney.

In Frodo's journey to deliver the ring, he becomes affected by the difficult standards of his idealized self. Frodo wants to be a courageous, selfless, strong, and an indestructible person that is able to deliver the ring without succumbing to its temptations. However, the longer he has the ring, the more his idealized self of being this hero drifts into a distant dream, not something that is realistic or presently achievable. This leads Frodo to spiral down into states of depression and anxiety, and it even furthers the neuroticism he began to develop midway through the trilogy. He places a heavy emphasis on how he should be the one and only ring bearer, and that pressure leads to insurmountable anxiety and neurosis from alienation and disconnection (Tolkien, 1954b).

Because Frodo ultimately obtained a dynamic of close real and idealized self towards the very end of the saga, it can be argued that he ultimately achieved self-actualization. Self-actualization, according to Karen Horney, is a comprehensive neurotic solution that satisfies, aids in painful feelings, and provides a fulfillment in life (Horney, 1950). To demonstrate self-actualization, Frodo, along with a few familiar faces, gets on a boat to sail to the Undying Lands, which is a place where the residents live in eternal bliss due to their calm and content state of being. It can be compared to a sort of heaven. Frodo isn't self-actualized simply because he goes there, but because before he leaves to enter those lands, he is able to acknowledge his real self, a broken but fulfilled Hobbit who doesn't feel at rest anywhere. He also sees that his ideal self is now concordant with that real self. Ultimately, this allows Frodo to become self-actualized. While there are many ways to interpret and

draw meaning from literature, Horney's perspective of self-actualization can be connected to these experiences.

Character Growth

Frodo Baggins was a character of great nobility, selflessness, and courage. He was a hero of heroes throughout the saga of *The Lord of the Rings*. As discussed, he was not always that way. In the beginning, Frodo could be better described as reserved, lazy, provincial, and small-minded. Some of these traits can be attributed to certain impactful life experiences with his parents and their deaths, as well as the events that soon followed. Though some of these traits persisted to the end of the films, Frodo underwent extensive changes both physically and mentally that altered his very personality. There were also negative traits obtained through carrying the ring for so long, including being paranoid, anxious, angry, and a selfish individual at times. Additionally, his failure to effectively use the basic orientations of life and primary modes of relating, the basic evil and anxieties felt from his parents dying, the struggles brought to him by the ring, and periods of time where his real self and idealized self were not aligned proved to increase his neuroticism. He became more and more unhealthy because of these behaviors, and that ultimately led to a potentially life-threatening mistake at Mount Doom in Mordor.

However, after he was able to rid himself of the ring and its powers, many of the issues he had with coping were able to be solved, and he was able to effectively use the modes of relating and orientations of life to combat the regular anxieties he felt from then on. Some of the characteristics that reflect Frodo's personality at the end of the film include bravery, resilience, courageousness, and wisdom. The natural character arc and progression of healthy personality to neurosis, and ultimately back to a healthy state of being was consistent with the story of Frodo Baggins. Karen Horney would suggest that people are able to make changes in order to better cope with the basic anxieties of life. Her theory states that the balanced use of all three basic orientations of life will provide a healthy personality, and self-actualization is possible through consistent efforts to do so.

Karen Horney's personality theory can offer much in terms of understanding the self and our relationships with others. This perspective, along with other interpretations, is valid and useful for examining literature and real-life scenarios. Anxiety, coping strategies, and basic orientations of life are all prevalent in the human experience. Our task is to escape the continual feeling of anxiety that is key to being human. Frodo Baggins, once a solitary and stable person living in the Shire, becomes more and more neurotic through the progression of the films *The Lord of the Rings*. His coping strategies fail, and the viewers can clearly see his physical and non-physical changes that come from those failures. Frodo may be a bit damaged and neurotic towards the end of the films, but it was a sacrifice worth making. Ultimately, he was able to achieve self-actualization after demonstrating more healthy choices and coping behaviors after ridding himself of the ring. These personal changes highlight some of the key concepts of personality through Horney's eyes. Frodo, though a fictional character, isn't that much different from you and me. His challenges are, in part, our challenges. His successes are similar to those of a regular person's. Perhaps the greatest lesson to be learned from examining Frodo through Karen Horney's personality theory is this: There are ways to cope with the basic anxieties of life, one can improve from a state of neurosis, and there is still good left in this world. When the call for adventure comes, be sure to answer it. It may take you the furthest away from home you've ever been.

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