Psi Chi
Journal of
Psychological Research

SPRING 2016 | VOLUME 21 | ISSUE 1

ISSN: 2164-8204

Published by Psi Chi,
The International Honor
Society in Psychology

PSI CHI

PSI CHI JOURNAL OF PSYCHOLOGICAL RESEARCH
SPRING 2016 | VOLUME 21, NUMBER 1

ABOUT PSI CHI

Psi Chi is the International Honor Society in Psychology, founded in 1929 for the purposes of encouraging, stimulating, and maintaining excellence in scholarship, and advancing the science of psychology. Membership is open to graduate and undergraduate students making the study of psychology one of their major interests and who meet Psi Chi's minimum qualifications. Psi Chi is a member of the Association of College Honor Societies (ACHS), and is an affiliate of the American Psychological Association (APA) and the Association for Psychological Science (APS). Psi Chi's sister honor society is Psi Beta, the national honor society in psychology for community and junior colleges.

Psi Chi functions as a federation of chapters located at over 1,100 senior colleges and universities around the world. The Psi Chi Central Office is located in Chattanooga, Tennessee. A Board of Directors, composed of psychology faculty who are Psi Chi members and who are elected by the chapters, guides the affairs of the Organization and sets policy with the approval of the chapters.

Psi Chi serves two major goals. The first of these is the Society's obligation to provide academic recognition to its inductees by the mere fact of membership. The second is the opportunity of each of the Society's local chapters to nourish and stimulate the professional growth of all members through fellowship and activities designed to augment and enhance the regular curriculum. In addition, the Organization provides programs to help achieve these goals including conventions, research awards and grants competitions, and publication opportunities.

JOURNAL PURPOSE STATEMENT

The twofold purpose of the *Psi Chi Journal of Psychological Research* is to foster and reward the scholarly efforts of psychology students as well as to provide them with a valuable learning experience. The articles published in the *Journal* represent the work of undergraduates, graduate students, and faculty. To further support authors and enhance *Journal* visibility, articles are now available in the PsycINFO® and EBSCO Academic Search Complete® databases.

JOURNAL INFORMATION

The *Psi Chi Journal of Psychological Research* (ISSN 2164-8204) is published quarterly in one volume per year by Psi Chi, Inc., The International Honor Society in Psychology, P.O. Box 709, Chattanooga, TN 37401-0709.

Subscriptions are available on a calendar-year basis only (Spring–Winter). U.S. rates are as follows (four issues): Individual $20; Institution $40.

For international rates or other information, contact Psi Chi Central Office. Printed in the USA. Periodicals postage paid at Chattanooga, TN, and additional mailing offices.

Statements of fact or opinion are the responsibility of the authors alone and do not imply an opinion on the part of the officers or members of Psi Chi. Psi Chi does not accept paid advertising for *Psi Chi Journal of Psychological Research*.

Postmaster: Send address changes to the address below.

For more information, contact:
Psi Chi Central Office
Publication and Subscriptions
P.O. Box 709
Chattanooga, TN 37401-0709
(423) 756-2044
www.psichi.org
psichijournal@psichi.org

Psi Chi
Journal of
Psychological Research

SPRING 2016 | VOLUME 21 | ISSUE 1

*Faculty mentor

Side-Effect Effect Take 2

Denise C. Keeren, Heidelberg University at Arrowhead Park
Jacob Burmeister, Bowling Green State University

ABSTRACT. Person X chooses a particular course of action, which has an unintended—but, foreknown—chain reaction, resulting in either a positive or negative side effect. Is Person X deemed guilty or innocent of this side effect? Previous research has shown that adults, as well as children as young as 4 years old, tend to assign blame but downplay praise, according to the negativity or positivity (respectively) of the side effect of the intentional action (Leslie, Knobe, & Cohen, 2006). The present study sought to replicate these results, which have come to be known as the *Side-Effect Effect*, or the *Knobe Effect*. Via random assignment to either a harm condition or a help condition, participants read a vignette and then ranked the amount of blame or praise that the subject of the vignette deserved for the side effect of his action. Participants were then asked whether the subject purposely brought about the unintended side effect. Results indicated that individuals are more likely to attribute responsibility when an intentional action of an agent brings about a negative side effect, but that attribution of responsibility is more likely to be withheld from agents when an intentional action produces a positive side effect (56.90% vs. 30.10%), $\chi^2(1) = 12.00$, $p < .001$, $\varphi = .27$. Similarly, the amount of blame attributed to the agent of the harm condition was consistently higher than the amount of praise attributed to the agent in the help condition ($M = 4.58$, $SD = 1.56$ vs. $M = 3.28$, $SD = 1.98$), $F(1, 159) = 20.52$, $p < .001$, $d = 0.73$.

Person X chooses a particular course of action, which has an unintended—but, foreknown—chain reaction, creating in its wake something akin to either a curse or a blessing. Is Person X guilty or innocent of this side effect? How do moral beings decide? A side effect is something that occurs as a by product of an action or decision. Knobe (2003) found that intuitions regarding whether a side effect was intentionally brought about can be shaped by a person's attitude toward the side effect in question. Beginning with the initial study, Knobe discovered that, when the intentional action of an agent produced a negative side effect, participants concluded that the agent deserved a lot of blame for the side effect. However, when the intentional action of an agent produced a positive side effect, participants concluded that the agent did not deserve to be praised for the resulting side effect.

Knobe received some criticism from Adams and Steadman (2004) regarding whether individuals understood intentional action the same way, or whether this opened the door for some confusion about what was truly being measured. To address this, Knobe conducted a follow-up study to analyze whether the word *intentionally* was understood by participants to mean a reason for bringing about the side effect, rather than simply knowing what the side effect would be and proceeding with the intended action regardless of any side effect. Knobe (2004) replaced the word *intentionally* with *in order* to in the vignettes in his study and found the results to again be statistically significant,

This manuscript is part of PCJ's Replication Study Initiative.

showing a propensity to attribute blame for a negative side effect and to withhold praise for a positive side effect. Preschoolers were likewise studied with vignettes geared to their age and understanding, and it was found that, beginning at age 4, children have the same intuition regarding judgment of praise and blame as do adults (Leslie, Knobe, & Cohen, 2006). That same year, Knobe and Burra (2006) translated the original vignettes into Hindi, expanding the study into another culture/language, and found once again an asymmetry between the attribution of blame over praise according to whether the unintended side effect was negative or positive. To further round out the analysis, Pettit and Knobe (2009) examined contributions made by others regarding the use of *intention* versus *intend* and *desire*, then added subsequent studies employing *decided*, *advocated*, and *in favor of*. The two concluded that the influence of moral judgment upon perceived intentional outcomes is persistent.

It was our aim with the present study to replicate Knobe's initial study, which has come to be known as the *Side-Effect Effect*, or the *Knobe Effect*, substituting only *purposely* for *intentionally* in both the harm and help vignettes. I hypothesized that attribution of blame would be clearly manifested when an action that is purposely done brings about a negative side effect, but that praise would be withheld from an agent when an action that is purposely done brings about a positive side effect.

Method

Participants

A total of 169 men (48.8%) and women (49.4%) were recruited from a convenience sample of friends and work associates who responded to either an e-mail request or posting on Facebook®, and associates of personal contacts. Participants were ages 18 to 25 (15.5%), 26 to 35 (27.4%), 36 to 45 (33.9%), 46 to 55 (12.5%), and 56 and over (8.3%). They identified as religious (61.3%) and nonreligious (34.5%), and as African American /Black (3.0%), Asian (1.8%), Biracial/Multiracial (3.0%), European American/White (86.9%), Latino(a)/Hispanic (1.8%), Native American /Pacific Islander (.6%), West Asian/Middle Eastern (.6%), and other (1.2%). This study was approved by a Midwestern university's institutional review board, and all participants provided consent for their contribution.

Procedure

Participants accessed a Google® Drive survey via a link posted on Facebook or included in an e-mail whereby they read an informed consent document, agreed to participate, and completed an online two-item questionnaire. They were provided with a study description, randomly assigned to read one of two vignettes (harm condition or help condition), and then rated how much blame (for the harm condition) or how much praise (for the help condition) the subject deserved on a scale of 0 to 6 and stated whether Person X purposely caused the side effect in the scenario. Upon completion of the questionnaire, as well as in the informed consent, participants were notified of the purpose of the study and directed to locator.apa.org or to their local listings to find a counselor should they feel unsettled or otherwise upset by the presented material.

Measures

Participants were presented with one the following vignettes first used by Knobe (2003).

Harm condition.

> A lieutenant was talking with a sergeant. The lieutenant gave the order, "Send your squad to the top of Thompson Hill."
>
> The sergeant said, "But if I send my squad to the top of Thompson Hill, we'll be moving the men directly into the enemy's line of fire. Some of them will surely be killed!"
>
> The lieutenant answered, "Look, I know that they'll be in the line of fire, and I know that some of them will be killed. But I don't care at all about what happens to our soldiers. All I care about is taking control of Thompson Hill."
>
> The squad was sent to the top of Thompson Hill. As expected, the soldiers were moved into the enemy's line of fire, and some of them were killed (p. 192).

Help condition.

> A lieutenant was talking with a sergeant. The lieutenant gave the order, "Send your squad to the top of Thompson Hill."
>
> The sergeant said, "But if I send my squad to the top of Thompson Hill, we'll be taking the men out of the enemy's line of fire. They'll be rescued!"
>
> The lieutenant answered, "Look, I

know we'll be taking them out of the line of fire, and I know that some of them would have been killed otherwise. But I don't care at all about what happens to our soldiers. All I care about is taking control of Thompson Hill."

The squad was sent to the top of Thompson Hill. As expected, the soldiers were taken out of the enemy's line of fire, and they thereby escaped getting killed (p. 192–193).

Participants who read the harm condition used a scale ranging from 0 (*not at all*) to 6 (*very much*) to describe how much blame the lieutenant deserved for what he did. Second, participants were asked (yes/no) whether the lieutenant purposely caused the deaths of the fallen soldiers. Participants who read the help condition used a scale ranging from 0 (*not at all*) to 6 (*very much*) to describe how much praise the lieutenant deserved for what he did. Second, participants were asked (yes/no) whether the lieutenant purposely saved the lives of the fallen soldiers. All participants' scores were averaged together, and all participants' yes/no answers were averaged together so that associations between praise/blame and responsibility could be measured.

Results

The data collected from each participant were responses to a harm or help condition vignette. Chi-squared tests were used to test the effect of the harm or help condition on whether participants believed that the lieutenant purposely killed or saved the soldiers. The results were significant. The percent of participants who believed that the lieutenant purposely killed the soldiers was greater in the harm condition (56.90%) than the percent who believed that the lieutenant purposely saved the lives of the soldiers in the help condition (30.10%), $\chi^2(1) = 12.00$, $p < .001$, $\varphi = .27$.

Additionally, participants' attributions of responsibility for the lieutenant's actions were rated from 0 (*not at all*) to 6 (*very much*). An Analysis of Variance was used to test whether attribution ratings differed by condition. As predicted, participants in the harm condition assigned more responsibility on average than participants in the help condition ($M = 4.58$, $SD = 1.56$ vs. $M = 3.28$, $SD = 1.98$), $F(1, 159) = 20.52$, $p < .001$, $d = 0.73$.

Discussion

Consistent with past research, participants in the present study were more likely to attribute blame when an intentional action of an agent brought about a negative side effect, and more likely to withhold praise from an agent when an intentional action produced a positive side effect. The amount of blame attributed to the agent of the harm condition was consistently higher than the amount of praise attributed to the agent in the help condition. The percentage of participants assigning blame to the lieutenant in the harm condition was significant, but less than anticipated. One possibility is that the scenario involved war. A couple of participants contacted us after the experiment had closed and willingly disclosed their thoughts that "all is fair in war." In their minds, it would not be fair to blame the lieutenant for doing what he felt was best. This seems irrelevant to whether the side effect was purposely done. Nevertheless, some participants might have been distracted by the particular scenario, rather than focusing on the question of intention. In the future, it would be interesting to give each participant two scenarios (either two of the help condition or two of the harm condition) to see whether responses would differ if one involved war and one involved something less prone to one making an exception for an outcome.

The current study was limited in that it was low in ethnic diversity. Knobe and Burra (2006) conducted a study with a set of harm and help vignettes translated into Hindi for Hindi-speaking participants in the United States. It may also be worthwhile to extend the study to include cultures which have not been westernized. Another facet that may be worth capturing is education level to see whether this has any impact on the judgment of the agent.

The present study substituted *purposely* for the original *intentionally*, but revealed the same phenomenon. Consistent with previous similar studies, most participants' assessment of the positive or negative consequence of the agent's choice affected participants' belief regarding whether the consequences were caused on purpose. But why? Perhaps there are more questions to ask. An interesting avenue for future research could include testing how participants who identify as religious would rate a person in a harm/help condition versus how they would rate their concept of God in the same harm/help condition. One hypothesis could be that God would be viewed similarly to the way the lieutenant was in this study's harm condition, with more concessions made because it may be assumed

that God would have a good reason for permitting the harm since God is generally equated with goodness by those identifying as religious. However, in the help condition, a person may hypothesize that God would be given more praise than people are given for the positive side effect because participants may not feel comfortable withholding praise from God. Another avenue worth investigating may be to intensify the harm and help conditions, making them more graphic or more personal, to see if this affects the judgment of the intuited blame/praise and amount of responsibility assigned to the agent. As researchers continue to explore nuances of moral judgment (e.g., flash intuitive judgments, which seem to run afoul of deliberate reasoning), the picture of what it means to be a moral being will hopefully come into clearer view.

References

Adams, F., & Steadman, A. (2004). Intentional action in ordinary language: Core concept or pragmatic understanding? *Analysis, 64*, 173–181. doi:10.1111/j.1467-8284.2004.00480.x

Leslie, A. M., Knobe, J., & Cohen, A. (2006). Acting intentionally and the side-effect effect. *Psychological Science, 17*, 421–427. doi:10.1111/j.1467-9280.2006.01722.x

Knobe, J. (2003). Intentional action and side-effects in ordinary language. *Analysis, 63*, 190–194. doi:10.1111/1467-8284.00419

Knobe, J. (2004). Intention, intentional action, and moral considerations. *Analysis, 64*, 181–187. doi:10.1111/j.1467-8284.2004.00481.x

Knobe, J., & Burra, A. (2006). The folk concepts of intention and intentional action: A cross-cultural study. *Journal of Cognition and Culture, 6*, 113–132. doi:10.1163/156853706776931222

Pettit, D., & Knobe, J. (2009). The pervasive impact of moral judgment. *Mind and Language, 24*, 586–604. doi:10.1111/j.1468-0017.2009.01375.x

Author Note. Denise C. Keeran, Heidelberg University at Arrowhead Park; Jacob Burmeister, Department of Psychology, Bowling Green State University, OH.

Special thanks to Ryan Nichols, Philosophy Department, California State University at Fullerton, for suggestions for the direction of this research.

Correspondence concerning this article should be addressed to Denise C. Keeran at subj2chg@gmail.com or Jacob Burmeister, Department of Psychology, University of Dayton, 300 College Park, Dayton, OH, 45469. E-mail: jburmeister1@udayton.edu

Trail and Ultrarunning: The Impact of Distance, Nature, and Personality on Flow and Well-Being

Christy Teranishi Martinez*, California State University Channel Islands
Crista Scott, California Lutheran University

ABSTRACT. Ultramarathons, races extending beyond the traditional 26.2 mile marathon, have become increasingly popular over the past decade. Ultrarunners run longer distances and spend extended periods of time in nature compared to short-distance runners. The present study examined the role of distance and nature on runners' *flow* (i.e., complete absorption in the present moment) and well-being. One hundred eighty-nine runners (132 women, 57 men, M_{age} = 35.93 years, SD = 9.66) completed an online survey assessing running distance, running environment, flow (Jackson & Marsh, 1996), personality (TIPI; Gosling, Rentfrow, & Swann, 2003), and well-being (Côté, Gyurak, & Levenson, 2010). Independent t tests revealed that ultrarunners spent more time in nature (p = .001), were more neurotic (p = .04), and experienced greater flow (p = .001) than short-distance runners, but did not differ in well-being. Multiple regression analyses indicated that being an ultrarunner, running in nature, conscientiousness, and openness significantly predicted flow, $F(7, 163) = 8.48$, p = .001, R^2 = .27. Running environment and personality (i.e., extraversion, conscientiousness, and openness) predicted greater well-being. However, contrary to expectations, running in a nonnatural environment was related to greater well-being, but being an ultrarunner and flow were not, $F(8, 161) = 4.57$, p = .001, R^2= .19. Findings suggested that, although distance and nature contribute to flow, running in general may have a more profound impact on well-being than immersing oneself in nature.

For over two million years, humans have strived to live harmoniously with nature. Early ancestors found that being outdoors often requires high physical endurance and labor such as chasing after prey, traveling across mountain ranges, and cultivating farms (Bramble & Lieberman, 2004). Heinrich (2001) described the evolutionary pressure to travel farther and faster in his book, *Why We Run*: "For millions of years, our ultimate form of locomotion was running" (p. 9). However, modern advances in technology and urban living provide people with resources such as bicycles and motor vehicles, so they no longer have to depend on their physical skills for survival.

Over the past 20 years, there has been a dramatic increase in a sedentary lifestyle and a decrease in overall physical activity (Ernersson, Lindström, Nyström, & Frisman, 2010). Instead of hunting or cultivating land for food, people drive to grocery stores and consume high-caloric meals at restaurants. Although modern living is beneficial and desirable for many, it may diminish the opportunity for an active and healthy lifestyle.

Physical and Psychological Well-Being

Exercise and an active lifestyle contribute to physical and emotional health and well-being (World Health Organization, 2005). Nevertheless, many people fail to incorporate exercise into their daily routines: National statistics have indicated that

*Faculty mentor

less than 20% of American adolescents and adults participate in sports or exercise activities on a daily basis (Bureau of Labor Statistics, 2008). Physical inactivity can lead to serious health consequences such as obesity, heart disease, Type 2 diabetes, musculoskeletal disease, and breast cancer (Bauman & Miller, 2004; Singh & Purohit, 2012). Sedentary behaviors may also increase the risk for depression (Teychenne, Ball, & Salmon, 2010).

Outdoor physical activity contributes to physical and emotional well-being (Brinkerhoff & Jacob, 1999; Howell, Dopko, Passmore, & Buro, 2011; Reese & Myers, 2007, 2012; Roszak, 2001; Roszak, Gomes, & Kanner, 1995; Totton, 2003). Sometimes people do not realize that there is a disconnect from nature that poses serious physical and psychological health risks. The lack of time spent outdoors in a natural environment has contributed to poor psychological well-being, emotional problems, and ill health (Kavetsos, 2011; Kuhn, 2001; Pilisuk & Joy, 2001; Roszak, 2001).

Immersion in nature has been found to increase vitality and happiness (Fredrickson, 2009; Joye, 2007; Ryan et al., 2010). Ecopsychology is a growing field that emphasizes that a reconnection with nature is essential to happiness and well-being (Roszak, 2001; Roszak et al., 1995; Totton, 2003). Time spent in a natural environment has been found to buffer stress and enhance mood (Davis, Lockwood, & Wright, 1991; Maller, Townsend, Pryor, Brown, & St. Leger, 2006; Passmore, 2011; Wells & Evans, 2003). In contrast to those who live in urban neighborhoods, those who live close to nature are more mindful, find life more meaningful, and have greater well-being (Brinkerhoff & Jacob, 1999; Howell, Passmore, & Buro, 2013; Wells & Evans, 2003). Nature therapy is an innovative experiential approach that has been integrated into many therapeutic practices, helping people immerse themselves in a natural environment to enhance their well-being (Berger & McLeod, 2006; Burns, 1998, 2009; Raanaas, Patil, & Hartig, 2012).

Running and Well-Being

Running provides an outlet to help improve and maintain physical and emotional health. Researchers have found that running improves mood (Boudreau & Giorgi, 2010; Chapman & De Castro, 1990), increases cognitive ability (Hillman, Belopolsky, Snook, Kramer, & McAuley, 2004), decreases stress and fatigue (Hanson & Neddle, 1974), increases work productivity (Coulson, McKenna, & Field, 2008), enhances self-image (Noakes, 2003), and contributes to overall well-being (Hillman et al., 2004).

Ultramarathons, races extending beyond the 26.2 mile marathon, have grown in popularity over the past decade. Although 26,842 people participated in ultramarathons in 2000, participation increased to 46,280 in 2012 (Medinger, 2011). Ultrarunners run longer distances and spend extensive periods of time in nature compared to short-distance runners.

Runners often develop a sense of achievement and purpose by overcoming the obstacle of distance. Researchers found that first-time female marathon runners experience self-discovery and personal change (Boudreau & Giorgi, 2010). For many, completing an ultramarathon is considered a mastery of the mind and body (Runs, 2013). In a phenomenological study of 26 ultrarunners, preparation, management, discovery, personal achievement, and a sense of community were the primary factors that characterized the ultrarunning experience (Simpson, Post, Young, & Jensen, 2014).

In his book, *Ultramarathon Man: Confessions of an All-Night Runner*, veteran ultrarunner Dean Karnazes (2006) described the role of ultrarunning in his life: "Some seek the comfort of their therapist's office, others head to the corner pub and dive into a pint, but I chose running as my therapy" (p. 86). Although there are numerous nonfiction books and memoirs written by ultrarunners, few studies have examined the impact of ultrarunning on well-being. Although the science behind the physical benefits of running has been established, research exploring the psychological benefits of ultramarathon running is in the beginning stages of development. The present study examined the impact of distance and nature on runners' *flow* and well-being.

Flow

Flow is complete absorption in the present moment, an optimal psychological state that often occurs during an enjoyable activity (Csíkszentmihályi, 1990, 1998). Flow is described as "the state in which people are so intensely involved in an activity that nothing else seems to matter, and such an experience is so enjoyable that people will carry it out even at a great cost, just for the sheer sake of doing it" (Csíkszentmihályi, 1990, p. 4). Csíkszentmihályi (1990) found that key components of flow are the balance between challenge and skills, an autotelic personality (i.e., those who

actively seek challenges and are driven to do things for the experience in itself), distortion of time, and a loss of self-awareness. Flow is an important vehicle for promoting a positive outlook on life, which contributes to increased health and longevity (Xu & Roberts, 2010).

Flow has been examined extensively with athletes (Jackson, 1988, 1992, 1995, 1996, 1999; Jackson & Roberts, 1992; Jackson, Kimiecik, Ford, & Marsh, 1998). Positive emotions facilitate flow and performance in athletes (Stavrou, Jackson, Zervas, & Karteroliotis, 2007). Chavez (2008) found that athletes must engage in positive thinking, mental preparation, and task orientation to get into flow. Exploring the characteristics of elite athletes can help illuminate ways of promoting optimal flow experiences among athletes (Jackson, 1996).

Long-distance runners may tap into this process to achieve a *runner's high*, a term often used to describe the flow experience (Wise, 2011). Weinberg (1999) investigated runners' flow during the Western States 100-Mile Endurance Race in 1997. Ultrarunners were highly motivated by one component of flow, the balance between perceived challenge and skill. When the challenge and mastery were in balance, flow was more likely to occur. This may explain why many runners desire to run longer distances: As they become acclimated to certain distances over time, their motivation to push the balance between challenge and skill leads to a gradual increase in mileage.

Runners' Personality

Personality profiles differ between athletes and nonathletes, and vary among athletes depending on the sport (Colley, Roberts, & Chipps, 1985; Dowd & Innes, 1981; Egloff & Gruhn, 1996; Nieman & George, 1987). In general, athletes tend to be more extraverted (Colley et al., 1985; Egloff & Gruhn, 1996) and more goal oriented (Acevedo, Dzewaltoski, Gill, & Noble, 1992) than nonathletes. Ultramarathon runners are more extraverted, open, and experience seekers compared to the general population (Hughes, Case, Stuempfle, & Evans, 2003). Hughes et al. (2003) argued that runners who were able to complete ultramarathons did so because of their personality. Ultramarathon runners thrive on energy, optimism, and curiosity, which enhance their desire and competitive drive to take on the challenge of an ultramarathon.

Gray (1987) argued that certain personality characteristics help people create life events that have an effect on their well-being. Gray found a connection between extraversion, positive affect, and approach behavior, in which people seek out positive events/situations. On the other hand, those who are neurotic are more likely to avoid negative affect and events. Extraverts are more likely to seek out fulfilling social interactions that promote higher levels of happiness and well-being (Argyle & Lu, 1990; Hills, Argyle, & Reeves, 2000; Pavot, Diener, & Fuijita, 1990; Watson, Clark, McIntyre, & Hamaker, 1992; Yik & Russell, 2001). Agreeableness and conscientiousness are also related to happiness (McCrae & Costa, 1991). Because personality is an important characteristic that distinguishes athletes, the present study explored whether there were differences in personality between short-distance and ultrarunners, and the extent to which personality predicted runners' well-being.

The Present Study

The present study aimed to close the gap in the literature, examining the extent to which nature and distance have an impact on runners' flow and well-being. Although many runners enjoy running around their neighborhoods or on a treadmill, others choose a natural environment such as trails, mountains, and beaches. The amount of time spent immersed in a natural environment varies between runners.

Running 4 hr in a natural environment compared to 30 to 45 min on a treadmill inside a gym may have very different effect on a person's well-being. Researchers found that long-distance running promotes an enhanced sense of self and well-being (Boudreau & Giorgi, 2010). Simpson et al. (2014) found that ultrarunners reported feeling spiritual, connected with a higher power, and a sense of unity with nature. McDonald, Wearing, and Pointing (2009) found that immersion in nature had positive effect on flow. Nature had a positive effect on mood, which can enhance both flow and performance for athletes (Stavrou et al., 2007).

For the present study, we predicted that being an ultrarunner, running in nature, and personality characteristics of extraversion, conscientiousness, and openness would contribute to greater flow. We also hypothesized that being an ultrarunner, running in nature, personality characteristics (i.e., extraversion, conscientiousness, and openness), and flow would predict greater well-being.

Method

Participants

One hundred eighty-nine runners (132 women, 57

men, M_{age} = 35.93 years, *SD* = 9.66) were recruited from a small private liberal arts school on the West Coast, as well as through postings in local running shops, social media, and e-mails to local running groups. Of the 189 participants, 52% were married, 27.9% were single, and 13% were cohabitating. Seventy-nine percent of participants were from the United States. The rest were from countries including the United Kingdom, Canada, and Australia. Forty-two percent reported that their highest education was a bachelor's degree; 35.4% had a graduate degree; 21.6% attended some college; and 1% obtained a high school diploma. Approximately 90% of participants self-identified as European American, and the rest identified as Hispanic/Latino/a (6%), Asian/Pacific Islander (2%), American Indian/Native American (1%), and other (1%).

Participants reported having between 1 and 45 years of running experience (*M* = 10.44, *SD* = 8.73). Of the 189 participants, 36% identified as ultramarathon runners (50 km+), 33% as long-distance runners (5 km to half marathon), 20% as marathon runners, 9% as short-distance runners (less than 5 km), and 1% did not identify as a runner (1% was missing).

Measures

Runner identity. Runner identity was assessed by a self-report measure created for the purposes of the present study. Some of the questions included "How many days per week do you run;" "In an average week, what is your total distance ran;" "Enter the number of hours per week you run;" "To date, what is the longest distance you have run;" "Are you currently active as an ultrarunner;" "Do you consider yourself an ultrarunner;" and "How many ultramarathons have you completed in the last year?" Participants were also asked, "As a runner, how would you identify yourself?" For this question, they were provided the following choices, as well as an open-ended response option: (a) nonrunner, (b) short-distance runner (less than 5K), (c) long-distance runner (5K to half marathon), (d) marathon runner (26.2 mi), (e) ultramarathon runner (50K+), and (f) other ____.

Personality traits. The Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003) is a valid and reliable personality measure. Gosling et al. (2003) found that the TIPI has test-retest reliability and alternate forms reliability, converging with widely used Big-Five measures of self, observer, and peer reports. Short scales of personality traits have been found to be just as valid as long scales (Burisch, 1997). The Big Five personality characteristics (i.e., openness, conscientiousness, extraversion, agreeableness, and neuroticism) were individually assessed by summing the items of each subscale, and obtaining the means. Cronbach's alphas for the following subscales indicated good reliability and internal consistency, extraversion (α = .74), conscientiousness (α = .62), and neuroticism (α = .69). Cronbach's alphas for openness (α = .45) and agreeableness (α = .34) were low. However because they were two-item scales, they were incorporated for exploratory analyses.

Flow. Jackson and Marsh's (1996) Flow State Scale is a 36-item measure used to assess runners' overall flow experience defined as being completely immersed and absorbed in an activity in the present moment. Examples of items included "I knew clearly what I wanted to do," "My attention was focused entirely on what I was doing," and "Things just seem to happen automatically." Each item was rated on a 5-point Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*). An overall composite score of flow was calculated by summing the responses and obtaining the mean. Cronbach's alpha indicated that the measure had good reliability and internal consistency for this sample (α = .89).

Running environment. Prior to the present study, no measure of running environment existed. For the purpose of the present study, a measure was created assessing how often participants run in a natural environment where the surface is nonnatural. First, participants identified whether they ran in the following natural environments: (a) at the beach, (b) on a trail in the mountains, (c) on a natural path, (d) on grass, and (e) in other natural environments. Next, participants were asked to describe whether they ran on nonnatural surfaces such as (a) around their neighborhood, (b) in the city, (c) on an inside track, or (d) on a treadmill at the gym. Participants were asked to rate how often they ran in each environment ranging from 1 (*never*) to 5 (*every day*). Items were summed, and the mean was obtained to provide a score indicating the frequency of running in natural and nonnatural environments.

Well-being. The Measure of Well-Being Scale (Côté, Gyurak, & Levenson, 2010) was used to assess subjective well-being. This measure was validated and verified by administrating it along with the Satisfaction With Life Scale (Diener, Emmons,

Larsen, & Griffin, 1985), indicating that these two measures were strongly correlated. Participants were asked to describe their overall well-being, rating five statements on a 5-point Likert-type scale, ranging from 1 (*not at all true of me*) to 5 (*extremely true of me*). Some examples of the statements are "My daily life is full of things that keep me interested," "Most of the time I feel happy," and "It often seems that my life has no meaning." Three of the statements were reverse scored. The mean was calculated to obtain a composite score of subjective well-being. Cronbach's alpha indicated that the measure had good reliability and internal consistency for this sample ($\alpha = .81$).

Procedures

The study was approved by the institutional review board in accordance with ethical standards and protection of human subjects (protocol #2012083). Participants were recruited through social media, local runners groups, postings at local gyms, and through flyers at a local university campus. The survey was administered via a web-based survey tool, Qualtrics®. An online survey method was used to allow a wider range of runners from around the world to participate. Participation in the survey was completely voluntary. No incentives were given to participants. The survey took approximately 20 min to complete. Eighty percent of participants who began the survey finished it.

Results

Runners ran between 5 and 80 miles per week ($M = 33.74$, $SD = 20.36$). Of the 189 participants, 36% ran in a natural environment weekly to every day. Descriptive statistics and correlations of all key variables are shown in Table 1. Thirty-six percent identified as ultrarunners, 33% as long-distance runners, 20% as marathon runners, 9% as short-distance runners, and 1% did not identify as a runner, although they ran regularly. Because a large percentage identified as ultrarunners, comparative analyses were conducted to examine differences between ultrarunners and nonultrarunners.

TABLE 1

Descriptive Statistics and Correlations of Key Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. Ultrarunner	0.39	0.49	—							
2. Nature	2.28	0.71	.34***	—						
3. Openness	5.67	1.06	.07	.26***	—					
4. Conscientiousness	5.66	1.19	.003	-.02	.11	—				
5. Extraversion	4.46	0.84	-.07	.08	.06	-.05	—			
6. Agreeableness	4.40	0.93	-.07	.02	.05	-.22**	.22**	—		
7. Neuroticism	4.30	0.79	-.15	-.14	-.11	.01	.03	.11	—	
8. Total flow	4.04	0.57	.26***	.26***	.30***	.31***	.16*	.13	.01	—
9. Well-being	4.20	0.73	.07	-.04	.29***	.24***	.15*	-.08	-.07	.20**

Note. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Pearson's correlational analyses were conducted to examine the relationships between key variables (see Table 1). There was a moderate positive correlation between running distance and flow, $r(174) = .26$, $p = .001$. Running in a natural environment was positively associated with flow, $r(174) = .26$, $p = .001$, but not significantly related to well-being, $r(187) = -.04$, $p = .63$. Those who were more open ran more often in nature, $r(182) = .26$, $p = .001$. They also reported greater flow, $r(182) = .30$, $p = .001$, and well-being, $r(182) = .29$, $p = .001$. Conscientiousness was also associated with greater flow, $r(183) = .31$, $p = .001$, and well-being, $r(183) = .24$, $p = .001$. There were low correlations between extraversion and flow, $r(183) = .16$, $p = .03$, and well-being, $r(183) = .15$, $p = .04$. Flow was related to greater well-being, $r(183) = .20$, $p = .008$.

Independent-samples *t* tests were conducted to examine differences in distance ran per week, time spent running in nature, personality traits, flow, and well-being for ultrarunners and nonultrarunners. Those who identified themselves as ultrarunners ran more miles per week ($M = 42.67$, $SD = 19.84$) than nonultrarunners ($M = 27.04$, $SD = 18.19$), $t(110) = -4.33$, $p = .001$. Ultrarunners ran more often in natural environments (e.g., on trails and in mountains; $M = 2.57$, $SD = 0.62$) than nonultrarunners ($M = 2.08$, $SD = 0.71$), $t(174) = -4.77$, $p = .001$. Ultrarunners ($M = 4.40$, $SD = 0.78$) scored higher on neuroticism than nonultrarunners ($M = 4.16$, $SD = 0.79$), $t(184) = -2.10$, $p = .04$. Although ultrarunners experienced greater flow ($M = 4.23$, $SD = 0.50$) than nonultrarunners ($M = 3.92$, $SD = 0.58$, $t(184) = -3.70$, $p = .001$, there was no difference in subjective well-being, $t(184) = -0.91$, $p = .37$.

Multiple regression analyses were conducted to examine the extent to which being an ultrarunner, running in nature, and personality traits (i.e., openness, conscientiousness, extraversion, agreeableness, and neuroticism) contributed to flow. Ultrarunners were coded as 1, and all other runners were coded as 0. The final model was trimmed excluding the nonsignificant variables. As shown in Table 2, being an ultrarunner ($\beta = .23$), running in nature ($\beta = .13$), conscientiousness

(β = .30), and openness (β = .22) significantly predicted flow, accounting for 27% of the variance, $R = .52$, $R^2 = .27$, $F(7, 163) = 8.48$, $p = .001$. Extraversion, agreeableness, and neuroticism did not significantly contribute to flow.

To test the second hypothesis, multiple regression analyses were conducted to examine the extent to which being an ultrarunner, running in nature, personality characteristics (e.g., extraversion, conscientiousness, and openness), and flow contributed to well-being. The final model was trimmed excluding the nonsignificant variables. As shown in Table 3, running in a nonnatural environment (β = -.17), extraversion (β = .18), conscientiousness (β = .18), and openness (β = .29) contributed to predicting greater well-being, accounting for 19% of the variance in well-being, $R = .43$, $R^2 = .19$, $F(8, 161) = 4.57$, $p = .001$. Being an ultrarunner and flow did not significantly contribute to well-being.

Discussion

Ultrarunners ran more miles per week and spent more extensive periods of time in a natural environment than nonultrarunners, which is consistent with Medinger's (2011) findings. Contrary to expectations, rather than being more extraverted, open, and conscientious, ultrarunners reported higher neuroticism than nonultrarunners. Gray (1987) found that neuroticism is linked to avoidance of negative events and affect. Perhaps ultrarunners utilize running as an outlet to relieve stress and cope with negative life events. Ultrarunners may have certain personality characteristics that contribute to why they choose to run such long distances (Hughes et al., 2003). As a veteran ultrarunner, Karnazes (2006) argued that rather than seeking the comfort in a therapist's office, some ultrarunners choose running as therapy.

Being an ultrarunner, running in nature, and personality characteristics of conscientiousness and openness contributed to runners' flow, complete immersion in the activity of running. Csíkszentmihályi (1990) argued that flow occurs during times of great exertion: "The best moments usually occur when a person's body or mind is stretched to its limits in a voluntary effort to accomplish something difficult or worthwhile" (p. 3). This encapsulates an ultrarunner's experience.

Findings confirmed that running in a natural environment contributes to runners' experience of flow. Ultrarunners' sense of connectedness with nature may help them disconnect from technology and a face-paced lifestyle, enabling them to focus in the present moment to experience flow. Researchers have found that immersion in nature has a positive impact on the experience of flow (MacAloon & Csíkszentmihályi, 1974; McDonald et al., 2009; Mitchell, 1985). Nature plays a role in enhancing peak experiences (Maslow, 1964; Stavrou et al., 2007) and has a positive impact on mood (Davis et al., 1991; Passmore, 2011).

Although there was only a small correlation between extraversion and flow, consistent with previous research, conscientiousness and openness contributed to greater flow (Costa & McCrae, 1992; Hughes et al., 2003). Conscientiousness has been related to goal orientation and dedication (Costa & McCrae, 1992). Those who are goal oriented and hardworking are more likely to focus on a task at hand, a fundamental aspect of flow. In addition, those who are open to new experiences are more likely to experience flow (Csíkszentmihályi, 1993). The influence of personality on flow appears to be multidimensional, affecting the choice of activity, a person's environment, and their overall perception of the experience.

Personality was also a primary factor associated with runners' well-being. Specifically, extraversion, conscientiousness, and openness contributed to greater well-being. This was consistent with previous research indicating that ultrarunners tend to be more extraverted and open (Hughes et al., 2003). Those who are more extraverted are more likely to seek out life events and fulfill social interactions that promote happiness and well-being (Argyle & Lu, 1990; Gray, 1987; Hills et al., 2000; Pavot et al., 1990; Watson et al., 1992; Yik & Russell, 2001). McCrae and Costa (1991) found that conscientiousness was related to greater happiness, which was consistent with findings from the present study.

Contrary to expectations, being an ultrarunner, distance, and nature did not have an impact on runners' well-being. These findings were

TABLE 2

Multiple Regression for Factors Predicting Flow

Variable	B	SE (B)	β	*t*
Ultrarunner	.26	.08	.23	3.20**
Natural Environment	.10	.06	.13	1.78*
Personality:				
Conscientiousness	.14	.03	.30	4.39***
Openness	.12	.04	.22	3.09**

Note. *$p < .05$. **$p < .01$. ***$p < .001$. $R = .52$, $R^2 = .27$, $F(7, 163) = 8.48$, $p < .001$.

inconsistent with previous studies that indicated that running distance is associated with greater well-being (Boudreau & Giorgi, 2010; Chapman & De Castro, 1990; Hanson & Neddle, 1974; Hill et al., 2004; Noakes, 2003). Boudreau and Giorgi (2010) found that marathon runners reported a stronger sense of self and well-being. Further research should involve neurological testing of cortisol levels for trail and ultrarunners. It is possible that runners may be unaware of the extent to which running long distances and running in natural environments influences well-being. Assessing cortisol levels before and after long-distance runs, or pre- and posttraining season, may help shed light on the neurobiological and psychological effects. In addition, by observing the progression of short-distance runners to becoming long-distance ultramarathon runners, researchers could also examine tolerance, persistence, flow, and well-being in relation to running distance.

Although running in a natural environment significantly predicted greater levels of flow, there was no significant effect of nature on well-being. This was inconsistent with research showing that nature enhances vitality, mood, and well-being (Brinkerhoff & Jacob, 1999; Fredrickson, 2009; Howell et al., 2011; Joye, 2007; Ryan et al., 2010). Perhaps the physiological and neurological effects of running contribute to well-being over and above being immersed in a natural environment.

One limitation of the present study was the challenge of finding an adequate measure of running environment. Because there was no previously established measure, one was created for this study to assess the running surface and environment. For example, running on a trail or in the mountains was coded as natural environment, and running in the gym was coded as a nonnatural environment. Participants were asked to rate each environment on a 5-point Likert-type scale from 1 (*never*) to 5 (*every day*). Few individuals indicated that they ran in only one type of environment. Most participants ran in both natural and nonnatural environments. Researchers have found that simply viewing nature through a window can enhance well-being (Raanaas et al., 2012). This makes it difficult to discern the unique impact of running in a natural environment. A person who runs around their neighborhood surrounded by gardens and trees may receive the same benefit as someone who is running on trails in the mountains. Comparative analyses between those who run only in nonnatural environments such as at the gym and those who only run in natural settings such as on trails would provide more accurate information regarding the specific impact that environment has on flow. Future research is needed to utilize a more reliable and valid measure of running environment to better understand the impact of nature on flow and well-being.

TABLE 3

Multiple Regression for Factors Predicting Well-Being

Variable	B	SE (B)	β	*t*
Ultrarunner	.14	.12	.10	1.18
Natural Environment	-.17	.08	-.17	-2.16*
Personality:				
Extraversion	.15	.06	.18	2.37*
Conscientiousness	.11	.05	.19	2.41*
Openness	.20	.05	.29	3.73**

Note. $^{*}p < .05$. $^{**}p < .001$. $R = .43$, $R^2 = .19$, $F(8, 161) = 4.57$, $p < .001$.

Results revealed a low correlation between flow and well-being. However, contrary to expectations, flow was not a significant predictor of well-being among runners. There are several important factors to consider when examining the phenomenological experience of flow in retrospect. Although a connection between ultrarunning and flow has been established, further research is needed to better understand the immediate flow experience while running. Hughes et al. (2003) conducted a study having runners describe their flow experiences every 10 miles at the aid stations. This method may elicit more genuine and immediate responses.

Another limitation of the present study was selection bias. Most participants were long-distance runners and ultrarunners. To better assess the impact of running distance on flow and well-being, it would be beneficial to compare ultrarunners with short- and long-distance runners. Furthermore, although postings were placed in local gyms, on a college campus, and with several local running groups, the study could have been advertised to a more diverse sample of runners. There was a large percentage of female participants, which could be relative to the female-dominated sport, and the large percentage of women on college campuses. In addition, the sample was mainly representative of ultrarunners in southern California, which may not adequately represent the general population of runners in the United States. Nevertheless, the sample did include diverse participants from

various countries including Canada, the United Kingdom, and Australia.

Cross-cultural research is needed to examine similarities and differences in flow and well-being between individualistic and interdependent cultures. Researchers have found that individuals experience flow differently when in a group compared to when alone, reporting that group settings promote higher levels of flow and well-being among Japanese adults (Hirao, Kobayashi, Okishima, & Tomokuni, 2012). Future research should also examine the relationship between flow and mindfulness, which may have a more direct impact on well-being. Kabat-Zinn (2003) defined mindfulness as awareness that arises through purposefully and nonjudgmentally paying attention to the present moment, which can reduce stress and enhance overall well-being.

In general, there has been a lack of research investigating the ultrarunning experience. Researchers can gain a better understanding of this population by examining the motivation, personality, and routines of ultrarunners. Future research should investigate personality types of ultrarunners using a more in-depth measure of personality such as the NEO-II. It would also be interesting to examine the extent to which ultrarunners are addicted to running. There is a growing body of research investigating the relationship between running and addiction (Kanarek, D'Anci, Jurdak, & Mathes, 2009; Smith, Wright, & Winrow, 2010). However, running has also been found to be a coping mechanism, which may explain why some individuals desire to run ultramarathons (Basson, 2001; Karnazes, 2006; Leedy, 2000). Further investigation of the various motives for running would shed light on what compels individuals to run marathons and ultramarathons.

Short-distance runners who only run in urban environments may benefit from running in nature and pushing their limits to run longer distances. Personal challenge and feelings of achievement are cornerstones of ultrarunning. Ultrarunning is an activity that requires dedication, mental toughness, and physical stamina beyond that of the traditional marathon. Although 5 km, 10 km, and marathon races are popular, ultrarunning has roots deeper than merely being a recreational activity. Because running is a part of evolutionary history, ultramarathons are essentially the return of humans' instinctive nature to follow in the path of their ancestors' footsteps.

References

Acevedo, E. O., Dzewaltoski, D. A., Gill, D. L., & Noble, J. M. (1992). Cognitive orientations of ultramarathoners. *The Sport Psychologist, 6*, 242–252. Retrieved from http://www.humankinetics.com/acucustom/sitename/Documents/DocumentItem/8176.pdf

Argyle, M., & Lu, L. (1990). The happiness of extraverts. *Personality and Individual Differences, 11*, 1011–1017. doi:10.1016/0191–8869(90)90128–E

Basson, C. J. (2001). Personality and behavior associated with excessive dependence on exercise: Some reflections from research. *South African Journal of Psychology, 31*(2),53–59.doi:10.1177/008124630103100207

Bauman, A. E., & Miller, Y. D. (2004). The public health potential of health enhancing physical activity (HEPA). In P. Oja & J. Borms (Eds.), *Health enhancing physical activity* (pp. 125–149). Oxford, United Kingdom: Oxford, Meyer, and Meyer Sport Publishers.

Berger, R., & McLeod, J. (2006). Incorporating nature into therapy: A framework for practice. *Journal of Systemic Therapies, 25*, 80–94. doi:10.1521/jsyt.2006.25.2.80

Boudreau, A. L, & Giorgi, B. (2010). The experience of self-discovery and mental change in female novice athletes in connection to marathon running. *Journal of Phenomenological Psychology, 41*, 234–267. doi:10.1163/156916210X532144

Bramble, D. M., & Lieberman, D. E. (2004). Endurance running and the evolution of Homo. *Nature, 432*, 345–352. doi:10.2307/1387610

Brinkerhoff, M. B., & Jacob, J. C. (1999). Mindfulness and quasireligious meaning systems: An empirical exploration within the context of ecological sustainability and deep ecology. *Journal for the Scientific Study of Religion, 38*, 524–542.

Bureau of Labor Statistics. (2008). *Sports and exercise*. U.S. Department of Labor Statistics. Last modified May 15, 2008. Retrieved from http://www.bls.gov/spotlight/2008/sports/

Burisch, M. (1997). Test length and validity revisited. *European Journal of Personality, 11*, 303–315. doi:10.1002/(SICI)1099-0984(199711)11:4=303::AID-PER292>3.0.CO;2-#

Burns, G. W. (1998). *Nature-guided therapy: Brief integrative strategies for health and well-being*. Philadelphia, PA: Brunner/Mazel.

Burns, G. W. (2009). Can you be happy in pain? Applying positive psychology, mindfulness, and hypnosis to chronic pain management. In G. W. Burns (Ed.), *Happiness, healing, enhancement: Your casebook collection for applying positive psychology in therapy* (pp. 202–213). Hoboken, NJ: John Wiley & Sons.

Chapman C. L., & De Castro, J. M. (1990). Running addiction: Measurement and associated psychological characteristics. *The Journal of Sports Medicine and Physical Fitness, 30*, 283–290. Retrieved from http://www.researchgate.net/publication/20888832_Running_addiction_measurement_and_associated_psychological_characteristics

Chavez, E. J. (2008). Flow in sport: A study of college athletes. *Imagination, Cognition, and Personality, 28*, 69–91. doi:10.2190/IC.28.1.f

Colley, A., Roberts, N., & Chipps, A. (1985). Sex-role identity, personality, and participation in team and individual sports by males and females. *International Journal of Sport Psychology, 16*, 103–112.

Costa, P. T., Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor-Inventory (NEO-FFI) professional manual*. Odessa, FL: Psychological Assessment Resources.

Côté, S., Gyurak, A., & Levenson, R. W. (2010). The ability to regulate emotion is associated with greater well-being, income, and socioeconomic status. *Emotion, 10*, 923–933. doi:10.1037/a0021156

Coulson, J., McKenna, J., & Field, M. (2008). Exercising at work and self-reported work performance. *International Journal of Workplace Health Management, 1*, 176–197. doi:10.1108/17538350810926534

Csíkszentmihályi, M. (1990). *Flow: The psychology of optimal experience*. New York, NY: Harper & Row Publishers.

Csíkszentmihályi, M. (1993). *The evolving self: A psychology for the third millennium*. New York, NY: HarperCollins.

Csíkszentmihályi, M. (1998). *Finding flow: The psychology of engagement with everyday life*. New York, NY: Harper & Row Publishers.

Davis, J., Lockwood, L., & Wright, C. (1991). Peak–experiences among Japanese youth. *Journal of Humanistic Psychology, 47*, 524–540. doi:10.1177/0022167806296857

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction

With Life Scale. *Journal of Personality Assessment, 49*, 71–75.
Dowd, R., & Innes, J. M. (1981). Sport and personality: Effects of type of sport and level of competition. *Perceptual and Motor Skills, 53*, 79–89. doi:10.2466/pms.1981.53.1.79
Egloff, B., & Gruhn, A. J. (1996). Personality and endurance sports. *Personality and Individual Differences, 21*, 223–229. doi:10.1016/0191-8869(96)00048-7
Ernersson, Å. L., Lindström, T., Nyström, F. H., & Frisman, G. H. (2010). Young healthy individuals develop lack of energy when adopting an obesity provoking behavior for 4 weeks: A phenomenological analysis. *Scandinavian Journal of Caring Sciences, 24*, 565–571. doi:10.1111/j.1471-6712.2009.00750.x
Fredrickson, B. (2009). *Positivity*. New York, NY: Random House Inc.
Gosling, S. D., Rentfrow, P. J, & Swann, W. B. (2003). A very brief measure of the Big-Five personality domain. *Journal of Research in Personality, 37*, 504–528. doi:10.1016/S0092-6566(03)00046-1
Gray, J. A. (1987). Perspectives on anxiety and impulsivity: A commentary. *Journal of Research in Personality, 21*, 493–509. doi:10.1016/0092-6566(87)90036-5
Hanson, J. S., & Neddle, W. H. (1974). Long-term physical training effect in sedentary females. *Journal of Applied Physiology, 37*, 112–116. Retrieved from http://jap.physiology.org/content/37/1/112
Heinrich, B. (2001). *Why we run: A natural history*. New York, NY: Harper Collins.
Hillman, C. H., Belopolsky, A. V., Snook, E. M., Kramer, A. F., & McAuley, E. (2004). Physical activity and executive control: Implications for increased cognitive health during older adulthood. *Research Quarterly for Exercise and Sport, 75*, 176–185. doi:10.1080/02701367.2004.10609149
Hills, P., Argyle, M., & Reeves, R. (2000). Individual differences in leisure satisfactions: An investigation of four theories of leisure motivation. *Personality and Individual Differences, 28*, 763–779. doi:10.1016/S0191-8869(99)00137-3
Hirao, K., Kobayashi, R., Okishima, K., & Tomokuni, Y. (2012). Flow experience and health-related quality of life in community dwelling elderly Japanese. *Nursing and Health Sciences, 14*, 52–57. doi:10.1111/j.1442-2018.2011.00663.x
Howell, A. J., Dopko, R. L, Passmore, H., & Buro, K. (2011). Nature connectedness: Associations with well-being and mindfulness. *Personality and Individual Differences, 51*, 166–171. doi:10.1016/j.paid.2011.03.037
Howell, A. J., Passmore, H., & Buro, K. (2013). Meaning in nature: Meaning in life as a mediator of the relationship between nature connectedness and well-being. *Journal of Happiness Studies, 14*, 1681–1696. doi:10.1007/s10902-012-9403-x
Hughes, S. L., Case, H. S., Stuempfle, K. J., & Evans, D. S. (2003). Personality profiles of Iditasport ultramarathon participants. *Journal of Applied Sport Psychology, 15*, 256–261. doi.org/10.1080/10413200305385
Jackson, S. A. (1988). *Positive performance states of athletes: Toward a conceptual understanding of peak performance* (Unpublished master's thesis). University of Illinois at Urbana-Champaign, Champaign, IL.
Jackson, S. A. (1992). Athletes in flow: A qualitative investigation of flow states in elite figure skaters. *Journal of Applied Sport Psychology, 4*, 161–180. doi:10.1080/10413209208406459.
Jackson, S. A. (1995). Factors influencing the occurrence of flow state in elite athletes. *Journal of Applied Sport Psychology, 7*, 138–166. doi:10.1080/10413209508406962
Jackson, S. A. (1996). Toward a conceptual understanding of the flow experience in elite athletes. *Research Quarterly for Exercise and Sport, 67*, 76–90. doi:10.1080/02701367.1996.10607928.
Jackson, S. A. (1999). Joy, fun, and flow state in sport. In Y. L. Hanin (Ed.), *Emotions in sport* (pp. 135–155). Champaign, IL: Human Kinetics.
Jackson, S. A., Kimiecik, J. C., Ford, S. K., & Marsh, H. W. (1998). Psychological correlates of flow in sport. *Journal of Sport and Exercise Psychology, 20*, 358–378. Retrieved from https://ess220.files.wordpress.com/2008/02/jackson-19981.pdf
Jackson, S. A., & Marsh, H. W. (1996). Development and validation of a scale to measure optimal experience: The Flow State Scale. *Journal of Sport and Exercise Psychology, 18*, 17–35. Retrieved from http://journals.humankinetics.com/jsep-back-issues/JSEPVolume18Issue1March/
Jackson, S. A., & Roberts, G. C. (1992). Positive performance states of athletes: Toward a conceptual understanding of peak performance. *The Sport Psychologist, 6*, 156–171. Retrieved from http://journals.humankinetics.com/tsp-back-issues/TSPVolume6Issue2June/
Joye, Y. (2007). Architectural lessons from environmental psychology: The case of biophilic architecture. *Review of General Psychology, 11*, 305–328. doi:10.1037/1089-2680.11.4.305
Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice, 10*, 144–156. doi:10.1093/clipsy.bpg016
Kanarek, R. B., D'Anci, K. E., Jurdak, N., & Mathes, W. F. (2009). Running and addiction: Precipitated withdrawal in a rat model of activity-based anorexia. *Behavioral Neuroscience, 123*, 905–912. doi:10.1037/a0015896
Karnazes, D. (2006). *Ultramarathon man: Confessions of an all-night runner*. New York, NY: J. P. Tarcher/Penguin.
Kavetsos, G. (2011). Physical activity and subjective well-being: An empirical analysis. In G. Rodriguez, S. Kesenne, & B. R. Humphreys (Eds.), *The economics of sport, health and happiness: The promotion of well-being through sporting activities* (pp. 213–222). Cheltenham, UK: Edward Elgar.
Kuhn, J. L. (2001). Toward an ecological humanistic psychology. *Journal of Humanistic Psychology, 41*, 9–24. doi:10.1177/0022167801412003
Leedy, M. G. (2000). Commitment to distance running: Coping mechanism or addiction? *Journal of Sport Behavior, 23*, 255–270. Retrieved from https://www.questia.com/read/1G1-65306581/
MacAloon, J. J., & Csíkszentmihályi, M. (1974). Deep play and the flow experience in rock climbing. In M. Csíkszentmihályi (Ed.), *Beyond boredom and anxiety* (pp. 74–101). San Francisco, CA: Jossey-Bass.
Maller, C., Townsend, M., Pryor, A., Brown, P., & St. Leger, L. (2006). Healthy nature, healthy people: 'Contact with nature' as an upstream promotion intervention for populations. *Health Promotion International, 21*, 45–54. doi:10.1093/heapro/dai032
Maslow, A. H. (1964). *Religions, values, and peak-experiences*. New York, NY: The Viking Press.
McCrae, R. R., & Costa, P. T. (1991). Adding *Liebe* und *Arbeit*: The full five-factor model and well-being. *Personality and Social Psychology Bulletin, 17*, 227–232. doi:10.1177/014616729101700217
McDonald, M. G., Wearing, S., & Pointing, J. (2009). The nature of peak experience in wilderness. *The Humanistic Psychologist, 37*, 370–385. doi:10.1080/08873260701828912
Medinger, J. (2011). The year in review. *UltraRunning, 30*(9), 27–32.
Mitchell, R. G. (1985). *Mountain experience: The psychology and sociology of adventure*. Chicago, IL: University of Chicago Press.
Noakes, T. D. (2003). *Lore of running* (4th ed.). Champaign, IL: Human Kinetics.
Nieman, D. C., & George, D. M. (1987). Personality traits that correlate with success in distance running. *Journal of Sports Medicine and Physical Fitness, 27*, 345–356.
Passmore, H. (2011). Feeling blue—get green: The benefits of nature on our mental health and well-being. *Earth Common Journal, 1*, 80–86.
Pavot, W., Diener, E., & Fujita, F. (1990). Extraversion and happiness. *Personality and Individual Differences, 11*, 1299–1306. doi:10.1016/0191-8869(90)90157-M
Pilisuk, M., & Joy, M. (2001). Humanistic psychology and ecology. In K. J. Schneider, J. F. T. Bugental, & J. F. Pierson (Eds.), *Handbook of humanistic psychology* (pp.101–114). doi:10.4135/9781412976268.n9
Raanaas, R. K., Patil, G. G., & Hartig, T. (2012). Health benefits of a view of nature through the window: A quasi-experimental study of patients in a rehabilitation center. *Clinical Rehabilitation, 26*, 21–32. doi:10.1177/0269215511412800
Reese, R. F., & Myers, J. E. (2012). EcoWellness: The missing factor in holistic wellness models. *Journal of Counseling and Development, 90*, 400–406. doi:10.1002/j.1556-6676.2012.00050.x
Roszak, T. (2001). *The voice of the earth: An exploration of ecopsychology*. Grand Rapids, MI: Phanes Press.
Roszak, T., Gomes, M. E., & Kanner, A. D. (1995). *Ecopsychology: Restoring the mind, healing the earth*. San Francisco, CA: Sierra Club Books.
Runs, V. (2013). *The summit seeker*. San Bernardino, CA: Y42K Publication Services.
Ryan, R. M., Weinstein, N., Bernstein, J., Brown, K. W., Mistretta, L., & Gagné, M. (2010). Vitalizing effects of being outdoors and in nature. *Journal of Environmental Psychology, 30*, 159–168. doi:10.1016/j.jenvp.2009.10.009
Simpson, D., Post, P. G., Young, G., & Jensen, P. R. (2014). 'It's not about taking the easy road': The experiences of ultramarathon runners. *Sport*

Psychologist, 28, 176–185. doi:10.1123/tsp.2013-0064

Singh, A., & Purohit, B. (2012). Physical activity, sedentary lifestyle, and obesity among Indian dental professionals. *Journal of Physical Activity and Health, 9*, 563–570.

Smith, D. W., Wright, C. J., & Winrow, D. (2010). Exercise dependence and social physique anxiety in competitive and noncompetitive runners. *International Journal of Sport and Exercise Psychology, 8*, 61–69. Retrieved from http://www.e-space.mmu.ac.uk/e-space/handle/2173/97646

Stavrou, N. A., Jackson, S. A., Zervas, Y., & Karteroliotis, K. (2007). Flow experience and athletes' performance with reference to the orthogonal model of flow. *The Sport Psychologist, 21*, 438–457. Retrieved from http://www.academia.edu/371923

Teychenne, M., Ball, K., & Salmon, J. (2010). Sedentary behavior and depression among adults: A review. *International Journal of Behavioral Medicine, 17*, 246–254. doi:10.1007/s12529-010-9075-z

Totton, N. (2003). The ecological self: Introducing ecopsychology. *Counseling and Psychotherapy Journal, 14*, 14–17.

Watson, D., Clark, L. A., McIntyre, C. W., & Hamaker, S. (1992). Affect, personality, and social activity. *Journal of Personality and Social Psychology, 63*, 1011–1025. doi:10.1037/0022-3514.63.6.1011

Weinberg, G. (1999). Motivation in ultradistance runners: A reversal theory approach to optimal experience. *Dissertation Abstracts International: Section B: Sciences and Engineering, 60*(1-B), 0404.

Wells, N. M., & Evans, G. W. (2003). Nearby nature: A buffer of life stress among rural children. *Environment and Behavior, 35*, 311–330. doi:10.1177/0013916503251445

Wise, J. (2011, March). The tough track: How—and why—an average guy became an ultramarathoner. *Psychology Today*. Retrieved from https://www.psychologytoday.com/articles/201103/the-tough-track

World Health Organization. (2005). *Preventing chronic diseases: A vital investment*. Geneva, Switzerland: World Health Organizations.

Xu, J., & Roberts, R. E. (2010). The power of positive emotions: It's a matter of life or death—Subjective well-being and longevity over 28 years in a general population. *Journal of Health Psychology, 29*, 9–19. doi:10.1037/a0016767

Yik, M. S. M., & Russell, J. A. (2001). Predicting the Big Two of affect from the Big Five of personality. *Journal of Research in Personality, 35*, 247–277. doi:10.1006/jrpe.2001

Author Note. Christy Teranishi Martinez, Department of Psychology, California State University Channel Islands; Crista Scott, Department of Psychology, California Lutheran University.

Crista Scott is now a business owner, a consultant, and an ultrarunner.

Correspondence regarding this article should be addressed to Christy Teranishi Martinez, California State University Channel Islands, Psychology Program, 1 University Drive, Camarillo, CA 93012. E-mail: christy.teranishi-martinez@csuci.edu

Stress Management in Young Adults: Implications of Mandala Coloring on Self-Reported Negative Affect and Psychophysiological Response

Christina Muthard and Rebecca Gilbertson*
Lycoming College

ABSTRACT. The purpose of the present experiment was to assess the effectiveness of mandala coloring paired with focused breathing in reducing negative affect, state anxiety, and psychophysiological stress response following a psychosocial stressor. The current study employed a validated psychosocial stressor, the Trier Social Stress Test (Kirschbaum, Pirke, & Hellhammer, 1993) and consisted of four phases that included baseline (sitting and standing), Speech 1, Speech 2, and the poststress manipulation, which consisted of either 7-min of mandala coloring/focused breathing or a no-task control group. Self-reported negative and positive affect, state anxiety, and blood pressure were assessed once after each phase, whereas pulse, skin conductance levels, and heart rate were measured throughout the experiment. Results indicated that self-reported negative affect and state anxiety were lower in the mandala-coloring experimental group as compared to the no-task control group following the psychosocial stressor. Specifically, a marginally significant reduction was found in negative affect, $t(35) = -2.03$, $p = .05$, $\eta^2 = .11$, and a trend toward significant reduction was found in state anxiety, $t(35) = -1.76$, $p = .08$, $\eta^2 = .08$. These findings suggested modest support for the effectiveness of mandala coloring paired with already validated focused breathing as an effective technique for reducing self-reported negative affect and state anxiety. Implications and the need for further research to assess the combination of these techniques are discussed.

Within the United States, the presence of stress is reaching epidemic proportions (Everly & Lating, 2013). Evidence has suggested that 82.8% of adults in the United States will be exposed to traumatic events during their lifetime (Breslau, 2009). Notably, stressors do not need to be considered traumatic in order to have damaging effects. A stressor is defined as a stimulus that elicits a stress response (Everly & Lating, 2013). Stressors come in two different forms. Biogenic stressors directly initiate a stress response and include pain-evoking stimuli, exposure to extreme heat or cold, caffeine, nicotine, and prolonged exercise (Everly & Lating, 2013; Lovallo & Thomas, 2000). Psychosocial stressors can be described as real or imagined events that may elicit the stress response via a cognitive interpretation of the stressor (Everly & Lating, 2013). Examples of psychosocial stressors include public speaking tasks, mental arithmetic tasks, and other daily hassles (Everly & Lating, 2013; Lovallo & Thomas, 2000). Research has demonstrated that the presence of stressors are related to diseases of the gastrointestinal, cardiovascular, respiratory, and psychological systems (Everely & Lating, 2013). Therefore, it is important for clinicians to have a

  (VOL. 21, NO. 1/ISSN 2164-8204)

*Faculty mentor

variety of therapeutic tools to address the effects of stressors.

The main biological system that responds to a stressor, regardless of whether it is biogenic or psychosocial, is the sympathetic nervous system, also known as the *fight or flight* system (Everely & Lating, 2013). The sympathetic nervous system creates a fast and immediate response that allows the body to prepare to react to a threatening situation. Activation of the sympathetic nervous system results in the discharge of norepinephrine throughout the brain (Chrousos & Gold, 1992). The presence of norepinephrine results in enhanced arousal, vigilance, and anxiety. Additionally, the hippocampus and amygdala are the major brain regions involved in this system along with their relationship between the mesocortical and mesolimbic dopamine pathways that are activated during the stress response (Chrousos & Gold, 1992). During the stress response, 35% of epinephrine and norepinephrine are secreted from the adrenal medulla on the kidneys with the remainder being directly released in the blood stream by sympathetic nerve endings (al'Absi, 2007). Furthermore, catecholamines such as epinehprine impact organ systems by being transported throughout the body (al'Absi, 2007). Thus, the sympathetic nervous system is activated by a stressor, either biogenic or psychosocial, and catecholamines impact the brain and organ system to generate the fight or flight response.

In a threatening situation, the sympathetic nervous system is responsible for inducing the stress response. The stress response can be defined as a range of psychophysiological markers such as increased heart rate (HR), blood pressure (BP), and electrodermal activity as a result of frightening stimuli (Kirschbaum, Pirke, & Hellhammer, 1993). Electrodermal activity refers to the electrical activity occurring in a person's skin. Specifically, skin conductance level (SCL) refers to the tonic level of electrical conductivity of the skin. As a result of sympathetic activation, sweat rises toward the skin's surface in varying amounts from varying glands (Stern, Ray, & Quigley, 2001). The hydration of the skin with sweat increases SCL (Stern et al., 2001). Therefore, SCL should increase as a result of sympathetic activation resulting from a stressor.

The cardiovascular system is how the heart moves blood to various organs. Activation of the sympathetic nervous system produces arousal responses in the cardiovascular system (Stern et al., 2001). These responses include changes in HR, BP, and pulse volume. HR is defined as the number of heart beats that occur per min (Stern et al., 2001). Thus, as a result of a stressor, HR increases in beats per min (bpm). Another response that increases as a result of sympathetic activation is BP. BP is described as the necessary pressure the heart must produce to move blood through arteries, capillaries, and veins (Stern et al., 2001). The maximum amount of BP occurs when the heart contracts. This is referred to as systolic BP. Conversely, the minimum amount of BP occurs after contraction when the heart relaxes (Stern et al., 2001). This is referred to as diastolic BP. Notably, diastolic BP is more sensitive to cardiovascular assessment. Furthermore, mean arterial pressure can be calculated by adding 1/3 systolic BP to 2/3 diastolic BP. Mean arterial pressure represents the average arterial pressure of a single cardiac cycle. A single cardiac cycle includes contraction and relaxation of the cardiovascular system. Pulse volume is another cardiovascular response affected by sympathetic activation. Pulse volume is the change in blood flow as it relates to the pumping of the heart (Stern et al., 2001). Specifically, pulse volume is a measurement of the amplification of single pulse (Stern et al., 2001). Therefore, HR, BP, and pulse are all measures indicative of the psychophysiological stress response.

The biopsychosocial perspective implies that biological, psychological, and social forces work together to determine a person's health or vulnerability to disease (Straub, 2012). The belief in the biopsychosocial paradigm classifies the mind and body as entities that influence each other. Mind-Body Therapies (MBTs) align with the biopsychosocial paradigm and are defined as healing practices with the aim to use the mind's ability to affect biological functioning (Bertisch, Wee, Phillips, & McCarthy, 2009). MBTs are typically alternative therapies used in conjunction with other clinically supported therapies. MBTs include practices such as meditation, mindfulness, deep breathing, muscle relaxation, guided imagery, and biofeedback.

One mechanism of MBTs is mindfulness, which plays a role in treatment of psychological disorders along with use in nonclinical populations (Arch & Craske, 2006). Mindfulness can be described as fostering concentration, attention, and acceptance toward what a person is experiencing in the present moment (Arch & Craske, 2006). Further, focused breathing is a type of mindfulness technique. The premise of focused breathing is to have people become aware of the sensations of breathing while paying attention to experiences in the present

moment (Arch & Craske, 2006). Thus, focused breathing has been used to aid the parasympathetic nervous system to return the body to homeostasis after a stress response (Linehan, 1993).

Meditation is a technique that also falls under the category of MBTs. Meditation is described as a relaxing method that limits stimulus input and centers attention on a constant object of focus (Curry & Kasser, 2005). Therefore, the basic principles of meditation are similar to that of mindfulness, but mindfulness is more easily achieved with less practice. Some research has stated that meditation can be used as a relaxation or cognitive technique that could be of therapeutic benefit (Bertisch et al., 2009).

Art therapy is a highly unstudied treatment option with many potential benefits (Curry & Kasser, 2005). Art therapy channels the use of creativity and of art making to help elicit self-expression. This form of expression may help people create a visual representation of their mental state (Curry & Kasser, 2005). In particular, coloring therapy is the combination of art therapy with meditation (Curry & Kasser, 2005). Coloring not only encourages self-expression, but is also understood to produce a meditative state that could alleviate sentiments of anxiety (Curry & Kasser, 2005). In one study, participants in an art-making activity showed reduced anxiety and negative emotions compared to an art-viewing group (Bell & Robbins, 2007). One means to create this meditative state via an art-making process is through the use of a mandala.

A mandala is a circular art form that resembles geometric stained glass (Curry & Kasser, 2005). Mandalas were used in Eastern cultures as a form of meditation. In Sanskrit, the word *mandala* means *healing circle.* Carl Jung first suggested that the drawing of mandalas creates a trance-like or meditative state. Curry and Kasser (2005) along with a replication study by van der Vennet and Serice (2012) both concluded that mandala coloring reduced state anxiety significantly more than plaid pattern coloring or blank page-coloring. Another study similarly concluded that an art-making group that included a mandala activity showed significantly decreased levels of state anxiety following the art making (Sandmire, Gorham, Rankin, & Grimm, 2012). In other words, research has demonstrated that drawing, coloring, or tracing the mandala's structured pattern elicits a decrease in state anxiety and negative emotion understood to operate via that meditative state that these designs create.

The purpose of the current experiment was to assess the effects of mandala coloring and focused breathing on self-reported affect, state anxiety, and psychophysiological response following a psychosocial stressor. Notably, mandala coloring and focused breathing were used together in the present research. This decision was based in the literature in that coloring therapy can be defined as the combination of art therapy with meditation (Curry & Kasser, 2005). Therefore, to create a manipulation that was representative of the components of coloring therapy, focused breathing was used to enhance the meditative aspect of the definition. A control group that received no mandala coloring or focused breathing was included as a comparison. It was primarily hypothesized that the psychosocial stressor would produce elevated measures of self-reported negative affect, state anxiety, and psychophysiological response and reduce positive affect in all participants. It was further predicted that coloring a mandala paired with focused breathing would reduce self-reported affect, state anxiety, and psychophysiological response following a psychosocial stressor greater than controls.

Methods

Participants

Of the 37 participants in the current sample, 81% were women and 19% were men. Participants were primarily European American (81%). Other ethnicities that were represented were Asian (8%), African American (5%), and Hispanic (5%). The average age of participants was 19 years (SD = 1.22, range = 18–21). The sample was comprised of 54% first-year students, 11% sophomores, 16% juniors, and 19% seniors. Participants were undergraduate students attending a small liberal arts college in north central Pennsylvania. Participants were notified of the experiment via posters hung across campus to advertise the study. All participants were compensated $10 in cash for participation in the study. All procedures were approved by the local college-wide institutional review board, and the experiment was conducted according to the APA Ethical Principles of Psychologists and Code of Conduct (APA, 2010).

Materials

Self-reported positive and negative affect. The Positive and Negative Affect Schedule (PANAS) was used to assess positive and negative mood

(Watson, Clark, & Tellegan, 1988). Both positive and negative affect scores were dependent variables of the research. This instrument is a self-report survey consisting of 20 descriptor words in no particular order. A high positive score indicates that participants are in an energetic and pleasurable mood, and a high negative score indicates a nervous or aversive mood (Watson et al., 1988). It is important to note that these two mood factors are negatively correlated (Watson et al., 1988). This means that, when negative scores are high, positive scores should be low and vice versa. The PANAS is a validated measure widely used in the field of psychology (Watson et al., 1988). Specifically, Cronbach's alpha coefficients were reported to range from .86 to .90 for positive affect and .84 to .87 for negative affect (Watson et al., 1988). Test-retest coefficients for an 8-week period ranged from .47 to .68 for positive affect and .39 to .71 for negative affect in an 8-week interval (Watson et al., 1988). In the present study, positive and negative affect were assessed at four separate points. For the present sample, Cronbach's alpha internal consistency coefficients of positive affect were .84, .84, .84, and .85 consecutively. Cronbach's alpha coefficients of negative affect for the current sample were .65, .93, .87, and .81 consecutively.

Self-reported state anxiety. The State-Trait Anxiety Inventory (STAI) Form Y-1 was used to assess state anxiety (Spielberger, 1985). State anxiety consists of a stream of subjective feelings that a person might experience during a situation that they perceive as threatening. State anxiety can also be defined as a level of intensity corresponding to the activation of the automatic nervous system (Spielberger, 1985). This instrument consists of 20 questions on a 4-point Likert-type scale. A high score indicates a high level of state anxiety, and a low score represents a low level of anxiety. The STAI is a validated measure and is widely used across a variety of studies throughout the field of psychology (Curry & Kasser, 2005; Spielberger, 1985). Specifically, test-retest reliability coefficients have ranged from .69 to .89 over 2-month intervals (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). There has also been evidence to suggest that this scale has adequate construct and concurrent validity (Spielberger, 1985). State anxiety was assessed at four separate points through the experiment. Cronbach's alpha coefficients for state anxiety of the present sample were .87, .92, .94, and .91 consecutively.

Physiological measures. iWorx® psychological physiology equipment was used to measure all physiological data. The hardware equipment consisted of one plethysmograph that measured HR and pulse, and two other connected electrodes that measured SCL. The data were recorded and analyzed in LabScribe3 computer software (LabScribe3, 2013). The computer with the recording software was in a different room from where the experiment took place so that participants were unaware of what was being recorded.

BP. A ReliOn® BP monitor was used to measure participants' BP. This cuff was secured above the elbow of participants' dominant arm. BP measurements were taken at four points throughout the experiment. These included once during baseline, after Speech 1, after Speech 2, and immediately following the 7-min poststress manipulation. BP was assessed in terms of systolic BP, diastolic BP, and mean arterial pressure.

HR and pulse. The plethysmograph electrode was used to measure pulse and HR. This electrode was attached to the volar surface of the middle finger of participants' nondominant hand. HR was recorded in bpm, and pulse was recorded in mV. Data were analyzed at 30-s intervals for the duration of the 3-min sitting baseline, 3-min standing baseline, both 3-min speeches, and the 7-min poststress manipulation. Psycophysiological recording was analyzed at 30-s intervals. However, to eliminate data that were severely flawed by movement artifact, only the largest and most accurate piece of recording during that specific 30 s was used.

Electrodermal activity. The SCL equipment consisted of two connected electrodes used to measure skin conductance. These electrodes were attached to the volar surface where the fingerprints are located on two nonadjacent fingers. Data were generated at 30-s intervals for the duration of the 3-min sitting baseline, 3-min standing baseline, both 3-min speeches, and the 7-min poststress manipulation.

Mandala. A mandala template that was found using a basic Internet search engine was used for the coloring activity of the experimental group (Picture Coloring Book, 2013).

Procedure

Prior to the beginning of the study, participants were randomly assigned to one of two groups: either mandala coloring with focused breathing or control. Upon arrival to the experiment, the consent form was explained to participants. Once informed consent was obtained, the baseline phase

began. Participants were not aware of the true purpose of the experiment in order to avoid response bias. Participants were informed that the title of the research was "Effects of Coloring." Additionally, participants were informed that they would be hooked up to electrodes, but they were not told what the electrodes were measuring. Also at the outset of the study, participants were blind to their group assignments. Following completion of each individual session, participants were debriefed.

Baseline. Participants were asked to fill out the demographic survey, STAI (Spielberger, 1985), for state anxiety, and PANAS (Watson et al., 1988). Participants were instructed to fill out all surveys as they felt in the present moment. Following this, participants' BP was taken. Next, participants were asked to wash their hands with soap and water to ensure an effective physiological recording. Next, the electrodes were hooked up to participants' nonwriting hand. At this point, participants were sitting, and a 3-min sitting baseline was recorded.

Trier Social Stress Test (TSST). All participants underwent the TSST. This is a validated measure that increases psychosocial stress (Kirschbaum et al., 1993). The test consisted of two public speaking tasks. Participants were told they had 2 min to prepare for their speech without writing anything down, and that they had 3 min to deliver the speech. Participants were also told that their speech and other nonverbal behaviors would be rated by a lab assistant wearing a white lab coat, and that they would be video recorded.

Speech 1. Participants were then given their first prompt, "You must take on the role of a job applicant who was invited to a personal interview with the company's hiring manager. Convince the manager why you are the perfect applicant for the vacant position," (Kirschbaum et al., 1993). Following the 2-min preparation period, a lab assistant wearing a white lab coat and holding a clipboard entered the room. At this time, the camera light was turned on, but no video was actually recorded. An egg timer was also set for 3 min. If participants stopped talking before the end of their 3 min, the lab assistant instructed them to continue. Following the first speech presentation, BP was measured, and participants filled out the STAI and PANAS.

Speech 2. Next, the second prompt was delivered with the same directions. The prompt stated, "You have just been caught and accused of stealing. Defend yourself, and convince the police why you are innocent and should not be arrested," (al'Absi, Wittmers, Erickson, Hatsukami, & Crouse, 2003). The protocol used during the first speech was also implemented during the second. Following the second speech, BP measure was recorded, and participants filled out STAI and PANAS.

Poststress manipulation. Participants underwent activities dependent upon group assignment. Participants in the experimental group received a predrawn mandala and were instructed on a focused breathing technique. In this focused breathing technique, participants were asked to breathe as evenly and gently as possible (Linehan, 1993). They were asked to pay attention to their breath, and the way their stomach and lungs were moving while still remaining aware of their coloring task. Participants had 7 min to complete the activity and were presented with crayons, markers, and colored pencils. Participants in the control group were asked to sit quietly for 7 min and not use their cell phone. A no-task control group was chosen to maximize differences between groups as a result of no differences found in a previous study that used an unstructured coloring group (Muthard & Williams, 2012). After the final phase ended, all participants again completed the STAI and PANAS, and BP was measured. Following the final measures, participants were debriefed and compensated.

Data Analysis

Baseline data including negative and positive affect, state anxiety, systolic BP, diastolic BP, and mean arterial pressure were assessed separately via independent-samples *t* tests to ensure that mandala coloring and control groups were equated at baseline. In addition, baseline measures of the continuous recording of pulse, SCL, and HR were assessed via repeated measures Analyses of Variance (ANOVAs) for each variable. A second set of analyses assessed the hypothesis that the psychosocial stressor would elevate self-reported negative affect, state anxiety, and psychophysiological response and reduce self-reported positive affect for all participants. For these analyses, separate repeated measures ANOVAs were conducted on all dependent variables to assess change over time from baseline through the poststress manipulation. Finally, a third set of analyses assessed the hypothesis that the mandala coloring group would demonstrate less self-reported negative affect, state anxiety, and psychophysiological response and more self-reported positive affect to the psychosocial stressor as compared to the noncoloring control. These analyses included independent-samples *t* tests for

negative affect, positive affect, state anxiety scores, systolic BP, diastolic BP, and mean arterial pressure. Grand average means of pulse, SCL, and HR were included. Additionally, repeated measures ANOVAs were used to assess change across time for seven time points (1-min intervals) of pulse, SCL, and HR measurements taken during the poststress phase. When significance occurred in repeated measures ANOVAs, post-hoc analyses were conducted to determine between or within group differences.

Results

Demographics

Chi-squared tests were completed on demographic variables as a randomization check to confirm no significant differences between groups. Analyses confirmed no differences in frequency of sex, $\chi^2(1, N = 37) = 0.12$, $p = .73$, $\varphi = .06$, ethnicity, $\chi^2(3, N = 37) = 2.44$, $p = .49$, $\nu = .26$, and graduation year, $\chi^2(3, N = 37) = 0.98$, $p = .81$, $\nu = .16$. Additionally, an independent-samples t test revealed that there were no differences in mean age between groups, $t(35) = 0.53$, $p = .60$, $\eta^2 = .008$.

Baseline

Self-reported measurements. Independent-samples t tests were conducted on baseline self-report data to ensure that there were no group differences at baseline. There were no significant differences in mean state anxiety, $t(35) = -0.27$, $p = .79$, $\eta^2 = .002$, positive affect, $t(35) = 0.47$, $p = .64$, $\eta^2 = .006$, or negative affect between groups, $t(35) = 0.86$, $p = .40$, $\eta^2 = .02$.

BP. Independent t tests were used to confirm that there were no significant group differences in BP measures at the baseline phase. There were no differences between groups in mean systolic BP, $t(34) = -0.41$, $p = .68$, $\eta^2 = .005$, mean diastolic BP, $t(34) = -0.54$, $p = .59$, $\eta^2 = .009$, or mean arterial pressure, $t(35) = -1.13$, $p = .27$, $\eta^2 = .04$, following baseline.

Physiological measurements. Repeated measures ANOVAs were used to assess the six time points (30-s intervals) of pulse, SCL, and HR during the baseline phase to analyze change through baseline among these time points and differences in change across baseline between groups. Between-subjects and within-subjects statistics were analyzed in all ANOVAs. Note that within-subjects analyses refer to both groups. For pulse, between-subjects analyses revealed no significant differences in mean pulse between groups during baseline, $F(1, 35) = 0.32$, $p = .57$, $\eta_p^2 = .009$. Within-subjects analyses revealed a decrease in mean pulse measurements (mV) across baseline, $F(5, 175) = 4.40$, $p = .001$, $\eta_p^2 = .11$. However, the time by group interaction was not significant, suggesting that both groups decreased similarly across baseline, $F(5, 175) = 0.52$, $p = .76$, $\eta_p^2 = .02$. For SCL, between-subjects effects indicated no significant difference between groups of mean SCL measurements (mS) during baseline, $F(1, 35) = 1.07$, $p = .31$, $\eta_p^2 = .03$; within-subjects effects revealed that there were no significant changes across time of baseline, $F(5, 175) = 0.63$, $p = .68$, $\eta_p^2 = .02$, and there were no group by time interactions in mean SCL, $F(5, 175) = 0.58$, $p = .72$, $\eta_p^2 = .02$. Finally, for HR, between-subjects effects indicated no differences between groups in mean HR during baseline, $F(1, 35) = 1.89$, $p = .18$, $\eta_p^2 = .05$. Within-subjects effects revealed a significant increase in mean HR measurements (bpm) across baseline, $F(5, 175) = 2.78$, $p = .02$, $\eta_p^2 = .07$. However, there were no time by group interactions in mean HR, indicating that the groups increased similarly across baseline, $F(5, 175) = 1.39$, $p = .23$, $\eta_p^2 = .04$. In summary, analyses indicated a general decrease in pulse and increase in HR during baseline, but the groups moved similarly across time. However, SCL did not change over baseline.

Change Over Procedure: Response to Psychosocial Stressor in All Participants

Self-reported measurements. Repeated measures ANOVAs were conducted separately on self-report variables. Between-subjects analyses indicated no differences between groups in state anxiety, $F(1, 33) = 0.26$, $p = .61$, $\eta_p^2 = .01$, positive affect, $F(1, 33) = 0.31$, $p = .31$, $\eta_p^2 = .01$, and negative affect, $F(1, 33) = 0.01$, $p = .91$, $\eta_p^2 < .001$. Within-subjects analyses on self-reported affect indicated a significant change across the entire experiment for state anxiety, $F(3, 99) = 23.17$, $p = .001$, $\eta_p^2 = .42$, positive affect, $F(3, 99) = 10.33$, $p = .001$, $\eta_p^2 = .24$, and negative affect, $F(3, 99) = 6.82$, $p = .001$, $\eta_p^2 = .17$ (see Figures 1, 2, & 3). There was a time by group interaction only for positive affect, $F(3, 99) = 2.86$, $p = .04$, $\eta_p^2 = .08$. There were no time by group interactions for state anxiety, $F(3, 99) = 1.41$, $p = .25$, $\eta_p^2 = .04$, or negative affect, $F(3, 99) = 1.45$, $p = .23$, $\eta_p^2 = .04$. In summary, the experimental and control groups' self-reported affect was not different across the course of the experiment. Additionally, self-reported affect did change over the procedure, but only positive affect demonstrated a change in different directions.

Post-hoc analyses indicated that measurements increased from baseline to Speech 1 in state anxiety,

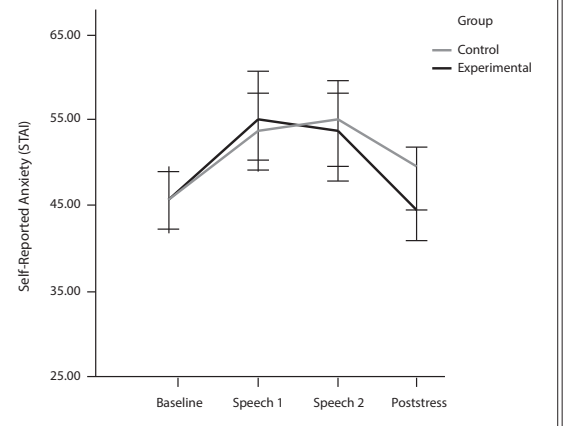
$t(34) = -6.12$, $p < .001$, $\eta^2 = .52$, and negative affect, $t(34) = -2.64$, $p = .01$, $\eta^2 = .17$. Self-reported measurements did not change between speeches in state anxiety, $t(34) = .50$, $p = .62$, $\eta^2 = .01$, and negative affect, $t(34) = .85$, $p < .40$, $\eta^2 = .02$. Measurements decreased from Speech 2 to poststress in state anxiety, $t(36) = 5.45$, $p < .001$, $\eta^2 = .45$, and negative affect, $t(36) = 3.33$, $p = .002$, $\eta^2 = .24$. Post-hoc analyses also indicated that positive affect decreased from baseline to Speech 1, $t(34) = 4.49$, $p < .001$. $\eta^2 = .37$, did not change between speeches, $t(34) = 1.71$, $p = .10$. $\eta^2 = .04$, and increased from Speech 2 to poststress, $t(36) = -1.96$, $p = .05$, $\eta^2 = .10$. To recap, this means that state anxiety and negative affect increased as a result of the psychosocial stressor, and decreased during the poststress phase; positive affect decreased as a result of the psychosocial stressor, and increased during the poststress phase. These results reflected expected changes due to the experimental manipulations.

BP. Between-subjects analyses revealed that there were no significant differences between groups for systolic BP, $F(1, 32) = 1.27$, $p = .27$, $\eta_p^2 = .04$, diastolic BP, $F(1, 32) = 0.07$, $p = .79$, $\eta_p^2 = .002$, or mean arterial pressure when analyzing the procedure as a whole, $F(1, 35) = 1.63$, $p = .21$, $\eta_p^2 = .04$. Within-subjects analyses indicated a significant change over procedure for systolic BP, $F(3, 96) = 6.44$, $p = .001$, $\eta_p^2 = .17$, diastolic BP, $F(3, 96) = 76.01$, $p = .001$, $\eta_p^2 = .70$, and mean arterial pressure, $F(3, 105) = 3.39$, $p = .02$, $\eta_p^2 = .09$ (see Figures 4, 5, & 6). Further, there were no time by group interactions for systolic BP, $F(3, 96) = 0.84$, $p = .48$, $\eta_p^2 = .03$, diastolic BP, $F(3, 96) = 0.55$, $p = .65$, $\eta_p^2 = .02$, or mean arterial pressure, $F(3, 105) = 0.03$, $p = .99$, $\eta_p^2 < .001$. In summary, BP measurements were not different according to group over the course of the experiment, but did change in similar directions as the experiment went on.

Post-hoc analysis on diastolic BP indicated that

FIGURE 1

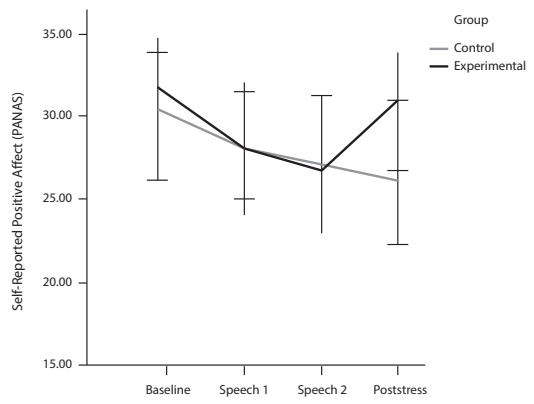
State Anxiety Change Over Time



Note. State anxiety scores significantly changed across the course of the experiment. Post-hoc analysis indicated that state anxiety increased from baseline to Speech 1, did not change between the speeches, and decreased from Speech 2 to poststress. Additional analyses indicated no change directly from baseline to poststress manipulation, indicating that participants returned to baseline levels of anxiety at the conclusion of the experiment, $t(36) = -0.13$, $p = .90$, $\eta^2 < .001$. The error bars indicate +/- 2 standard errors of the mean.

FIGURE 2

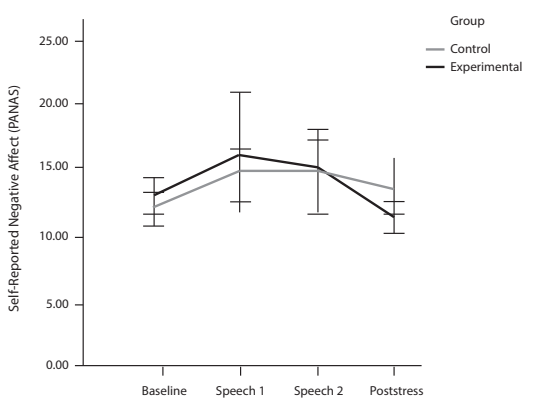
Positive Affect Change Over Time



Note. Positive affect scores significantly changed across the entire experiment. Post-hoc analysis also indicated that positive affect decreased from baseline to Speech 1, did not change between speeches, and increased from Speech 2 to poststress. Further analyses indicated that positive affect was significantly decreased directly from baseline to poststress manipulation, $t(36) = 3.24$, $p = .003$, $\eta^2 = .23$. The error bars indicate +/- 2 standard errors of the mean.

FIGURE 3

Negative Affect Change Over Time



Note. Negative affect scores significantly changed over the course of the experiment. Post-hoc analysis indicated that negative affect increased from baseline to Speech 1, did not change between speeches, and decreased from Speech 2 to poststress. Additional analyses indicated a time by group interaction directly from baseline to poststress manipulation in which the experimental group's negative affect decreased and the control group's increased, $F(1, 35) = 10.21$, $p = .003$, $\eta_p^2 = .23$. The error bars indicate +/- 2 standard errors of the mean.

  (VOL. 21, NO. 1/ISSN 2164-8204)

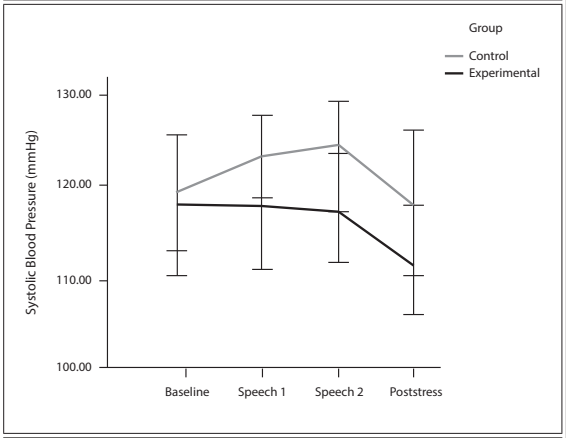
diastolic BP significantly increased from baseline to Speech 1, $t(33) = -10.02$, $p < .00$, $\eta^2 = .75$, did not change between the speeches, $t(33) = -.035$, $p = .97$, $\eta^2 < .001$, and significantly decreased from Speech 2 to poststress, $t(35) = 11.93$, $p < .001$, $\eta^2 = .80$. Post-hoc analyses indicated that systolic BP and mean arterial pressure did not change from baseline to Speech 1, $t(33) = -1.02$, $p = .31$, $\eta^2 = .03$, $t(36) = -0.47$, $p = .64$, $\eta^2 = .006$, or Speech 1 to Speech 2, $t(33) = 0.31$, $p = .76$, $\eta^2 = .003$, $t(36) = -1.36$, $p = .18$, $\eta^2 = .05$, but did decrease from Speech 2 to poststress, $t(35) = 4.11$, $p < .001$, $\eta^2 = .33$, $t(36) = 11.28$, $p < .001$, $\eta^2 = .78$. However, a paired-samples t test indicated that there was a significant increase in average mean arterial pressure from baseline to directly after the second speech, $t(36) = -8.35$, $p = .001$, $\eta^2 = .70$. Mean arterial pressure increased from 82.67 mmHg, (SD = 16.72) during baseline to 89.49 mmHg (SD = 17.12) following Speech 2. This suggested that the psychosocial stressor might not have been effective at increasing systolic BP, but mean arterial pressure increased as a result of the second speech. However, diastolic BP changed over the course of the experiment as expected.

Physiological measurements. Between-subjects analyses revealed a trend toward difference between groups in mean pulse, $F(1, 35) = 3.80$, $p = .06$, $\eta_p^2 = .14$, but there were no group differences in SCL, $F(1, 35) = 0.72$, $p = .40$, $\eta_p^2 = .02$, or HR, $F(1, 35) = 0.04$, $p = .84$, $\eta_p^2 = .001$. Within-subjects analyses also indicated significant change across the entire procedure for pulse, $F(3, 99) = 3.73$, $p = .01$, $\eta_p^2 = .10$, SCL, $F(3, 105) = 42.99$, $p = .001$, $\eta_p^2 = .55$, and HR, $F(3, 105) = 89.77$, $p = .001$, $\eta_p^2 = .72$ (see Figures 7 & 8). There was a time by group interaction only for HR measurements, $F(3, 105) = 2.86$, $p = .04$, $\eta_p^2 = .08$. There were no time by group interactions for pulse, $F(3, 105) = 1.77$, $p = .16$, $\eta_p^2 = .05$, or SCL, $F(3, 105) = 1.37$, $p = .26$, $\eta_p^2 = .04$. To review, the only variable to demonstrate slight group differences across the experiment was pulse. Additionally, pulse and SCL variables changed over the course of the experiment in the same direction by both groups, but the experimental and control groups' HR moved in opposite directions of each other.

Additionally, post-hoc analyses indicated that pulse significantly decreased from baseline to Speech 1, $t(36) = -9.46$, $p < .001$, $\eta^2 = .71$, and between speeches, $t(36) = 9.48$, $p < .001$, $\eta^2 = .71$, but did not change from Speech 2 to poststress, $t(36) = -1.35$, $p = .18$, $\eta^2 = .05$. These results might have been affected by an outlier. Further, post-hoc analyses revealed that SCL significantly increased from baseline to Speech 1, $t(36) = -6.53$, $p < .001$, $\eta^2 = .54$, did not change between speeches, $t(36) = -1.92$, $p = .06$, $\eta^2 = .09$, and did not change from Speech 2 to poststress, $t(36) = 1.25$, $p = .22$, $\eta^2 = .04$. Lastly, post-hoc analyses indicated that HR significantly increased from baseline to Speech 1, $t(36) = -9.56$, $p < .001$, $\eta^2 = .72$, did not change between speeches, $t(36) = -1.14$, $p = .26$, $\eta^2 = .03$, and

FIGURE 4

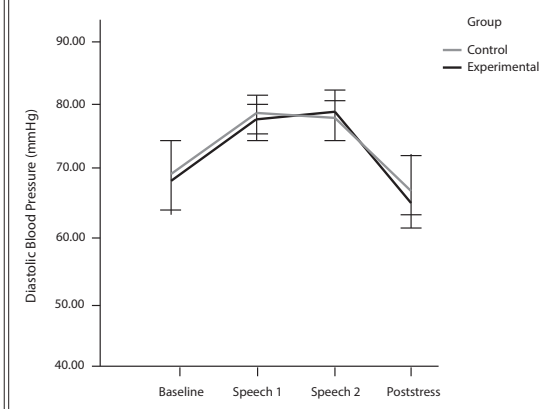
Systolic Blood Pressure Change Over Time



Note. Systolic blood pressure significantly changed over the course of the experiment. Post-hoc analysis indicated that there was no significant change from baseline to Speech 1, no change from Speech 1 to Speech 2, but a decrease from Speech 2 to poststress. Further analyses indicated the systolic BP significantly decreased directly from baseline to poststress manipulation, $t(35) = 2.61$, $p = .01$, $\eta_p^2 = .16$. The error bars indicate +/- 2 standard errors of the mean.

FIGURE 5

Diastolic Blood Pressure Change Over Time



Note. Diastolic blood pressure significantly changed course over the course of the experiment. Post-hoc analysis indicated that diastolic blood pressure significantly increased from baseline to Speech 1, did not change between the speeches, and significantly decreased from Speech 2 to poststress. Additional analyses indicated no change directly from baseline to poststress manipulation, $t(35) = 0.33$, $p = .75$, $\eta^2 = .003$. The error bars indicate +/- 2 standard errors of the mean.

significantly decreased from Speech 2 to baseline, $t(36) = 10.42$, $p < .001$, $\eta^2 = .75$. In summary, these analyses indicated that all dependent variables changed over time as a result of the psychosocial stressor with the exception of systolic BP, mean arterial pressure, and pulse.

Poststress Measurements of Mandala Coloring and Focused Breathing Versus Control

Self-reported measurements. Self-reported measures were only administered once during the poststress phase that occurred at the end of the 7-min poststress manipulation. Independent-samples *t* tests were used to assess differences between experimental and control groups during the 7-min post stress manipulation phase. These independent-samples *t* tests also revealed a marginally significant difference and moderate effect size in mean negative affect between groups $t(35) = -2.03$, $p = .05$, $\eta^2 = .11$ (see Figure 9). Mean negative affect scores for the experimental group were 11.05 ($SD = 1.87$), and mean negative affect scores for the control group were 12.94 ($SD = 3.59$). There was a trend toward significance in mean STAI score between groups with a moderate effect size, $t(35) = -1.76$, $p = .08$, $\eta^2 = .08$ (see Figure 10). Mean state anxiety of the experimental group was 44.53 ($SD = 6.63$), and mean state anxiety of the control group was 49.06 ($SD = 8.39$) within the context of potential scores ranging from 34 to 63. There were no significant differences in mean positive affect between groups, $t(35) = 1.44$, $p = .16$, $\eta^2 = .06$. To specify, state anxiety and negative affect were higher in the control group.

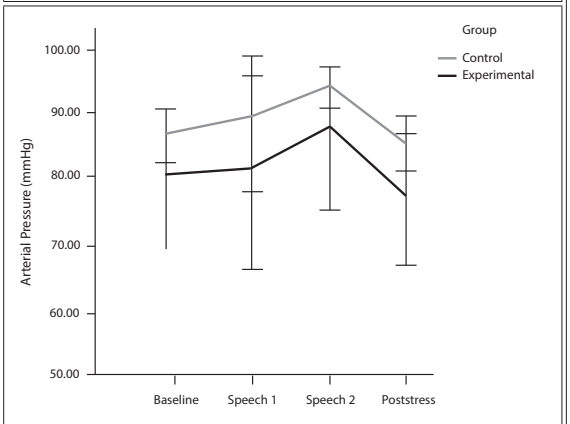
BP. Independent *t* tests were used to analyze differences in BP measurements between experiment and control groups during the poststress manipulation. There were no significant differences in mean systolic BP, $t(34) = -1.47$, $p = .15$, $\eta^2 = .06$, diastolic BP, $t(34) = -0.77$, $p = .45$, $\eta^2 = .02$, or mean arterial pressure between groups, $t(35) = -1.47$, $p = .15$, $\eta^2 = .06$. Overall, the groups did not differ in any BP variable during the poststress manipulation.

Physiological measurements. An independent *t* test was used on grand means created for pulse, SCL, and HR measures throughout the poststress manipulation phase. Analyses indicated no significant differences in pulse, $t(35) = -0.86$, $p = .40$, $\eta^2 = .02$, SCL, $t(35) = 1.32$, $p = .20$, $\eta^2 = .05$, or HR between groups, $t(35) = 0.1$, $p = .90$, $\eta^2 < .001$. Thus, the means of these variables did not differ according to group during the poststress manipulation.

Repeated measures ANOVAs were conducted separately on seven time points at 1-min intervals for pulse, SCL, and HR measures taken during the poststress manipulation phase to reveal differences between the experimental and control group during the poststress phase. It is important to note that poststress data were collapsed into 1-min intervals as opposed to 30 s to make analyses more manageable. Between-subjects analyses revealed no group differences in pulse measurements during poststress manipulation, $F(1, 35) = 0.73$, $p = .40$, η_p^2

FIGURE 6

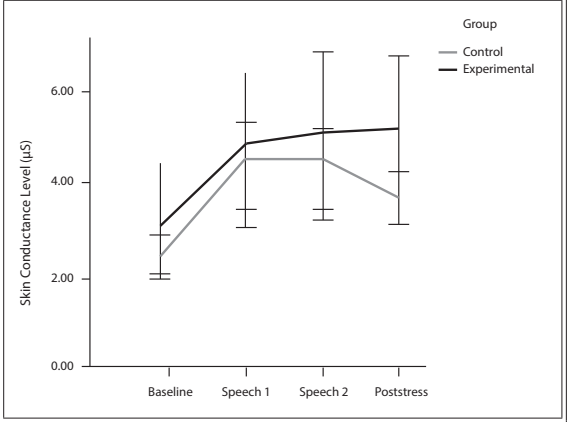
Mean Arterial Pressure Change Over Time



Note. Mean arterial pressure significantly changed across the course of the experiment. Post-hoc analysis indicated that there was no significant change from baseline to Speech 1, no change from Speech 1 to Speech 2, but a decrease from Speech 2 to poststress. Further analyses indicated no change directly from baseline to poststress manipulation, $t(36) = 1.79$, $p = .08$, $\eta^2 = .08$. The error bars indicate +/- 2 standard errors of the mean.

FIGURE 7

Skin Conductance Level Change Over Time



Note. Skin conductance level significantly changed over the course of the experiment. Post-hoc analysis revealed that skin conductance level significantly increased from baseline to Speech 1 and did not change between speeches and from Speech 2 to poststress. Additional analyses indicated a significant increase directly from baseline to poststress manipulation, $t(36) = -9.62$, $p < .001$, $\eta^2 = .72$. The error bars indicate +/- 2 standard errors of the mean.

  (VOL. 21, NO. 1/ISSN 2164-8204)

= .02; within-subjects effects revealed no significant changes in mean pulse across the poststress phase, $F(6, 210) = 0.98$, $p = .44$, $\eta_p^2 = .03$, and no significant group by time interactions suggesting that groups interacted similarly across the poststress phase, $F(6, 210) = 1.61$, $p = .15$, $\eta_p^2 = .04$. Between-subjects effects revealed no group differences in SCL during poststress manipulation, $F(1, 35) = 1.74$, $p = .20$, $\eta_p^2 = .05$. Within-subjects analyses on mean SCL indicated a decrease across time during the poststress manipulation, $F(6, 210) = 2.47$, $p = .03$, $\eta_p^2 = .07$. However, there were no group by time interactions indicating that the groups decreased in the same direction, $F(6, 210) = 0.99$, $p = .43$, $\eta_p^2 = .03$. Between-subjects analyses indicated no significant differences between groups of mean HR during poststress manipulation, $F(1, 35) = 0.02$, $p = .90$, $\eta_p^2 < .001$, and within-subjects effects of the repeated measures revealed no significant differences across time, $F(6, 210) = 0.62$, $p = .72$, $\eta_p^2 = .02$. However, a group by time interaction in mean HR was found between groups during the poststress manipulation, $F(6,210) = 3.80$, $p = .001$, $\eta_p^2 = .10$.

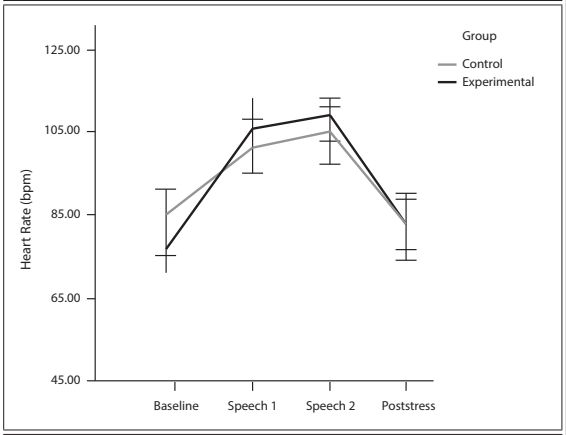
Post-hoc paired-samples *t* tests on HR revealed that both the control and experimental groups had a marginally significant change from the 0-s to 1-min time point to the 2-min to 3-min time point, $t(17) = 1.90$, $p = .075$, $\eta^2 = .18$, $t(18) = -1.91$, $p = .07$, $\eta^2 = .17$. The means indicated that the control group's HR decreased from 85.02 ($SD = 13.47$) to 82.83 ($SD = 13.39$), and the experimental group's mean HR increased from 79.97 ($SD = 9.99$) to 83.47 ($SD = 11.83$), suggesting that these changes can account for most of the time by group interaction. However, it is important to mention that the mean HR of the experimental group ($M = 83.76$, $SD = 10.86$) was higher than the control group ($M = 81.74$, $SD = 14.32$) during the last 5 min of the poststress manipulation. This pattern of HR results was opposite of the primary hypothesis and will be further discussed.

Discussion

The purpose of the present experiment was to assess the effectiveness of mandala coloring combined with focused breathing as potential techniques to change negative and positive affect, state anxiety, and psychophysiological response following a psychosocial stressor. By linking art therapy and mindfulness techniques, the study sought to bring validation to the art-making process, especially coloring, as a possible therapeutic tool. It was hypothesized that the psychosocial stressor would produce elevated measures of self-reported negative affect, state anxiety, and psychophysiological response and reduce positive affect in all participants. This hypothesis was fully supported. It was further hypothesized that, following the psychosocial stressor, mandala coloring paired with focused breathing in the experimental group would reduce negative affect, state anxiety, and psychophysiological indices of the stress response and

FIGURE 8

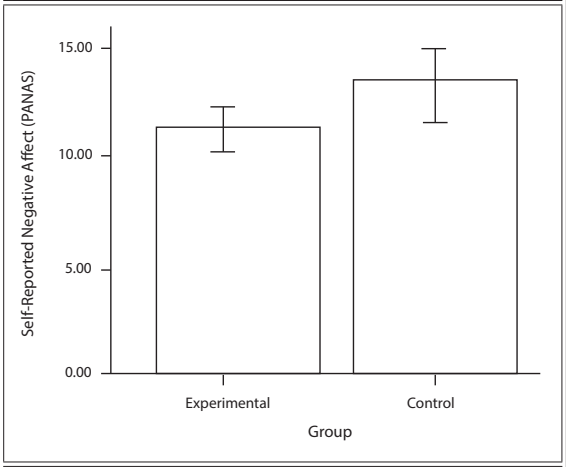
Heart Rate Change Over Time



Note. Heart rate significantly changed over the course of the experiment. Post-hoc analysis indicated that heart rate significantly increased from baseline to Speech 1, did not change between speeches, and significantly decreased from Speech 2 to baseline. Further analyses indicated a significant time by group interaction in which the experimental group's HR increased directly from baseline to poststress manipulation, whereas the control group's decreased, $F(1, 35) = 6.54$, $p = .02$, $\eta_p^2 = .12$. The error bars indicate +/- 2 standard errors of the mean.

FIGURE 9

Negative Affect Poststress Group Differences



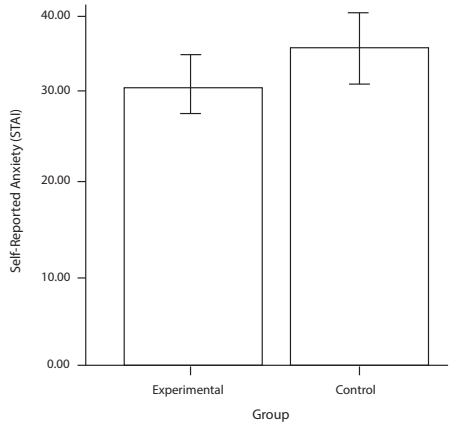
Note. Independent-samples *t* tests revealed a marginally significant difference in mean negative affect between the mandala coloring and focused breathing group when compared to the control group during the poststress phase. The error bars indicate +/- 2 standard errors of the mean.

increase positive affect greater than the control. This hypothesis was partially supported.

Concerning the first hypothesis, the psychosocial stressor was effective in elevating state anxiety, negative affect, and psychophysiological indices of the stress response while reducing positive affect in the present experiment. This conclusion supported the hypothesis that self-reported affect, state anxiety, and psychophysiological variables would change over time, and is also consistent with other literature that demonstrated the same effect (Campisi, Bravo, Cole, & Gobeil, 2012; Kirschbaum et al., 1993). Results indicated that, from baseline to both Speech 1 and Speech 2 independently, all self-reported measurements changed in the proper direction to indicate that participants experienced psychosocial stress. Specifically, state anxiety and negative affect scores increased as a result of the TSST, and positive affect scores decreased (p's < .05). In analyzing the effect of the TSST on BP, results indicated that diastolic BP increased from baseline to both speeches, and mean arterial pressure increased from baseline to Speech 2. However, there were no changes in systolic BP, which was consistent with the literature that has reflected that diastolic BP is more susceptible to stress (Stern et al., 2001). Additionally, HR and SCL both significantly increased from baseline to both speeches, demonstrating that the psychosocial stressors worked effectively. However, pulse decreased from baseline to both speeches. This might have been a result of overall variability in pulse measurements during the psychosocial stressor. In this case, it is important to note that there is much heterogeneity of the stress response, and that there are individual differences in responses (Kudielka, Hellhammer, & Wüst, 2009; Stern et al., 2001).

FIGURE 10

State Anxiety Poststress Group Differences



Note. Independent-samples *t* tests revealed a trend toward a significant difference in mean state anxiety between mandala coloring and focused breathing group when compared to the control group during the poststress phase. The error bars indicate +/- 2 standard errors of the mean.

Concerning the second hypothesis, it is possible to conclude that the findings partially supported that mandala coloring would reduce negative affect, state anxiety, and psychophysiological indices of the stress response while increasing positive affect as an intervention compared to a control. However, it is important to note that it cannot be determined whether mandala coloring or focused breathing individually contributed to the reductions because they were used together. A pilot study found no differences between control and a mandala-coloring group (Muthard & Williams, 2012), thus focused breathing was added to the experimental paradigm to strengthen the mandala-coloring manipulation. In the current study, self-reported negative affect and state anxiety demonstrated a trend toward stress reduction in the experimental group in the predicted direction. These results supported the secondary hypothesis and were consistent with research that has also demonstrated a decrease in state anxiety after mandala coloring (Curry & Kasser, 2005; Sandmire et al., 2012; van der Vennet & Serice 2012). Thus, the findings showed limited support for the effectives of mandala coloring with focused breathing in reducing self-reported measures of negative affect and state anxiety.

However, the psychophysiological measures did not demonstrate any differences between groups, thus not supporting the secondary hypothesis. A very common model of affect proposes that affect functions on a three-way systems model that includes physiological, behavioral, and cognitive components (Lang, 1978). This suggests a possible disconnect between self-reported measures of negative affect and state anxiety with psychophysiological measures. Therefore, each aspect has its own individual system that can respond to a stressor. For example, the behavioral system might register avoidance, whereas, the physiological system might physically increase HR. Viewing affect as a systems model justifies why the present study found effects in self-reported affect, but not in physiological measures. The Cannon-Bard Theory of Emotion (Cannon, 1949) also explains these results by indicating that autonomic arousal and conscious emotions are separate systems that do not result from one another. Therefore, the finding

that differences were found only in self-reported affect and state anxiety can be explained by the literature. Although participants were not told the full nature of the study, their personal biases might have exacerbated the significant results found in self-reported measurements, as is true in all studies assessing self-reported measures.

Additionally, a slight trend moved in the opposite direction than predicted. SCL levels during the entire poststress manipulation and HR measurements during the latter portion of the poststress manipulation were actually higher in the experimental group than the control group, which suggested that the control group was more psychophysiologically aroused. Two reasons might explain this trend of HR and SCL moving in the opposite direction than anticipated in the experimental group. One possibility is that the experimental group had a task to complete compared to the control group that had no task. The presence of the task itself might have been more arousing than sitting with no task. Initially, a no-task control group was incorporated into the study design because it was thought to maximize differences between control and experimental groups. Future research may be able to address this issue by giving the control group a neutral task such as reading or writing. Second, some research has suggested that mindfulness techniques actually increase arousal as opposed to decreasing arousal. One of the fundamental components of mindfulness is that it requires an attention that is characterized by observing one's moment-to-moment experiences (Arch & Craske, 2006). Therefore, if mindfulness requires attentional processes, this may explain why the experimental group's physiological arousal was higher. Other studies have concluded that meditational activities also cause higher arousal in HR variables (Jevning, Wallace, & Beidbach, 1992; Peng et al., 1999). Although these findings were not consistent with the hypothesis, literature has supported that meditation creates an attentive state that may cause increases in psychophysiological measures.

The study findings were limited by several factors. It is first important to note that, because focused breathing and mandala-coloring were completed at the same time, it is not possible to conclude whether one technique led to the self-reported negative affect or state anxiety reduction more than the other. The decision was made to combine techniques in order to generate a stronger manipulation based on results from previous research (Muthard & Williams, 2012). However, additional research is needed to address the effectiveness of both of these techniques in reducing negative affect, state anxiety, and psychophysiological response. A limitation regarding demographics was that the sample consisted of a very narrow age range. Thus, the results from the present study were constrained to young adults and may not apply to wider audiences of varied ages such as younger or older populations. Additionally, the sample consisted of mostly women (81%), meaning that the results might also not be generalizable to normal populations regarding sex. Third, the study was limited because factors that could affect stress response such as sleep deprivation, caffeine use, and exercise were not measured. These factors were only controlled for through random assignment to groups. Lastly, the present research was limited because participants were not experienced in focused breathing or mindfulness techniques. Therefore, it cannot be guaranteed that participants were practicing the focused breathing exercises as instructed.

In conclusion, this study found limited support for the effectiveness of the combination of mandala coloring with focused breathing techniques in reducing self-reported negative affect and state anxiety as compared to controls. Future research is needed to assess whether combining lesser validated art therapy coloring techniques with relatively highly studied mindfulness techniques such as focused breathing could potentially help improve the validation of art therapy techniques, giving practitioners additional therapeutic tools to use with clients.

References

al'Absi, M. (Ed). (2007). *Stress and addiction: Biological and psychological mechanism*. New York, NY: Elsevier.

al'Absi, M., Wittmers, L. E., Erickson, J., Hatsukami, D., & Crouse, B. (2003). Attenuated adrenocortical and blood pressure responses to psychological stress in ad libitum and abstinent smokers. *Pharmacology, Biochemistry, and Behavior, 74*, 401–410. doi:10.1016/s0091-3057(02)01011-0

American Psychological Association. (2010). *Ethical principles of psychologists and code of conduct*. Retrieved May 6, 2014, from http://www.apa.org/ethics/code/index.aspx

Arch, J. J., & Craske, M. G. (2006). Mechanisms of mindfulness: Emotion regulation following a focused breathing induction. *Behavior Research and Therapy, 44*, 1849–1858. doi:10.1016/j.brat.2005.12.007

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

Bertisch, S. M., Wee., C. C., Phillips, R. S., & McCarthy, E. P. (2009). Alternative mind-body therapies used by adults with medical conditions. *Journal of Psychosomatic Research, 66*, 511–519. doi:10.1016/j.jpsychores.2008.12.003

Breslau, N. (2009). The epidemiology of trauma, PTSD, and other

posttrauma disorders. *Trauma, Violence, and Abuse: A Review Journal, 10*, 198–210. doi:10.1177/1524838009334448

Campisi, J., Bravo, Y., Cole, J., & Gobeil, K. (2012). Acute psychosocial stress differentially influences salivary endocrine and immune measures in undergraduate students. *Physiology and Behavior, 107*, 317–321. doi:10.1016/j.physbeh.2012.09.003

Cannon, W. (1949). What strong emotions do to us? In D. Wayne (Ed.), *Readings in general psychology*, 146–157. New York, NY: Prentice-Hall

Chrousos, G. P., & Gold, P. W. (1992). The concepts of stress and stress system disorders. Overview of physical and behavioral homeostasis. *Journal of the American Medical Association, 267*, 1244–1252. doi:10.1001/jama.267.9.1244

Curry, N. A., & Kasser, T. (2005). Can coloring mandalas reduce anxiety? *Journal of the American Art Therapy Association, 22*, 81–85. doi:10.1080/07421656.2005.10129441

Everly, G. S., Jr., & Lating, J. M. (2013). *A clinical guide to the treatment of the human stress response*. New York, NY: Springer.

Jevning, R., Wallace, R. K., & Beidbach, M. (1992). The physiology of meditation: A review. A wakeful hypometabolic integrated response. *Neuroscience and Biobehavioral Reviews, 16*, 415–424. doi:10.1016/s0149-7634(05)80210-6

Kirschbaum, C., Pirke, K-M., & Hellhammer, D. H. (1993). The 'Trier Social Stress Test'—A tool for investigating psychobiological stress responses in a laboratory setting. *Neuropsychobiology, 28*, 76–81. doi:10.1159/000119004

Kudielka, B. M., Hellhammer, D. H., & Wüst, S. (2009). Why do we respond so differently? Reviewing determinants of human salivary cortisol responses to challenge. *Psychoneuroendocrinology, 34*, 2–18. doi:10.1016/j.psyneuen.2008.10.004

Lang, P. J. (1978). Anxiety: Toward a psychophysiological definition. In H. S. Akiskal & W. L. Webb (Eds.), *Psychiatric diagnosis: Exploration of biological predictors*, 365–389. New York, NY: Spectrum.

LabScribe3 [Computer software]. (2013). Dover, NH: iWorx Systems, Inc.

Linehan, M. M. (1993). *Skills training manual for treating borderline personality disorder*. New York, NY: The Guilford Press.

Lovallo, W. R., & Thomas, T. L. (2000). Stress hormones in psychophysiological research: Emotional, behavioral, and cognitive implications. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Ed.), *Handbook of psychophysiology (2nd ed.)*, 342–367. New York, NY: Cambridge University Press.

Muthard, C., & Williams, A. (2012). *Effects of coloring on anxiety*. Presented at Lycoming College, Department of Psychology Research Expo, Williamsport, PA.

Peng, C. K., Mietus, J. E., Liu, Y., Khalsa, G., Douglas, P. S., Benson, H., & Goldberger, A. L. (1999). Exaggerated heart rate oscillations during two meditation techniques. *International Journal of Cardiology, 70*, 101–107. doi:10.1016/s0167-5273(99)00066-2

Picture Coloring Book (2013). Retrieved from http://picturecoloringbook.blogspot.com/2013/06/mandala-coloring-pages-mandala-coloring.html

Sandmire, D. A., Gorham, S. R., Rankin, N. E., & Grimm, D. R. (2012). The influence of art making on anxiety: A pilot study. *Journal of the American Art Therapy Association, 29*, 68–73. doi:10.1080/07421656.2012.683748

Spielberger, C. D. (1985). Assessment of state and trait anxiety: Conceptual and methodological issues. *Southern Psychologist, 2*, 6–16. doi:10.1016/b978-0-12-657402-9.50013-2

Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

Stern, R. M., Ray, W. J., & Quigley, K. S. (2001). *Psychophysiological Recording*. New York, NY: Oxford University Press.

Straub, R. O. (2012). *Health psychology: A biopsychosocial approach*. New York, NY: Worth Publishers.

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

Watson, D., Clark, L. A., & Tellegan, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063–1070. doi:10.1037/0022-3514.54.6.1063

Author Note. Christina Muthard and Rebecca Gilberston, Department of Psychology, Lycoming College, Williamsport, PA.

This research was supported in part by the Lycoming College Haberberger Fellowship awarded to Christina Muthard.

Christina Muthard is now a doctoral student in the Psychology and Counseling Department at Marywood University, Scranton, PA.

Rebecca Gilbertson is now at the Department of Psychology, University of Minnesota Duluth.

Correspondence concerning this article may be sent to Christina Muthard via e-mail at cmuthard@m.marywood.edu or Rebecca Gilbertson via e-mail at gilbertr@d.umn.edu.

Impact of Positive, Negative, and No Personality Descriptors on the Attractiveness Halo Effect

William J. Lammers*, Sarah Davis, Olivia Davidson, and Kellie Hogue
University of Central Arkansas

ABSTRACT. The halo effect occurs when an individual with one or a few positive qualities is assumed to have other positive qualities. Our study investigated how a positive, negative, or no written description of an attractive woman affects men's ratings of other positive qualities. Sixty-five male undergraduate participants completed 1 of 3 questionnaires with the same questions and same photo of an attractive woman. The only difference between the questionnaires was the written description of the woman. Results showed that participants in all description conditions rated the woman as equally attractive, $F(2,62) = 0.35$, $p = .71$, $\eta^2 = .01$, athletic, $F(2,62) = 2.28$, $p = .11$, $\eta^2 = .07$, and feminine, $F(2,62) = 1.68$, $p = .19$, $\eta^2 = .05$). However, comparisons for the other 7 personality attributes showed that participants rated the woman in the no description and positive description conditions higher than they rated the woman in the negative description condition in every case: successful, $F(2,62) = 16.58$, $p < .001$, $\eta^2 = .35$, extroverted, $F(2,62) = 8.64$, $p < .001$, $\eta^2 = .22$, intelligent, $F(2,62) = 14.21$, $p < .001$, $\eta^2 = .31$, friendly, $F(2,62) = 58.43$, $p < .001$, $\eta^2 = .65$, not aggressive, $F(2,62) = 16.64$, $p < .001$, $\eta^2 = .35$, ambitious $F(2,62) = 3.47$, $p = .04$, $\eta^2 = .10$, and likeable, $F(2,62) = 56.19$, $p < .001$, $\eta^2 = .64$. These results suggested that a negative description reduces the attractiveness halo effect in men when rating the qualities of an attractive woman.

Whether they realize it or not, people make judgments and form opinions about others every single day. For example, meeting someone for the first time, or even interviewing someone for a job, results in a variety of personal judgments (Borman, 1979). When people form these opinions, they often do so quickly and irrationally, causing them to draw illogical conclusions about others. The *halo effect* describes the way people often incorrectly attribute characteristics to others (Goffin, Blake, & Wagner, 2003). The halo effect is a cognitive bias in which people assign a host of positive or negative traits to a person after observing only one specific positive or negative trait of that person (Kahneman, 2011).

Thorndike (1920) first coined the term *halo* in his paper, "A Constant Error in Psychological Ratings," in which he explained that even professionals such as teachers and department heads are often unable to rate qualities of others individually; they allow one known quality to affect their ratings of other qualities. According to Thorndike, if people are to rate others' qualities fairly, they should rate all qualities individually without knowing about any other attributes a person may have. The current study examined the halo effect in the context of an image of an attractive woman associated with either a positive, negative, or no description of personality traits. Thus, the study assessed the impact of written character information while holding physical attractiveness constant.

It appears that the halo effect is prevalent in a variety of contexts. Recent studies have described the halo effect regarding teacher behaviors (Keeley,

*Faculty mentor

English, Irons, & Henslee, 2013), impact of interpersonal skills of service employees (Dagger, Danaher, Sweeney, & McColl-Kennedy, 2013), perceptions of athletes using steroids (Chantal, Bernache-Assollant, & Schiano-lomoriello, 2013), impact of the phrase "natural ingredients" on perfume perception (Apaolaza, Hartmann, López, Barrutia, & Echebarria, 2014), and expectations of a country's response to AIDS/HIV (Jacques, & Mmatli, 2013). For example, past studies have revealed that the halo effect often occurs when teachers grade their students' papers. Dennis (2007) found that college professors who grade multiple papers by the same student suffer from the halo effect because they underestimate changes in writing performance over time. Malouff, Emmerton, and Shutte (2013) found that even psychology professors and their assistants, who are often well-educated on cognitive biases such as the halo effect, make similar mistakes when grading students' written or oral assignments.

Studies have shown that the halo effect not only influences individuals, but groups as well. One study showed that being involved in a group discussion about a person exacerbated the halo effect by group members toward that person (Palmer & Loveland, 2008). A subtype of the halo effect, known as the *team halo effect*, is a phenomenon that occurs in almost all teams of people (Naquin & Tynan, 2003). According to the team halo effect, when a team fails, individuals on the team are more likely to be blamed for the failure than the team as a whole although this is often quite inaccurate. However, not all people make this error in judgment. In one study, Naquin and Tynan (2003) found that those with the most team experience fall prey to the cognitive bias much less often than less experienced members of a team.

Many factors affect the magnitude of the halo effect, and unconscious factors change people's judgments. In other words, their judgments may be altered by small variables in their environment of which they are not aware (Nisbett & Wilson, 1977). For example, mood often influences the impact that the halo effect has on decision making. Previous studies have shown that those in a good mood rely heavily on the halo effect whereas those in a bad mood often avoid the halo effect altogether (Forgas, 2011). Another small factor that can have a significant influence on the halo effect is arousal. O'Neal (2005) found that arousal achieved through everyday substances such as caffeine can cause people to rely more heavily on the halo effect when making future choices.

Physical attractiveness is an important part of American society. Magazines, movies, and the news bombard U.S. citizens with the importance of beauty and attractiveness, and many studies throughout the years have clearly shown that attractiveness greatly influences the way people perceive others (Lennon & Kenny, 2013; Ogden, 2013; Shinada & Yamagishi, 2014). The halo effect and attractiveness is a popular research topic in the field of psychology. For example, Pollock (2012) found that, when men rate a woman as attractive, they also tend to rate the woman as being promiscuous, a trait evolutionarily associated with mate selection in men. Lucker, Beane, and Helmreich (1981) also found that three personality dimensions (i.e., liking, sexiness, and masculinity/femininity) were positively correlated with physical attractiveness. According to these studies, and many more, if a person is physically attractive, they are likely to be rated by others as holding many other positive qualities as well.

In the past, researchers have employed several methodologies to examine the effects of attractiveness on the halo effect. For example, Wade and DiMaria (2003) studied the influence of women's race and weight on the halo effect by combining pictures with a written description of the women. The written description was the same for all pictures and included characteristics such as what sport the person played and their favorite color. They found that race and weight affected several measures of life success and personality, with thinner White women and heavier Black women receiving more positive ratings on several of these items. In another study, men rated attractive authors as being significantly more talented in their writing than unattractive authors (Kaplan, 1978). The study paired either an attractive or an unattractive picture of an author to the same essay and then asked participants to rate the authors' writing skill. In another study (Bak & Köln, 2010), male and female college students (N = 113) at a German university viewed simulated online dating profiles that included a variety of written information about the person (e.g., age, sex, hobbies) and either an attractive photo or unattractive photo. Further, researchers informed participants that, for reasons of privacy, the photo was not of the actual person but a randomly selected photo. Participants rated the person on 10 positive and 10 negative trait dimensions and received an overall personality valence score. Results showed that attractiveness of

the male photo did not influence attribute ratings by female participants but that attractiveness of the female photo did result in more positive attribute ratings by male participants, even though the male participants knew that the photo did not represent the person in the profile description. These results suggested that the attractiveness halo effect may be more of an evolutionarily automatic process in men than in women.

A substantial amount of research exists on the halo effect, and it is evident that the halo effect affects people's judgments in a variety of ways. Studies have shown that, because of the halo effect, people are often unfairly attributed with qualities that they may not actually possess (Eagly, Ashmore, Makhijani, & Longo, 1991; Feingold, 1992; Segal-Caspi, Roccas, & Sagiv, 2012). The study conducted by Bak and Köln (2010) provided the impetus for the present study. As stated, their research revealed that, for men, the halo effect that results from a written description of a person can, to some degree, be modulated by a somewhat automatic halo effect that results from a picture depicting a woman with a particular level of attractiveness. They manipulated the attractiveness of the photo and held constant the written profile description.

The present study examined the relative contribution of the halo effect that results from a photo with the relative contribution of the halo effect that results from a written description of that person by manipulating the written description and holding constant the photo. Specifically, the purpose of the present study was to show men a photo of an attractive woman and determine the relative contributions of positive, negative, and no written descriptions to the perception of the woman's personality traits. If the visual attractiveness halo effect for men is completely automatic and overrides other information, neither the presence or absence nor the nature of the written description should affect perception of personality traits. Because other studies show halo effects associated with written/verbal information, we hypothesized that a written personality description would modulate the attractiveness halo effect such that, compared to a no description condition, a positive description would result in a more positive personality assessment and a negative description would result in a more negative personality assessment.

Method

Participants

Sixty-five male undergraduate students from a state university in the midsouth served as participants. Although the researchers did not record age and race of participants, most were 18 to 22 years of age and White. Each received a research credit for participation. The research credit provided either course extra credit or partial fulfillment of requirements in a course. Researchers treated all participants in accordance with the ethical principles provided by the American Psychological Association.

Materials

We created three separate online surveys using Qualtrics® software. Each survey consisted of a single picture of an attractive woman, accompanied by either no description, a positive written description, or a negative written description. We chose the picture from a search for attractive women on Google® images. The photo selected was a black and white facial image of the actor and singer/songwriter Victoria Justice downloaded from the website fanpop.com. She is best known for her roles on *Nickelodeon*® television.

We wrote the two descriptions based on positive and negative personality traits that other researchers had examined in the literature. The positive description stated the following:

> This young woman is an optimistic person. She often views things in a positive light. She is usually honest and is considered to be a reliable person. She is a generous woman. She is usually understanding and sympathetic. She is conscientious and generally a rather patient person.

The negative description stated the following:

> This young woman is not an optimistic person. She often views things in a negative light. She is usually dishonest and is considered to be an unreliable person. She is not a generous woman. She is not usually understanding or sympathetic. She is not conscientious and generally a rather impatient person.

This was followed by 10 questions that asked participants to rate various personality attributes of the woman in the image (see Appendix). These personality attributes were different from those in the descriptions. The questions required the participant to rate, on a 9-point Likert-type scale, how likely or unlikely it was for the woman to possess certain personality traits. We modeled some questions in our survey after the questions used in

a successful study conducted by Pollock (2012). In her study, Pollock only used five questions, but we chose to ask 10 in order to assess a greater variety of personality traits. These traits included physical attractiveness, success, extroversion, athleticism, femininity, intelligence, friendliness, aggression (reverse scored), ambition, and likability. The photo of the woman and the questions were identical in all conditions.

Procedure

After institutional review board approval (#14-028), we provided participants with a link to the online survey that could be completed on any device from any location with Internet connectivity. After reading the consent form, participants indicated whether the last number of their student ID fell between 0 and 3, 4 and 6, or 7 and 9. The software used this question in the experimental design to randomly assign participants to one of the three description conditions described above. Participants viewed a screen that contained the photo, the description (if there was one), and the 10 questions regarding the personality traits. This screen remained until the participant completed all 10 questions. Participants then read the debriefing statement. Total participation time was approximately 3 min.

Results

Random assignment to conditions based on the last digit of the student ID, resulted in 21 participants in the no description condition, 22 participants in the positive description condition, and 22 participants in the negative description condition. A one-way Multivariate Analysis of Variance (MANOVA) was conducted to analyze the effect of description condition on each of the 10 rated personality attributes. Analysis showed a significant effect of description condition on personality attribute ratings, $F(20, 108) = 6.24$, $p < .001$, Wilks $\Lambda = 0.21$, $\eta_p^2 = .54$. Descriptive statistics and results of the MANOVA for each item are shown in Table 1. These results showed that participants in all description conditions rated the woman as equally attractive, athletic, and feminine (all ps $> .05$). However, description condition did affect ratings on the other seven personality attributes.

Pairwise comparisons for these seven personality attributes showed that, in every case (successful, extroverted, intelligent, friendly, not aggressive, ambitious, likeable), participants rated the woman in the no description and positive description conditions higher than they rated the woman in the negative description condition (all ps $< .04$). Further, ratings between the no description and positive description conditions did not differ.

Discussion

We hypothesized that, compared to a no description condition, a positive description would result in a more positive personality assessment and a negative description would result in a more negative personality assessment. Results partially supported this hypothesis in that the negative description did lower most of the personality attribute ratings, but the positive description did not significantly increase those ratings. Participants who viewed the attractive woman and read a description with several negative personality traits rated the woman less successful, less extroverted, less intelligent, less friendly, more aggressive, less ambitious, and less likeable.

Prior research on the halo effect that involved both a photographic image and a description have tended to use a methodology in which the description is held constant and qualities of the photo are varied (Bak & Köln, 2010; Kaplan, 1978; Wade & DiMaria, 2003). In these studies, the qualities of the photo have been shown to affect subsequent ratings of various personality attributes. The present study varied the descriptions and held constant the qualities of the photo. We showed that descriptions can affect subsequent ratings of various personality attributes.

The fact that the positive description did not increase ratings of personality attributes may be due in part by a ceiling effect. Participants across all conditions rated the woman as very attractive, with an overall mean score of 7.40 ($SD = 1.61$) on a 9-point Likert-type scale. In fact, 15 of the 65 participants (23%) selected the highest score on the scale. For the ratings of personality attributes, participants in the no description condition provided individual ratings at the highest end of the scale 12% of the time and mean ratings across individuals of 5.38 ($SD = 1.72$) to 7.43 ($SD = 1.91$). Although these ratings were on the high end of the scale, it does seem that there is still room for even higher ratings on the personality attributes.

It is also possible that the positive description simply served as confirmation bias for the attractiveness halo effect. When an image and text appear concurrently, people tend to focus increased visual attention on the image (Townsend & Kahn, 2014). In the present study, the attractiveness halo effect

likely occurred before participants read the positive or negative personality description. We speculate that the halo effect that resulted from the attractive photo caused participants to assume positive personality traits. The fact that positive personality traits also occurred in the description simply confirmed what they were already thinking and thus did not increase ratings of other personality attributes beyond the increase that already occurred as a result of the attractiveness halo effect. However, in the condition in which participants read about negative personality traits in the description, this description likely countered the assumed positive attributes that resulted from the attractiveness halo effect. Thus, participants adjusted their opinion of the woman in the photo. In the present study, the photo and the description appeared simultaneously on the screen. It would be interesting in future research to systematically manipulate the order and timing of these two events.

TABLE 1

Results of Multivariate Analysis of Variance for Each Rated Personality Attribute

Rated Personality Attribute	Type of Description	*M*	*SD*	*F*	*p*	η_p^2
Attractive	None	7.29	1.49	0.35	.71	.01
	Positive	7.64	1.68			
	Negative	7.27	1.70			
Successful	None	6.62	1.12	16.58	< .001	.35
	Positive	6.86	1.32			
	Negative	4.73	1.55			
Extroverted	None	7.29	1.19	8.64	< .001	.22
	Positive	6.27	1.80			
	Negative	5.00	2.25			
Athletic	None	5.38	1.72	2.28	.11	.07
	Positive	5.82	1.37			
	Negative	4.73	1.98			
Feminine	None	7.43	1.91	1.68	.19	.05
	Positive	7.05	0.95			
	Negative	6.55	1.74			
Intelligent	None	6.29	1.01	14.21	< .001	.31
	Positive	6.55	1.10			
	Negative	4.77	1.41			
Friendly	None	6.71	1.62	58.43	< .001	.65
	Positive	7.27	1.49			
	Negative	2.50	1.68			
Aggressive (reverse scored)	None	6.24	1.90	16.64	< .001	.35
	Positive	5.91	1.44			
	Negative	3.64	1.50			
Ambitious	None	6.00	1.52	3.47	.04	.10
	Positive	6.09	1.63			
	Negative	4.82	2.13			
Likeable	None	6.81	1.25	56.19	< .001	.64
	Positive	7.45	1.41			
	Negative	2.86	1.91			

Although our results were significant, our study had a few limitations. The attractive photo was selected by a group of three undergraduate women. Although ratings of physical attractiveness by the men in our study confirmed that the woman in the photo was attractive ($M = 7.90$ in the no description condition), pilot testing the photo with a separate group of students would have been a better approach. Further, the woman in the photo was an actor (Victoria Justice), and it is possible that some participants knew other qualities of this person. Another limitation was that we only studied a sample of undergraduate men. We do not know if the pattern of results would extend to women rating men or to individuals in older age groups. Finally, one could argue whether some of the rated personality attributes including athletic, feminine, and ambitious are indeed viewed as positive qualities by young adult men. The fact that the descriptor manipulation did not affect two of these attributes (athletic, feminine) may support this argument. Future research should address each of these issues.

The halo effect is a cognitive bias that humans possess, especially when forming first impressions of others. These perceptions of others then affect the way in which people act toward or respond to their behaviors. Thus, understanding the specifics of the halo effect is critical to understanding most social encounters. That understanding can then be used to develop cognitive strategies and protocols to avoid the bias that results in the inaccurate and often unfair impression of others.

References

Apaolaza, V., Hartmann, P., López, C., Barrutia, J. M., & Echebarria, C. (2014). Natural ingredients claim's halo effect on hedonic sensory experiences of perfumes. *Food Quality and Preference, 36*, 81–86. doi:10.1016/j.foodqual.2014.03.004

Bak, P. M., & Köln, H. F. (2010). Sex differences in the attractiveness halo effect in the online dating environment. *Journal of Business and Media Psychology, 1*, 1–7.

Borman, W. C. (1979). Format and training effects on rating accuracy and rater errors. *Journal of Applied Psychology, 64*, 410–421. doi:10.1037/0021-9010.64.4.410

Chantal, Y., Bernache-Assollant, I., & Schiano-Iomoriello, S. (2013). Examining a negative halo effect to anabolic steroids users through perceived achievement goals, sportspersonship orientations, and aggressive tendencies. *Scandinavian Journal of Psychology, 54*, 173–177. doi:10.1111/sjop.12028

Dagger, T. S., Danaher, P. J., Sweeney, J. C., & McColl-Kennedy, J. R. (2013). Selective halo effects arising from improving the interpersonal skills of frontline employees. *Journal of Service Research, 16*, 488–502. doi:10.1177/1094670513481406

Dennis, I. (2007). Halo effects in grading students projects. *Journal of Applied Psychology, 92*, 1169–1176. doi:10.1037/0021-9010.92.4.1169

Eagly, A. H., Ashmore, R. D., Makhijani, M. G., & Longo, L. C. (1991). What is beautiful is good, but . . . : A meta-analytic review of research on the physical attractiveness stereotype. *Psychological Bulletin, 110*, 109–128. doi:10.1037/0033-2909.110.1.109

Feingold, A. (1992). Good-looking people are not what we think. *Psychological Bulletin, 111*, 304–341. doi:10.1037/0033-2909.111.2.304

Forgas, J. P. (2011). She doesn't look like a philosopher . . . ? Affective influences on the halo effect in impression formation. *European Journal of Social Psychology, 41*, 812–817. doi:10.1002/ejsp.842

Goffin, R. D., Blake, J. R., & Wagner, S. H. (2003). Is halo helpful? Effects of inducing halo on performance rating accuracy. *Social Behavior and Personality, 31*, 625–636. doi:10.2224/sbp.2003.31.6.625

Jacques, G., & Mmatli, T. O. (2013). Addressing ethical nonsequiturs in Botswana's HIV and AIDS policies: Harmonising the halo effect. *Ethics and Social Welfare, 7*, 342–358. doi:10.1080/17496535.2013.768071

Kahneman, D. (2011). *Thinking, fast and slow*. New York, NY: Farrar, Straus, and Giroux.

Kaplan, R. M. (1978). Is beauty talent? Sex interaction in the attractiveness halo effect. *Sex Roles, 4*, 195–204. doi:10.1007/BF00287500

Keeley, J., English, T., Irons, J. G., & Henslee, A. M. (2013). Investigating halo and ceiling effects in student evaluations of instruction. *Educational and Psychological Measurement, 73*, 440–457. doi:10.1177/0013164412475300

Lennon, C. A., & Kenny, D. A. (2013). The role of men's physical attractiveness in women's perceptions of sexual risk: Danger or allure? *Journal of Health Psychology, 18*, 1166–1176. doi:10.1177/1359105312462438

Lucker, G. W., Beane, W. E., & Helmreich, R. L. (1981). The strength of the halo effect in physical attractiveness research. *The Journal of Psychology, 107*, 69–75. doi:10.1080/00223980.1981.9915206

Malouff, J. M., Emmerton, A. J., & Shutte, N. S. (2013). The risk of a halo bias as a reason to keep students anonymous during grading. *Teaching of Psychology, 40*, 233–237. doi:10.1177/0098628313487425

Naquin, C. E., & Tynan, R. O. (2003). The team halo effect: Why teams are not blamed for their failures. *Journal of Applied Psychology, 88*, 332–340. doi:10.1037/0021-9010.88.2.332.

Nisbett, R. E., & Wilson, T. D. (1977). The halo effect: Evidence for unconscious alteration of judgments. J*ournal of Personality and Social Psychology, 35*, 250–256. doi:10.1037/0022-3514.35.4.250

Ogden, R. S. (2013). The effect of facial attractiveness on temporal perception. *Cognition and Emotion, 27*, 1292–1304. doi:10.1080/02699931.2013.769426

O'Neal, E. (2005). Influence of future choice importance and arousal upon the halo effect. *Integrative Physiological and Behavioral Science, 40*, 147–155. doi:10.1007/BF03159711

Palmer, J. K., & Loveland, J. M. (2008). The influence of group discussion on performance judgments: Rating accuracy, contrast effects, and halo. *Journal of Psychology: Interdisciplinary and Applied, 142*, 117–130. doi:10.3200/JRLP.142.2.117-130

Pollock, J. P. (2012). The halo effect: The influence of attractiveness on perceived promiscuity. *Sentience: The University of Minnesota Undergraduate Journal of Psychology, 7*, 34–37.

Segal-Caspi, L., Roccas, S., & Sagiv, L. (2012). Don't judge a book by its cover, revisited: Perceived and reported traits and values of attractive women. *Psychological Science, 23*, 1112–1116. doi:10.1177/0956797612446349

Shinada, M., & Yamagishi, T. (2014). Physical attractiveness and cooperation in a prisoner's dilemma game. *Evolution and Human Behavior, 35*, 451–455. doi:10.1016/j.evolhumbehav.2014.06.003

Thorndike, E. L. (1920). A constant error in psychological ratings. *Journal of Applied Psychology, 4*, 25–29. doi:10.1037/h0071663

Townsend, C., & Kahn, B. E. (2014). The 'visual preference heuristic': The influence of visual versus verbal depiction on assortment processing, perceived variety, and choice overload. *Journal of Consumer Research, 40*, 993–1015. doi:10.1086/673521

Wade, J. T., & DiMaria, C. (2003). Weight halo effects: Individual differences in perceived life success as a function of women's race and weight. *Sex Roles, 48*, 461–465. doi:10.1023/A:1023582629538

Author Note. William J. Lammers, Department of Psychology and Counseling, University of Central Arkansas; Sarah Davis, Department of Psychology and Counseling, University of Central Arkansas; Kellie Hogue, Department of Psychology and Counseling, University of Central Arkansas.

The first author is the faculty sponsor and the remaining three authors were undergraduate students at the time of the study.

Correspondence concerning this article should be addressed to William J. Lammers, Department of Psychology and Counseling, University of Central Arkansas, 201 S. Donaghey Ave, Conway, AR 72035. E-mail: billl@uca.edu

APPENDIX

How physically attractive do you think this individual is? Not very attractive … Very attractive 1 2 3 4 5 6 7 8 9	How intelligent do you think this individual is? Not very intelligent … Very intelligent 1 2 3 4 5 6 7 8 9
How successful do you think this individual is? Not very successful … Very successful 1 2 3 4 5 6 7 8 9	How friendly do you think this individual is? Not very friendly … Very friendly 1 2 3 4 5 6 7 8 9
How extroverted do you think this individual is? Not very extroverted … Very extroverted 1 2 3 4 5 6 7 8 9	How agressive do you think this individual is? (reverse scored) Not very Aggressive … Very Aggressive 1 2 3 4 5 6 7 8 9
How athletic do you think this individual is? Not very athletic … Very athletic 1 2 3 4 5 6 7 8 9	How ambitious do you think this individual is? Not Very Ambitious … Very Ambitious 1 2 3 4 5 6 7 8 9
How feminine do you think this individual is? Not very feminine … Very feminine 1 2 3 4 5 6 7 8 9	How likeable do you think this individual is? Not Very Likeable … Very Likeable 1 2 3 4 5 6 7 8 9

A Life History Theoretical Perspective on Mate Selection

Atina Manvelian and Molly A. Metz*
University of California, Santa Barbara

ABSTRACT. Life history theory suggests that early childhood environments lead to the development of different reproductive strategies to optimize reproductive success. We used a life history theoretical perspective to investigate whether early life experiences (stable vs. unstable family environments) influence what women find attractive in a potential mate. Using an online face perception task, women reported perceptions of traits and attraction to male faces. Life history strategy was operationalized in 2 ways: (a) the Mini-K Short Form self-report measure and (b) the contact or absence of a father during childhood. We hypothesized that women employing a faster life history strategy would be more attracted to men who have facial features reflecting more masculine traits, which have been linked to testosterone and signal high genetic quality. We also hypothesized that women employing a slower life history strategy would be more attracted to men who have facial features reflecting traits associated with high parental investment. Consistent with our hypothesis, those on a faster life history track rated masculine male faces as more attractive ($\beta = .13$, $p < .001$), and those employing a slower life history strategy reported more attraction to men with high feminine traits ($\beta = .31$, $p < .001$). This suggests that women employing a faster life history strategy favor men who show signs of high genetic quality (masculine traits) and little cues of parental investment, possibly subjecting these women to adverse life and relationship outcomes. Strategies for more precisely studying the link between life history and mate selection are discussed.

Evolutionary psychologists have suggested that humans should have developed specific psychological mechanisms that solve the adaptive and important problem of selecting a mate (Cosmides & Tooby, 1994). Choosing mates who provide good genes and high parental investment in their children is associated with reproductive success and the spread of one's genes into the next generation. Because women tend to bear the majority of the burden of reproduction, they have been known to select mates with more caution (Johnstone, Reynolds, & Deutsch, 1996). But what strategies do women use to facilitate their reproductive success?

There are multiple and sometimes competing processes that contribute to variation in reproductive strategies in women, some of which may be conscious and others unconscious. For example, Penton-Voak, Jacobson, and Trivers (2004) proposed that specific cues from a woman's environment can trigger the early onset of reproductive behavior. Their study focused on noteworthy variation in reproductive timing; those born into more stressful environments tend to engage in courtship and reproductive behavior earlier in life. However, their research does not address variation in the types of mates that women may select. We proposed that variations in reproductive strategy should be revealed in predictable patterns of mate attraction and selection, and we began to

*Faculty mentor

explore this question using a life history theoretical framework.

Life History Theory

Originally developed by evolutionary biologists and behavioral ecologists to address between-species variation in reproductive strategy (Clutton-Brock, 1991), life history theory suggests that, due to finite energy and resources, organisms must decide where to invest their time (i.e., to either reproduce early in life or to collect resources, grow, and delay reproduction; Chisholm, 1999). Life history theory proposes that, all else being equal, species or organisms living in unstable and unpredictable environments evolve clusters of traits associated with high reproductive rates (having many offspring) and low parental investment called a fast strategy. In contrast, species or organisms living in relatively stable environments evolve clusters of traits associated with lower reproductive rates (having few offspring) and high parental investment called a slow strategy (Chisholm, 1999).

Differential costs of reproduction. Throughout humanity's evolutionary past, different selection pressures have acted on men and women, creating distinct psychological modules that help men and women discriminate between potential mates (Cosmides & Tooby, 1994). Women must gestate, lactate, and invest in their young to increase their reproductive fitness. Therefore, because women incur many costs such as pregnancy, time, and energy, they have become more discriminating when choosing a potential mate and are often referred to as "the choosier sex" (Johnstone et al., 1996). Researchers have suggested that strong selection pressures would have acted to ensure that women were able to discriminate and find a mate who would increase their reproductive success, although the strategy they use to increase reproductive success varies with life history strategy.

Stressful life environments. There are some suggestions as to what constitutes an unpredictable or stressful childhood environment. In humans, stressful environmental cues such as variation in life expectancy, violent crime rates, and unreliable attachment figures are all associated with both psychological (Chisholm, Quinlivan, Petersen, & Coall, 2005) and physiological (Draper & Harpending, 1982) indexes of a faster life history strategy. One early study determined that father absence, as an indicator of stressful early environments, predisposed women toward early reproduction by predicting the onset of menarche by an average of six months earlier compared to women whose fathers were present during childhood (Draper & Harpending, 1982).

Draper and Harpending (1982) theorized that natural selection has created mechanisms in women that can be turned on to encourage early reproduction. Father absence, throughout humanity's evolutionary past, was a strong indicator of high offspring mortality rates because paternal investment and protection was vital to having enough resources to survive. With the early onset of menarche in high mortality and unstable early environments, natural selection could be setting women on a trajectory that could lead them to early reproductive careers and potentially higher reproductive success. Other studies have shown that insecure attachment to parents can also predict early menarche and the onset of first sexual debut in women (Belsky, Steinberg, & Draper, 1991).

In summary, prior studies have shown that early environmental stress such as father absence and an insecure early childhood environment predicts whether women mate early in life (fast strategy) or delay reproduction (slow strategy), but what about mate preferences? Does early environmental stress also predict the types of mates that women are likely to choose? Based on the preceding literature, we reasoned that differences in fast and slow reproductive strategies would also be reflected in the types of mates that women find most attractive.

Mate Preferences

Many factors affect what men and women find attractive. For example, both men and women find symmetrical faces more attractive because symmetry has been a reliable indicator of good health and immune functioning throughout humanity's evolutionary past (Langlois, Roggman, & Musselman, 1994; Rhodes, Sumich, & Byatt, 1999). Men and women also show preferences for people with more feminine facial features. Having more feminine features has been linked with perceptions of kindness, trustworthiness, and parental investment (Penton-Voak et al., 2004).

Variation in attraction. Despite these general trends, there is much variation in which faces women find more attractive. For example, depending on hormones and goal-oriented motivations, women may differentially prefer faces varying on masculinity. During ovulation, when women are highly fertile, they show preferences for men with more masculine facial features that are associated with the immune suppressing hormone,

testosterone (Jones et al., 2005). Masculine-looking men, by virtue of being able to maintain such an immune suppressing hormone, are thought to have higher functioning immune systems and are found highly attractive to ovulating women who may be looking for good genes (Fink & Penton-Voak, 2002). In contrast, when they are not ovulating, women show preferences for men with more feminine facial features who are likely to be high in parental investment and look kind and caring. Moreover, biological processes have also been shown to be sensitive to current environmental conditions. For example, when reminded of their own death or mortality, women report a shift in attraction to more masculine looking faces as well (Vaughn, Bradley, Byrd-Craven, & Kennison, 2010).

In summary, these studies have suggested that, although women vary in the degree to which they value specific traits in men, there may be systematic differences in the extent to which they find masculine, dominant faces attractive. We sought to apply life history theory to address these systematic variations. If women with different early life experiences employ different reproductive strategies to increase reproductive success, would they be attracted to different kinds of men who might help them reach their goals?

Life history's influence on mate preference. Life history theory suggests that humans are born with psychological mechanisms that help them solve adaptive problems and, ultimately, help them maximize their reproductive success. Variables such as a father's absence during the fundamental years of his daughter's development could subconsciously suggest to his daughter that pair-bonding is unstable in their environment. This might warn her that parental investment will be low in her future as well. As a result, we predicted that daughters or women raised in father absent environments may prioritize signs of genetic quality (vs. signs of paternal investment) in a mate to ensure that they at least have healthy offspring given that they cannot depend on men in their communities for paternal investment.

There has been limited evidence for this idea. Penton-Voak et al. (2004) compared the mate preferences of Jamaican versus British women and found that Jamaican women preferred male faces that were more masculine with traits that may indicate high genetic quality. In contrast, women from Britain were attracted to men with softer traits that may indicate that these men would make good long-term partners and parents. They reasoned that Jamaican women had a faster life history strategy because many Jamaican families have absent fathers and high levels of parasites in their environments, which leads to higher mortality rates. In turn, these higher mortality rates may signal women to employ a faster reproductive strategy, possibly guiding their mate preferences for men with more masculine features. We suggested that clues from the environment such as low parental investment or high pathogen levels may unconsciously signal women to prioritize masculine male faces that may indicate high genetic quality and good health, rather than feminized male faces that may indicate long-term paternal investment.

The study by Penton-Voak et al. (2004) focused on between-culture differences in mate preferences. The authors suggested that the observed differences between Jamaican and British women may be due to differences in environmental stress (greater stress in Jamaica). There are many differences between Jamaican and British cultures, and many alternative explanations for between-culture differences in mate preferences. Therefore, it is important to provide a more direct test of the association between early environmental stress (life history strategy) and mate preferences by studying variations in mate preferences within a specific culture. In the current study, we investigated the possibility that within-culture variation in mate preferences may be shaped by differences in early life experiences.

One Approach: Face Perception

One common way to assess mate preferences is by using a face perception task. In a typical face perception paradigm, participants are presented with a series of faces and asked to rate them on various personality and physical characteristics. Face perception studies have demonstrated that the face is a reliable resource when it comes to assessing traits such as social dominance and aggressiveness (Dabbs & Morris, 1990); agreeableness and extraversion (Baron-Cohen, Knickmeyer, & Belmonte, 2005); and honesty, kindness, and warmth (Berry & Brownlow, 1989). Traits such as dominance and aggressiveness are particularly easy for raters to identify, and have been linked to the hormone, testosterone (Dabbs & Dabbs, 2000). Testosterone is reliably associated with physical characteristics in men such as facial hair, enlarged cheekbones, and a defined jaw that are often seen as attractive (Cunningham, Barbee, & Pike, 1990). However, testosterone is also associated with negative behavioral

traits such as low social sensitivity (Baron-Cohen et al., 2005), emotional containment, emotional flooding, and even rage (Dabbs & Dabbs, 2000), all of which can lead to poor communication and negative consequences in close relationships. These personality characteristics can make for a dominant mate who might be a good leader and may display markers of good genes. However, it might also predict low parental investment and bad parenting skills. Moreover, traits that are associated with parental investment are inversely related to traits related to mating effort. In a different study, Kruger (2006) found that participants associated mating effort with masculinized faces, and parenting effort with feminized faces, suggesting that facial cues may reveal important information about someone's personality.

The Present Study

In the present research, we investigated how a woman's life history strategy predicted the types of men she would find attractive as an adult. We predicted that women who used the fast strategy would prioritize cues of genetic quality (masculine facial features) over cues of parental investment (feminine facial features) when looking for a short-term or long-term mate. More specifically, we hypothesized that women who used a faster life history strategy would report more attraction to male faces that are perceived to be higher in masculine traits, which we labeled as *hard traits* (i.e., masculinity, dominance, and aggression). We also hypothesized that women who used a slower life history strategy would give higher attraction ratings to male faces that are perceived to be higher in traits related to parental investment, which we labeled *soft traits* (i.e., caring, supportive, trustworthy, and kind).

To test these hypotheses, we had young adult women participate in a study where they completed background questionnaires designed to assess the psychological correlates of their life history strategy. They, then viewed a series of photographs of young adult men, rated each photo on a series of hard (masculine) and soft (feminine) traits, and reported on attraction to the targets as short-term and long-term mates.

Method

Participants

Seventy-nine female participants were recruited and paid through Amazon Mechanical Turk™ (MTurk), but 18 had to be removed for incomplete measures, leaving a total of 61 participants. Most participants reported being heterosexual (87%); the rest identified as bisexual (13%). Approximately 69% of our sample was European American, 18% was Asian, and 13% reported being from other racial backgrounds. Participants ranged in age from 19 to 40 years with a mean of 27.5 (SD = 3.7). As a proxy for socioeconomic status, participants were asked to report their own and their parents' level of education. All participants reported having at least a high school diploma, and 64% reported a postsecondary degree. Most mothers and fathers had a high school diploma, and approximately 36% had a post-secondary degree. Thus, our sample was, on average, fairly well-educated.

Design

The present study used a mixed between- and within-subjects design. The between-subjects variable was *life history strategy*, which was assessed with two different measures. One was a multi-item scale, the Mini-K Short Form, (Mini-K; described below), and the other was a dichotomous variable indicating the contact or absence of father during childhood. The within-subjects variable was the perceptions of traits for each of the 45 photographs. We had two sets of trait ratings: soft traits (masculine traits) and hard traits (feminine traits). The dependent variable was the level of attraction as a short-term (sex and dating) vs. long-term (coparent and spouse) partner, which was rated for each of the 45 photographs. This research design resulted in multilevel data. At Level 1, we had each participant's trait ratings and attraction ratings for 45 photographs. At Level 2, we had each person's life history strategy. We analyzed the data using multilevel modeling.

Procedure

After institutional review board approval was given (13-0349), participants completed a 1-hr study to rate photos on a variety of personality traits. They were given instructions on MTurk and directed to a link that would open up the survey on Qualtrics® online survey software. Participants were asked to rate 45 male faces twice: the first time on a variety of personality traits and the second time on how attractive they found the person as a potential partner in various types of relationships (sex partner, spouse, and so on). Participants completed a background questionnaire to assess the stability of their environment, and therefore, their life history strategy. Participants were then thanked for their

participation and paid, and all guidelines for the ethical treatment of human subjects as set by the university and the American Psychological Association were followed throughout the study.

Stimuli. Participants were presented with photographs of 45 male faces. Most of these men were European American followed by Hispanic, Asian, and other ethnicities. They ranged in age from 18 to 34 and had a mean age of 21.8 (*SD* = 2.8). The photographs used in the present study were part of a larger investigation of face perception and caregiving behavior. For this reason, the 45 male photographs were screenshots taken from video data of male caregivers, acquired from a prior study of young adult couples. The still images were all selected to reflect the most neutral expression possible from the video clips and were edited to be approximately the same size and resolution.

Photograph ratings. Participants rated 45 male faces on a series of 14 traits: kind, warm, understanding, responsive to close others, trustworthy, assertive, masculine, feminine, dominant, friendly, physically attractive, caring, aggressive, supportive, and strong. Ratings ranged from 1 (*less than the average man*) to 5 (*more than the average man*). Three traits associated with testosterone (masculinity, dominance, and aggression; Dabbs & Morris, 1990) were averaged to form a composite representing hard traits (α = .77). Four traits associated with good parental investment (caring, supportive, trustworthy, and kind) were averaged to form a composite representing soft traits (α = .87). Participants then rated how attracted they were to each target in terms of six types of relationships: (a) a sex partner, (b) dating partner, (c) spouse, (d) coparent, (e) friend, and (f) coworker. Their ratings varied from 1 (*not at all attractive*) to 5 (*very attractive*). A *short-term mating composite* was created by averaging their attraction ratings for dating partner and sex partner (*r* = .88), and a *long-term mating composite* was formed by averaging their attraction ratings for spouse and coparent (*r* = .83).

Life history measures. We used two measures to assess life history. First, we included a validated life history questionnaire called the Mini-K (Figueredo et al., 2006). This measure is part of a larger battery of measures of life history called the Arizona Life History Battery (Figueredo, 2007). This larger set of measures assesses a number of validated psychological and behavioral correlates of life history strategy such as insight and planning, attachment, social contact, and support. The Mini-K consists of a few items targeted for each questionnaire in the larger set of measures. The Mini-K is a 20-item measure ranging from -3 (*strongly disagree*) to +3 (*strongly agree*) and includes questions like "I make plans in advance" and "I often get emotional support and practical help from my blood relatives." High scores reflect slow life history, and low scores reflect fast life history.

Second, based on prior research, we used one question to assess paternal contact or no contact during childhood by asking, "Did you have any contact with your father or primary male guardian while growing up?" Participants answered yes or no to this question. Fourteen of our 61 female participants reported never having contact with their father.

Results

Preliminary Analyses and Descriptive Statistics

Prior to conducting our hypothesis tests, we examined correlations between all study variables and computed means and standard deviations. As shown in Table 1, there was no significant correlation between scores on the Mini-K and ratings of soft traits or hard traits. There was also no association between father contact and ratings of soft and hard traits. These correlations indicated that those with a slower versus faster life history strategy did not differ in how they perceived the photos. That is, they did not see the photos as more or less masculine or feminine. In addition, we found no correlation between Mini-K and short-term attraction or long-term attraction. We also found no correlation between father contact and short-term and long-term attraction. These correlations indicated that those with a slower versus faster life history strategy did not differ in their overall levels of attraction toward the photos.

Data Analysis Plan

TABLE 1

Correlations and Descriptive Statistics for Key Study Variables

	Hard traits	ST attraction	LT attraction	Mini-K	Father contact	*M*	*SD*
Soft traits	-.04	.30*	.34**	.18	-.01	2.87	0.72
Hard traits	–	.18	.12	.15	-.08	2.98	0.76
ST attraction	–	–	.77***	-.04	-.04	1.93	1.05
LT attraction	–	–	–	.03	-.05	1.84	1.02
Mini-K	–	–	–	–	.09	0.80	0.74
Father contact	–	–	–	–	–	0.77	0.42

Note. Mini-K is scored such that higher scores represent a slower life history strategy. ST = short term. LT = long term. Father contact is dummy coded 0 = *No contact with father*, 1 = *Contact with father*. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

To analyze the within-person (Level 1) associations between the perception of hard and soft traits and attraction as moderated by the between-subjects (Level 2) variables (life history strategy as indexed by Mini-K and father contact), we estimated a series of multilevel models using HLM 6.0 software (Raudenbush, Bryk, & Congdon, 2004). In the first set of models, we used scores on Mini-K as the Level 2 moderator variable. In the second set of models, we used father contact or absence as the Level 2 moderator.

Effect of Mini-K on Attraction

Hard traits and attraction. First, we examined the association between hard traits and short-term attraction. As shown in Table 2, there was a significant main effect of hard traits ($b = .15$, $p < .001$), indicating that participants were more attracted to individuals who they perceived as having more masculine traits (masculine, dominant, aggressive). There was no main effect of Mini-K, indicating that average levels of short-term attraction did not differ for those who scored lower or higher on the Mini-K. Finally, contrary to our prediction, there was no significant interaction between hard traits and scores on the Mini-K, indicating that scores on the Mini-K did not increase or decrease attraction to hard traits. This finding was not consistent with our hypothesis that lower scores on the Mini-K (a faster life history strategy) would predict higher levels of attraction to masculine male faces.

Next, we examined the association between hard traits and long-term attraction. As shown in Table 2, there was a significant main effect of hard traits ($b = .05$, $p = .02$), indicating that participants were more attracted as potential long-term mates to individuals who they perceived to be more masculine. There was no main effect of Mini-K and no significant interaction between hard traits and the Mini-K. Once again, this finding was not consistent with our hypothesis. Scores on the Mini-K did not moderate the association between hard traits and level of attraction as long-term mates.

TABLE 2

The Moderating Role of Mini-K on the Link Between Perception of Hard and Soft Traits and Short-Term and Long-Term Attraction

	Outcome Variable	
Predictor variable	Short-term attraction	Long-term attraction
Hard traits		
Hard traits	.15***	.05*
Mini-K	.05	.04
Hard traits x Mini-K	-.02	.01
Soft traits		
Soft traits	.31***	.32***
Mini-K	-.05	.04
Hard traits x Mini-K	.15***	.16***

Note. Mini-K is scored such that higher scores represent a slower life history strategy. *$p < .05$. **$p < .01$. ***$p < .001$.

Soft traits and attraction. Next, we examined the association between soft traits and short-term attraction. As shown in Table 2, there was a significant main effect of soft traits ($b = .31$, $p < .001$), indicating that participants were more attracted to individuals they rated as higher in soft traits (trustworthy, caring, kind). There was again no main effect of Mini-K, but as predicted, there was a significant interaction between soft traits and the Mini-K ($b = .15$, $p < .001$). To understand this interaction, we computed the simple slopes relating soft traits to attraction at high (+1 *SD*) and low (-1 *SD*) levels of Mini-K. As shown in Figure 1, we found a strong and significant positive association between soft traits and short-term attraction for women with a slower life strategy ($\beta = .31$, $p < .001$), and a much weaker, but still significant, association for women with a faster life strategy ($\beta = .15$, $p < .001$).

Finally, we examined the association between soft traits and long-term attraction. As shown in Table 2, there was a significant main effect of soft traits ($b = .32$, $p < .001$), indicating that participants were more attracted to individuals they perceived as having soft traits. There was no main effect of Mini-K, but there was a significant interaction between soft traits and Mini-K ($b = .16$, $p < .001$). The pattern of the interaction as indicated by the simple slopes was very similar to the pattern shown in Figure 1. Although women, in general, preferred men who were higher versus lower in soft traits (trustworthy, caring, kind, supportive), this association was significantly stronger for women with a slower life-history strategy (those with higher scores on Mini-K).

Effect of Father Contact on Attraction

Hard traits and attraction. First, we examined the association between hard traits and short-term attraction. As shown in Table 3, there was a significant main effect of hard traits ($b = .15$, $p < .001$), indicating that participants were more attracted to individuals who they perceived as more masculine (masculine, dominant, aggressive). There was no main effect of father contact, but there was

a significant interaction between hard traits and father contact ($b = .15$, $p = .02$). To understand this interaction, we computed the standardized simple slope relating hard traits to short-term attraction for women whose fathers were present ($n = 47$) and absent ($n = 14$). We expected that women who had no contact with their fathers would be more influenced by facial masculinity, and our hypothesis was supported. As shown in Figure 2, there was a significant positive association between hard traits and short-term attraction for women whose fathers were not present ($\beta = .13$, $p < .001$), but no significant association for women who had contact with their fathers ($\beta = .02$, $p = .63$). In other words, women who reported no contact with their fathers (or those with a faster life history strategy) reported higher levels of short-term attraction to men who they rated as looking more versus less masculine, aggressive, and dominant, while women who had contact with their fathers showed no such preference for masculine faces.

Next, we examined the association between hard traits and long-term attraction. As shown in Table 3, there was a significant main effect of hard traits ($b = .05$, $p = .03$), indicating that participants were more attracted to long-term potential mates that they perceived to be more masculine (masculine, dominant, aggressive). There was no main effect of father contact and no interaction between hard traits and father contact.

Soft traits and attraction. Next, we examined the association between soft traits and short-term attraction. As shown in Table 3, there was a significant main effect of soft traits ($b = .32$, $p < .001$), indicating that participants were more attracted to individuals who displayed softer traits (trustworthy, caring, kind, supportive). There was no main effect of father contact and, contrary to our prediction, no interaction between soft traits and father contact ($b = .06$, $p = .38$). We had predicted that women whose fathers were present would be more attracted to men with soft traits. We did not find this pattern for short-term attraction.

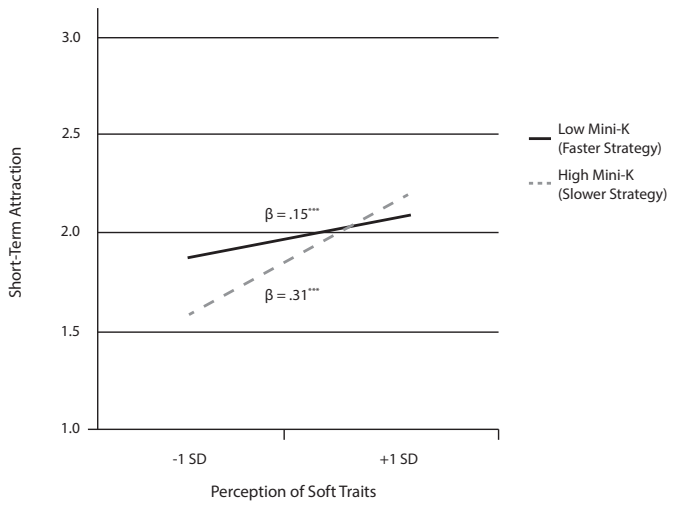
Finally, we examined the association between soft traits and long-term attraction. As shown in Table 3, there was a significant main effect of soft traits, indicating once again that participants were more attracted to individuals who displayed softer traits (trustworthy, caring, kind, supportive). There was no main effect of father contact, but there was a significant interaction between soft traits and father contact. To understand this interaction, we computed the standardized simple slope relating soft traits to long-term attraction for women who had contact with their fathers ($n = 47$) and no contact at all ($n = 14$). As shown in Figure 3, there was a significant positive association between soft traits and long-term attraction for women who had no contact with their fathers ($\beta = .26$, $p < .001$), and a weaker (but still significant) association for women who had contact with their fathers ($\beta = .14$, $p < .001$). This pattern was inconsistent with our prediction.

Discussion

The objective of the present study was to investigate if women raised in stressful versus stable life environments, using different reproductive strategies, showed preferences for different kinds of male faces. Based on life history literature, cues from a woman's environment such as father absence or low scores on the Mini-K scale have been shown to gear women to employ a faster reproductive strategy (Figueredo, 2007). We anticipated that differences in life history strategy may not only direct women toward an early reproductive career, but also lead to complementary variation in mate preferences, such that women seek out partners consistent with their reproductive goals. We predicted that women on a faster life history track who had never had contact with their fathers and scored lower on the Mini-K life history measure would find masculine male faces more attractive, indicating a preference

FIGURE 1

Perception of Soft Traits and Short-Term Attraction as Moderated by Mini-K



Note. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

for good health and immune function, especially for potential short-term mates. We also predicted that women on a slower life history track who had contact with their fathers in childhood and scored higher on the Mini-K life history measure would find softer male faces more attractive, indicating a preference for parental investment.

Results from our study were consistent with our hypotheses. In line with our first hypothesis, women employing a faster versus slower reproductive strategy with low scores on the Mini-K and father absence were more attracted to men who they perceived as more masculine, specifically when they were asked about short-term attraction. Women employing a slower life history strategy were not significantly more attracted to men with high versus low masculine traits. Consistent with our second hypothesis, women who should be employing a slower life history strategy with high scores on Mini-K and father contact were more attracted to men who had softer traits. This pattern emerged for both short-term and long-term mate attraction. Women employing a faster life history strategy were also more attracted to men with softer traits, but they were significantly less discriminating on this dimension. That is, softer traits were a stronger predictor of attraction for slow- versus fast-strategy women. In summary, our results revealed that women employing a slower life history strategy found softer (more feminine) traits as more attractive, whereas women with a faster life history strategy found men with harder traits (more masculine) as more attractive.

TABLE 3

The Moderating Role of Father Contact on the Link Between Perception of Hard and Soft Traits and Short-Term and Long-Term Attraction

	Outcome Variable	
Predictor variable	Short-term attraction	Long-term attraction
Hard traits		
Hard traits	.15***	.05*
Father contact	-.10	-.13
Hard traits x Father contact	.15*	.08
Soft traits		
Soft traits	.32***	.33***
Father contact	-.10	-.13
Hard traits x Father contact	.06	.17**

Note. Father contact is dummy coded 0 = *No contact with father*, 1 = *Contact with father*.
*$p < .05$. **$p < .01$. ***$p < .001$.

Women with a slower strategy reported more short-term and long-term attraction to men with more versus fewer soft traits who show more parental investment cues. These findings suggested that slow life history women were overall attracted to mates that demonstrated a potential for parental investment. Women with a faster life history strategy also reported short-term and long-term attraction to men high in soft traits, but this effect was not as strong. When asked to judge their short-term attraction to the male faces, however, women with a faster life history strategy were especially attracted to men who they ranked high on hard traits, suggesting that they were more attracted to masculine male faces that signal genetic quality and a strong immune system. How can we explain these findings?

Based on life history theory, we reasoned that different life history strategies would lead women to focus on different type of traits (parental investment vs. good genes) when selecting a mate. In line with this reasoning, we suggest that women employing a slower life history strategy show a preference for mates high in soft traits because these men can potentially provide them with the care, support, and paternal investment that they are looking for. It might have been more adaptive for these women who were born in stable life environments and could afford to grow and become more resourceful to not only reproduce later in life (Chisholm, 1999), but also to be careful in choosing a mate that may show early signs of paternal investment.

In contrast, women with a faster life history may be more willing to mate with someone who looks masculine and healthy because it was more adaptive for them to do so in the past. For these women who were raised in environments that were unstable, stressful, and potentially high in mortality, it would not only be advantageous for them to mate earlier in life as research has suggested (Chisholm, 1999), but also to choose a mate that can provide their progeny with great genes. Thus, from a life history perspective, it is possible that natural selection might have favored women in unstable environments to simply choose a mate who shows signs of strong genetic quality to increase the chances of them reproducing and their offspring surviving in environments where lifespans may have been short.

Limitations and Future Directions

One limitation of our methods was that, in the real world, women do not necessarily get to pick and choose what they want in a mate because their

options are usually limited by the size of their mate pool. Instead, women make decisions based on what traits they find the most important in men who they believe to be necessary for their reproductive success (Li, Bailey, Kenrick, & Linsenmeier, 2002). To test this idea, we could have had our subjects participate in a forced choice task between the more masculine and more feminine male faces. To understand how differing reproductive strategy can affect mate preferences, it would have been beneficial to ask our participants to make forced choices between the two kinds of male faces by using questions such as "If you had to pick one of these men as a long-term romantic partner, which would you choose?" Following the example of Li et al. (2002), we also could have had participants prioritize certain traits over others to determine what features are most important in a mate given limited resources. Having our participants make these choices may provide clearer insight as to whether they prefer harder or softer traits in different situations.

Another limitation of our study was that we extracted our stimuli photographs from video data, which limited how uniform our faces looked. Instead of all of our photographs having one neutral pose, they varied in the expression of their faces and body positions. Our photographs were not specifically coded or manipulated to vary on degree of masculinity or femininity. Instead, we allowed participants to rate the perception of these traits. Often in the face perception literature, computer-morphing techniques are used to masculinize or feminize faces using various criteria (Cunningham et al., 1990). On the other hand, having real unmorphed images might be more naturalistic, capturing mate preferences as they might occur in everyday life. Therefore, this may be a strength rather than a limitation in our study. For future studies, it would be useful to obtain a set of photos that are standardized in terms of photo quality and photo features. It is possible that our participants might have responded differently if we had manipulated cues of masculinity, dominance, and aggression rather than gathering subjective ratings of those traits.

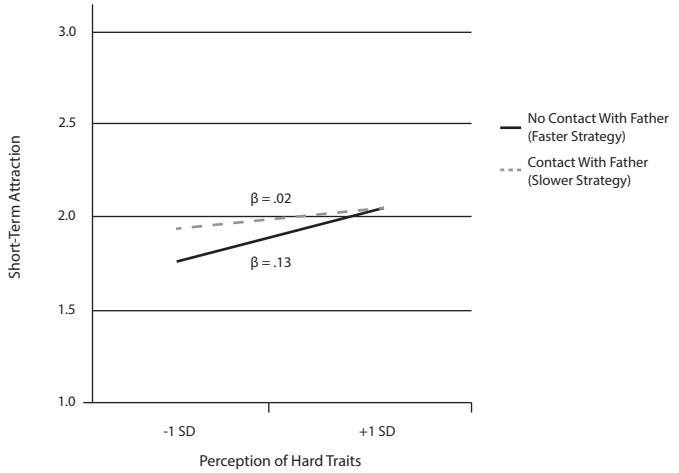
In future studies, it would also be useful to supplement self-report measures of attraction with physiological and behavioral measures of attraction. Although attraction is partially psychological, it is also a biological drive that can be measured using physiological measurements (Fisher, 2006). Scientists have demonstrated that self-ratings of attraction are not always consistent with mate choices that people actually make in an ecologically valid context (Eastwick & Finkel, 2008). Evolution has shaped these psychological mechanisms in response to what was most adaptive in humanity's evolutionary past. However, so much is both unconsciously and consciously calculated by psychological mechanisms that these decisions could become very complex, and therefore not easily reported upon (Cosmides & Tooby, 1994). It would be helpful for future studies to assess attraction using physiological measures such as pupil dilation or behavioral measures such as length of time fixating on a picture in addition to a self-report questionnaire to measure attraction.

Scores on the Mini-K scale were also not especially varied. Although the theoretical range of the scale spanned from -3 to 3, our sample only ranged from -.7 to 2.45, showing a demonstrable skew to the positive side of the scale. Oversampling women who scored both very low and very high on the Mini-K would have given us a clearer picture of the data.

An additional shortcoming of our method was that we only asked one question inquiring about father contact. A new study has shown that the reason why the father is absent may also be an important factor in determining reproductive strategy (Shenk, Starkweather, Kress, & Alam, 2013). They found that women had earlier births and earlier age at first marriage if their father divorced

FIGURE 2

Perception of Hard Traits and Short-Term Attraction as Moderated by Contact With Father



Note. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

their mother or abandoned their family. However, they found for fathers who were migrant workers that paternal absence did not have an effect on age of first birth or marriage (Shenk et al., 2013). Therefore, asking more nuanced questions about the relationship that participants had with their fathers and why their fathers were absent would have given us more accurate information about their childhood stability.

Last, assessing life history theory using a biological cue such as time of menarche to outline reproductive strategy in addition to our self-report and demographic measures would have added to the reliability of our assessments. Previous research has shown that women who are born with absent fathers tend to experience menarche earlier as compared with girls who have fathers present during their childhood (Chisholm et al., 2005).

Future studies should focus on using biological correlates of life history theory (e.g., onset of menarche) and physiological measures of attraction. Also, the use of a forced choice task in a sample that includes both people who have a slow and fast reproductive strategy (people at both extremes) combined with more concrete measures of life history strategy and attraction might illuminate the processes that govern mate selection in women.

Implications

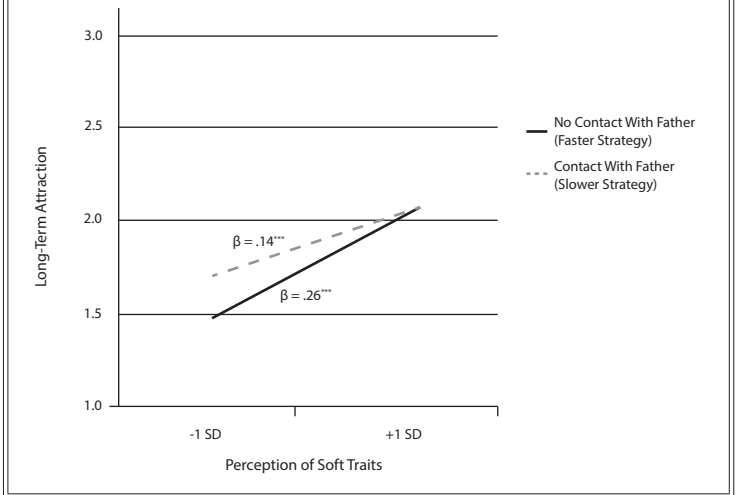
Using life history theory to study attraction can offer new insight into the world of decision making and mate choice. As research continuously demonstrates, these important decisions made by women every day are largely unconscious and might have been adaptive in the past, but they have serious implications for generations of women to come.

As our research demonstrated, if women on a faster life history track report lower levels of attraction to valuable diagnostic criteria in a male's face such as paternal investment cues, these women may be disadvantaged in being able to attain mates who can help raise their offspring. If these women with absent fathers are born to unsupportive environments and fail to select a mate that can offer them paternal investment, then this can lead to serious and adverse relationship outcomes. Being attracted to masculine men who may be unable to invest in children may lead to difficult lives for single mothers and unsupportive life environments. Single mothers have been shown to have a higher risk of being low-income, suffering from low self-esteem, and developing depression (Brown & Moran, 1997).

Moreover, the decisions that women make may not only affect them, but they could also have long-lasting effects for their children. For instance, high levels of perceived familial support have been linked to higher self-efficacy and positive health-related behaviors in children (Maldonado & Vaughn, 2013). Therefore, the lack of familial support, possibly due to an absent father, could have long-term affects on a child's psychological and physical health. Additionally, children who are raised in these conditions may also employ a faster life history strategy and favor unsupportive mates in their future, thus continuing the vicious cycle of absent fathers leading to unsupportive family environments, setting both women and their children on a faster life trajectory and subjecting them to adverse life consequences.

FIGURE 3

Perception of Soft Traits and Long-Term Attraction as Moderated by Contact With Father



Note. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Conclusion

We discovered that there were specific differences in what kinds of mates women found attractive. We found that women employing a faster life history strategy (with father absence and lower scores on the Mini-K) reported lower levels of attraction to more feminine looking male faces and high levels of attraction to masculine looking faces. This might suggest that women on a faster life history track, raised in more stressful environments, developed a mate selection strategy that would have increased their reproductive success in the past, specifically by making them less selective when choosing a

mate. However, with increases in expected lifespan, technology, and medicine, this strategy may be maladaptive in environments where resources are ample and paternal investment is beneficial for healthy development.

Therefore, in many societies today, being unable to choose the right mate who is willing to invest time and energy in child rearing can become consequential for women and for their children's development. For these reasons, it is necessary to conduct more research on mate attraction and life history. Studying these mechanisms in ecologically valid contexts could further help women avoid the perpetuating cycle of single motherhood, low paternal investment, and adverse life outcomes.

References

Baron-Cohen. S., Knickmeyer, R. C., & Belmonte, M. K. (2005). Sex differences in the brain: Implications for explaining autism. *Science, 310*(5749), 819–823. doi:10.1126/science.1115455

Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: An evolutionary theory of socialization. *Child Development, 62*, 647–670. doi:10.1111/j.1467-8624.1991.tb01558.x

Berry, D. S., & Brownlow, S. (1989). Were the physiognomists right? Personality correlates of facial babyishness. *Personality and Social Psychology Bulletin, 15*, 266–279. doi:10.1177/0146167289152013

Brown, G. W., & Moran, P. M. (1997). Single mothers, poverty, and depression. *Psychological Medicine, 27*, 21–33.

Chisholm, J. S. (1999). *Death, hope, and sex: Steps to an evolutionary ecology of mind and morality*. doi:10.1017/CBO9780511605932

Chisholm, J. S., Quinlivan, J. A., Petersen, R. W., & Coall, D. A. (2005). Early stress predicts age at menarche and first birth, adult attachment, and expected lifespan. *Human Nature*, 233–265. doi:10.1007/s12110-005-1009-0

Clutton-Brock, T. H. (1991). *The evolution of parental care*. doi:10.1046/j.1420-9101.1992.5040719.x

Cosmides, L., & Tooby, J. (1994). Origins of domain-specificity: The evolution of functional organization. In L. Hirschfeld & S. Gelman (Eds.), *Mapping the mind: Domain-specificity in cognition and culture*. doi:10.1017/cbo9780511752902.005

Cunningham M. R., Barbee A. P., & Pike C. L. (1990). What do women want? Facialmetric assessment of multiple motives in the perception of male facial physical attractiveness. *Journal of Personality and Social Psychology, 59*, 61–72. doi:10.1037/0022-3514.59.1.61

Dabbs, J. M., & Dabbs, M. G. (2000). *Heroes, rogues, and lovers: Testosterone and behavior*. doi:10.2307/4451200

Dabbs, J. M., & Morris, R. (1990). Testosterone, social class, and antisocial behavior in a sample of 4,462 men. *Psychological Science, 1*, 209–211. doi:10.1111/j.1467-9280.1990.tb00200.x

Draper, P., & Harpending, H. (1982). Father absence and reproductive strategy: An evolutionary perspective. *Journal of Anthropological Research, 38*, 255–273. Retrieved from http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1037&context=anthropologyfacpub

Eastwick, P. W., & Finkel, E. J. (2008). Sex differences in mate preferences revisited: Do people know what they initially desire in a romantic partner? *Journal of Personality and Social Psychology, 94*, 245–264. doi:10.1037/0022-3514.94.2.245

Figueredo, A. J. (2007). *The Arizona Life History Battery* [Electronic Version]. Retrieved from http://www.u.arizona.edu/~ajf/alhb.html

Figueredo, A. J., Vásquez, G., Brumbach, B. H., Schneider, S. M. R., Sefcek, J. A., Tal, I. R., . . . Jacobs, W. J. (2006). Consilience and life history theory: From genes to brain to reproductive strategy. *Developmental Review, 26*, 243–275. doi:10.1016/j.dr.2006.02.002

Fink, B., & Penton-Voak, I. (2002). Evolutionary psychology of facial attractiveness. *Current Directions in Psychological Science, 11*, 154–158. doi:10.1111/1467-8721.00190

Fisher, H. (2006). The drive to love: The neural mechanism for mate selection. In R. J. Sternberg & K. Weis (Eds.), *The new psychology of love* (pp. 87–115). New Haven: Yale University Press.

Johnstone, R. A., Reynolds, J. D., & Deutsch, J. C. (1996). Mutual mate choice and sex differences in choosiness. *Evolution, 50*, 1382–1391. doi:10.2307/2410876

Jones, B. C., Perrett, D. I., Little, A. C., Boothroyd, L., Cornwell, R. E., Feinberg, D. R., . . . Moore, F. R. (2005). Menstrual cycle, pregnancy, and oral contraceptive use alter attraction to apparent health in faces. *Proceedings of the Royal Society B: Biological Sciences, 272*(1561), 347–354. doi:10.1098/rspb.2004.2962

Kruger, D. J. (2006). Male facial masculinity influences attributions of personality and reproductive strategy. *Personal Relationships, 13*, 451–463. doi:10.1111/j.1475-6811.2006.00129.x/full

Langlois, J. H., Roggman, L. A., & Musselman, L. (1994). What is average and what is not average about attractive faces? *Psychological Science, 5*, 214–220. doi:10.1111/j.1467-9280.1994.tb00503.x

Li, N. P., Bailey, J. M., Kenrick, D. T., & Linsenmeier, J. A. (2002). The necessities and luxuries of mate preferences: Testing the tradeoffs. *Journal of Personality and Social Psychology, 82*, 947–955. doi:10.1037/0022-3514.82.6.947

Maldonado, A., & Vaughn, A. A. (2013). The influence of perceived familial emotional support in childhood on adult health-related behaviors. *Psi Chi Journal of Psychological Research, 18*, 46–60. Retrieved from www.psichi.org/?page=182JNSummer2013

Penton-Voak, I. S., Jacobson, A., & Trivers, R. (2004). Populational differences in attractiveness judgments of male and female faces: Comparing British and Jamaican samples. *Evolution and Human Behavior, 25*, 355–370. doi:10.1016/j.evolhumbehav.2004.06.002

Raudenbush, S. W., Bryk, A. S, & Congdon, R. (2004). *HLM 6 for Windows* [Computer software]. Skokie, IL: Scientific Software International, Inc.

Rhodes, G., Sumich, A., & Byatt, G. (1999). Are average facial configurations attractive only because of their symmetry? *Psychological Science, 10*, 52–58. doi:10.1111/1467-9280.00106

Shenk, M. K., Starkweather, K., Kress, H. C., & Alam, N. (2013). Does absence matter? A comparison of three types of father absence in rural Bangladesh. *Human Nature, 24*, 76–110. doi:10.1007/s12110-013-9160-5

Vaughn, J. E., Bradley, K. I., Byrd-Craven, J., & Kennison, S. M. (2010). The effect of mortality salience on women's judgments of male faces. *Evolutionary Psychology, 8*, 477–491.

Author Note. Atina Manvelian and Molly A. Metz, University of California, Santa Barbara.

This study was completed with the financial support of a UCSB Undergraduate Research and Creative Activities Grants and a Psi Chi Undergraduate Research Grants awarded to the first author, and a Psi Chi Graduate Research Grant awarded to the second author.

The authors also gratefully acknowledge the support of (a) Nancy L. Collins, for serving as honors thesis advisor for the first author and providing invaluable support and feedback throughout the process; (b) James Roney, for serving on the honors committee and providing helpful feedback on the thesis; (c) Shelly Gable, for providing the video data from which the photo stimuli were created; and (d) Brett Ouimette for his technological expertise in creating the photo stimuli.

Correspondence concerning this article may be addressed to Atina Manvelian, Department of Psychological and Brain Sciences, University of California, Santa Barbara, CA 93106. E-mail: atinamanvelian@gmail.com.

Effects of Priming Dialectic Rational Beliefs on Irrational Beliefs

James E. Crum II
Adrian College

ABSTRACT. Rational-emotive behavior therapy (REBT) theory describes irrational and rational beliefs as change mechanisms (Ellis, 1994). However, research in REBT theory has scarcely investigated, outside the setting of psychotherapy, changes in irrational beliefs as a function of rational beliefs. Therefore, the goal of the present research was to assess the effectiveness of a priming mechanism, namely dialectic rational beliefs, as a method of changing irrational beliefs. Participants were randomly assigned to either a prime or control condition. Participants in the primed condition were primed with dialectic rational beliefs, whereas those in the control were not. All participants completed a measure of irrational beliefs and state anxiety before and after the experiment. Results suggested that dialectic rational beliefs decrease irrational beliefs, $\eta_p^2 = .26$, 95% CI = [42.46, 48.07]. Discussions concern limitations to and future directions for using dialectic rational beliefs as a priming mechanism.

Of central focus to contemporary empirical research is the etiology of psychopathology. Among the theories that attempt to explain the pathogenesis of psychopathological symptoms, diathesis-stress theory posits a model wherein disorders develop as a result of specific interactions between stressful environmental events and diatheses, or vulnerabilities (Barlow & Durand, 1999; Ingram & Luxton, 2005; Kandel, 1983). Vulnerability factors can consist of genetic, neurological, behavioral, or cognitive processes (Monroe & Simons, 1991). Although a great deal is known as to how various biological aspects act as vulnerability factors to certain forms of psychopathology, the extent to which vulnerability, as well as invulnerability, is attributable to cognitive factors is not well understood. To address this issue, cognitive behavior therapies (CBT) have examined their respective cognitive vulnerability factors (David, Lynn, & Ellis, 2010). However, research outside the context of psychotherapeutic settings has been minimal in investigating the means, if any, by which cognitive vulnerability factors might be changed.

Rational-emotive behavior therapy (REBT), the first classical form of CBT, postulates a cognitive-vulnerability model in which irrational beliefs are etiopathogenic mechanisms. That is, vulnerability is largely a product of certain cognitive factors, namely irrational beliefs (David, Szentagotai, Eva, & Macavei, 2005; Ellis, 1962). In other words, REBT posits that irrational beliefs mediate the relationship between activating events (stressful environmental experiences that obstruct goal achievement) and psychopathological symptoms. Irrational beliefs are conceptualized as illogical, unrealistic, nonpragmatic, and inflexible evaluations or appraisals (David, Schnur, & Belloiu, 2002; Ellis, 1994). They are reducible to four main irrational cognitive processes: demandingness, catastrophizing, low frustration tolerance, and depreciation (David et al., 2010; Walen, DiGiuseppe, & Dryden, 1992). Irrational cognitive processes also reflect specific content areas such as achievement comfort, approval, affiliation, control, and fairness (David, 2003; Walen et al., 1992). Research investigating the relationship of irrational cognitive processes with emotional distress has by and large

Faculty mentor: Stacey Todaro, PhD

found correlational and causal evidence for REBT theory.

Research in REBT has used correlational and experimental designs to assess irrational beliefs. The association between irrational beliefs and emotional distress such as anxiety and depression has been corroborated (Bernard, 1998; David et al., 2002; Macavei, 2005; McDermut, Haaga, & Bilek, 1997; Muran & Motta, 1993; Muran, Kassinove, Ross, & Muran, 1989; Solomon, Arnow, Gotlib, & Wind, 2003). This evidence is limited by its inability to examine the etiopathogenic role of irrational beliefs because correlational designs were used (David et al., 2005). However, several studies have used experimental designs by measuring emotional distress and irrational beliefs during activating experiences. Some have found that irrational beliefs act as a mediator of activating events and emotional distress (Hart, Turner, Hittner, Cardozo, & Paras, 1991; Muran & Motta, 1993; Muran et al., 1989; Solomon et al., 2003), whereas others have not (Chang, 1997; Popov & Popov, 2013; Smith, Houston, & Zurawski, 1984).

These mixed findings might be attributable to the use of antiquated self-report measures. In particular, past research has used measures of irrational beliefs that have been confounded by affective and behavioral items (David et al., 2010). To address this issue, additional measures of irrational beliefs have been developed that omit confounding variables (see Lindner, Kirkby, Wertheim, & Birch, 1999, for a review). For example, the General Attitude and Belief Scale (GABS; DiGiuseppe, Leaf, Exner, & Robin, 1988) has been shown to be one of the most valid measures of irrational beliefs regarding discriminate and construct validity, internal consistency, and factor structure (Bernard, 1998; Owings et al., 2013).

Another possibility that might account for those cases mentioned above in which evidence was not found for the causative role of irrational beliefs in emotional distress might involve using inauthentic activating events. The presence of an activating event, or stressful environmental experience, is requisite to assess the cognitive-vulnerability model because it enables interactions between the postulated vulnerability factors and stressor (David et al., 2010). However, past studies investigating how irrational beliefs relate to emotional distress have employed activating events that are anomalous with Ellis's (1994) conceptualization of an authentic activating event (DiLorenzo, David, & Montgomery, 2007, 2011; Hart et al., 1991; Malouff, Schutte, & McClelland, 1992). Namely, Ellis argued that an activating event is an experience, environmental or psychological, that impedes or precludes the attainment of an individual's goals in real time. For example, imagery and retrospective reflection are methods that conflict with this conceptualization because the obstruction of participants' goals are not assessed in real time.

Although it is important for research on REBT theory to investigate irrational beliefs as a cognitive vulnerability factor, it is equally important to examine the role of irrational beliefs as a mechanism of change within psychotherapy. REBT theory propounds irrational and rational beliefs as mechanisms responsible for cognitive, emotive, and behavioral change during the psychotherapeutic process (David et al., 2010). However, most, if not all, studies that assess these cognitive processes as mechanisms of change are limited in terms of temporality. That is, a great deal of time is required to conduct research on mechanisms of change in psychotherapeutic settings. However, it could be argued that research examining how rational beliefs affect irrational beliefs could be conducted in a more expeditious manner. Namely, investigators could utilize methodologies that enable changes in irrational beliefs to be assessed outside therapy. One viable method by which to experimentally examine the effect of rational beliefs on irrational beliefs is to use priming. For instance, Davies (2008a, 2008b) used a priming method in a study assessing the relationship between irrational beliefs and conditional self-acceptance, such that participants were primed with rational and irrational statements. Davies found that priming participants with irrational belief statements increased conditional self-acceptance and that priming participants with rational belief statements increased unconditional self-acceptance. However, Davies (2008a, 2008b) suggested that rational beliefs should be primed using alternative techniques in future research because using statements alone as a priming method might not be elaborate enough to significantly change irrationality.

One future direction for using a priming mechanism in the context of REBT theory might consist of developing what can be termed *dialectic rational beliefs*. Unlike rational beliefs that are expressed in the form of a statement, dialectic rational beliefs are rational beliefs in the form of an argument. That is, rational beliefs can be primed in the form of logical argumentation to represent the dialectic discourse involved in psychotherapy.

Dialectic rational beliefs consist of two parts: a logical, empirical, and pragmatic disputation of each of the four irrational cognitive processes discussed above (Beal, Kopec, & DiGiuseppe, 1996) and a conclusion that suggests the adoption of an alternative rational belief. For example, preferences, a type of rational belief, might be primed dialectically by first challenging demandingness, the irrational alternative to preferences, and then concluding that preferences are more adoption-worthy than demands. Thus, priming mechanisms might be more effective if they encompass features of psychotherapy, namely the disputation process.

In sum, REBT theory holds that emotional distress is largely a result of interactions between irrational beliefs and activating events. However, corroboration for this idea has been limited for two reasons. First, the correlational research does not warrant causal inference. Second, the mixed findings of experimental research are, in part, attributable to using antiquated self-report measures and inauthentic activating events. In addition, the time involved in the practice of REBT limits empirical investigation into the effects of change mechanisms (rational and irrational beliefs) on cognition, emotion, and behavior. To address this issue, experimental research can use priming mechanisms as a less time-consuming method to study mechanisms of change and their relation to the cognitions targeted by psychotherapy (Davies, 2008a).

The goal of the present research was to test the effectiveness of dialectical rational beliefs as a priming mechanism. This was accomplished by assessing the degree to which irrational beliefs changed as a function of priming. I hypothesized that priming would decrease irrational beliefs. For this hypothesis to be supported, irrational belief scores should be significantly lower for participants in the priming group, compared to those in the control condition. A second goal was to assess changes in state anxiety as a function of the activating event. It was predicted that the activating event would increase state anxiety. A significant increase in scores of state anxiety as an effect of the activating event would support this hypothesis. The final goal was to quantify the predictive relationship between irrational beliefs and state anxiety. Thus, I hypothesized that irrational beliefs would significantly predict state anxiety. For this prediction to be corroborated, irrational belief scores should predict scores of state anxiety.

Method

Participants

Participants were 47 undergraduate students (27 women and 20 men; M_{age} = 19. 22, *SD* = 1.25) from a small midwestern liberal arts college. Most participants were European American (78.7%), followed by African American (14.9%), Pacific Islander (4.3%), and other (2.1%). All participants were enrolled in an introductory psychology course and received partial course credit for their participation. They were recruited using Sona Systems software, a platform for participant pool management.

Materials

The GABS (DiGiuseppe et al., 1988) was used to measure irrational beliefs and the content of those beliefs. It consists of 55 items. Each item was assessed on a 5-point Likert scale denoting level of agreement from 1 (*strongly disagree*) to 5 (*strongly agree*). Because the study was conducted in one session and designed for pretest and posttest measurements, the GABS was counterbalanced for each condition and modified to include six of the original seven subscales. The Other-Downing subscale was omitted because it contained too few items for counterbalancing, and the remaining six subscales were also slightly modified to contain one less item: Rationality (8 items), Self-Downing (8 items), Need for Achievement (8 items), Need for Approval (6 items), Need for Comfort (8 items), and Demand for Fairness (8 items). Scores of the GABS were summed to generate a total irrationality score. The GABS retained good reliability subsequent to the deletion of items, α = .76.

Form Y-1 of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970) measures participants' current anxiety levels. That is, the state anxiety version of the STAI was used. The inventory is comprised of 20 items (e.g., "I feel calm" and "I feel upset") scored on a 5-point Likert-type scale from 1 (*not at all*) to 5 (*very much so*). Because the STAI was divided for pretest and posttest measurements, it was counter-balanced for each condition, in that the pretest STAI was modified to include the former 10 items of the original STAI, and the posttest STAI consisted of the latter 10 items. The STAI retained good reliability, α = .78.

The priming material consisted of four dialectic rational beliefs, with each one addressing one of the four irrational cognitive processes discussed above (see Appendix A). Dialectic rational beliefs consist of two parts: a logical, empirical,

and pragmatic disputation of irrational cognitive processes, and a conclusion that suggests the adoption of an alternative rational belief. Thus a dialectic rational belief is comprised of sentences that describe and refute an irrational belief and of a concluding sentence that asks participants to renounce their irrational belief. For example, a dialectic rational belief for the catastrophizing belief process is as follows: "Whenever something undesirable happens to you and you view it as a horrible or awful thing, you are holding an extreme and inaccurate belief. This is because, if something was actually awful (100% bad), nothing else could happen to make it worse. Clearly, there are other things that could occur which are worse in any situation. Most of the undesirable things that happen to us are just unfortunate or inconveniencing. Therefore, it does you no good to continue holding onto beliefs about things being awful."

The speech task was developed to elicit rejection and constitutes the activating event. It requires participants to verbally answer 10 opinion-based questions; for example, "What kind of foods do you like?" (see Appendix B). Answers to the subjective questions were not recorded because they were not pertinent to the study.

Procedure

Participants were recruited using Sona Systems after approval from the institutional review board was acquired. Upon arrival to the lab, they were asked to read and sign informed consent. Immediately following, and in one sitting, they completed the STAI Form Y-1 and the GABS pretest measures; order of presentation was counterbalanced across participants and conditions. Participants were then randomly assigned to one of two conditions: priming versus no priming of dialectic rational beliefs. Those in the priming group were each presented four dialectic rational beliefs and instructed to think critically about the paragraphs. Then, all participants completed the speech task, in which they answered 10 opinion-based questions. They were randomly assigned to fail or not fail the speech task (stress, no-stress). Those in the stress condition received a piece of paper denoting failure (*task failed*) and those in the no-stress condition received no indication of failing the speech task. Subsequently, participants completed the GABS and STAI posttest measures, which were also counterbalanced across participants and conditions. Lastly, participants were debriefed on the nature of the study.

Results

Means and standard deviations for the GABS and STAI as a function of priming and time are presented in Table 1. Priming and activating event served as between-subjects factors. Dependent variables were irrational beliefs and state anxiety. Higher scores on the GABS indicate higher levels of irrationality, and higher scores on the STAI indicate higher levels of state anxiety.

Several analyses were conducted to assess hypotheses. Specifically, a linear regression analysis assessed the degree to which irrational beliefs were predictive of state anxiety. In addition, two Analyses of Covariance (ANCOVAs) examined whether priming dialectic rational beliefs significantly decreased irrational beliefs and whether the activating event (failing the speech task) significantly increased state anxiety.

After adjusting for priming, a linear regression analysis found that GABS scores significantly predicted STAI scores, $\beta = .29$, 95% CI = [9.81, 19.27], $t(45) = 2.05$, $p = .046$. This finding supported the hypothesis that irrational beliefs are predictive of state anxiety.

An ANCOVA [between-subjects factor: priming (present, absent); covariate: GABS pretest scores] revealed a significant effect of priming on GABS posttest scores, $F(1, 46) = 15.31$, $p < .01$, $\eta_p^2 = .26$, 95% CI = [42.46, 48.07]. Post-hoc tests (Tukey)

TABLE 1

Contrast of Pretest With Posttest Measures for Irrational Beliefs and State Anxiety of Priming and Control Groups

Variable	Priming	*M*	*SD*	*n*
Irrational beliefs (Pre)	Absent	53.33	8.61	24
	Present	57.26	9.17	23
	Total	55.26	9.01	47
Irrational beliefs (Post)	Absent	48.42	11.96	24
	Present	42.22	17.05	23
	Total	45.38	14.84	47
State anxiety (Pre)	Absent	19.50	5.03	24
	Present	19.22	4.28	23
	Total	19.36	4.63	47
State anxiety (Post)	Absent	19.50	5.30	24
	Present	18.74	5.03	23
	Total	19.13	5.13	47

Note. Irrational beliefs represent scores on the General Attitude and Belief Scale (DiGuiseppe et al., 1988) and state anxiety represents scores on the State Trait Anxiety Inventory (Spielberger et al., 1970). These data indicate that, when priming was present, participants' irrational beliefs significantly decreased from pretest to posttest measures.

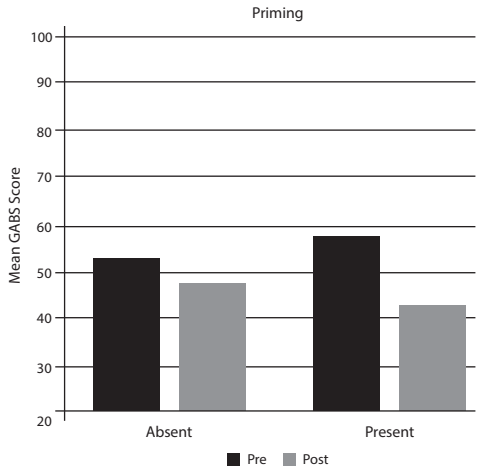
showed that, when priming was present, scores on the GABS significantly decreased from pre to post (p = .016); whereas there was no significant difference in GABS scores when priming was absent (p = .219). These results suggested that dialectical rational beliefs decrease irrational beliefs (Figure 1). Also, an ANCOVA [between-subjects factor: activating event (present, absent); covariate: state anxiety pretest scores] indicated that the effect of the activating event on state anxiety was not significant, $F(1, 46) = 3.03$, $p = .09$, $\eta_p^2 = .06$, 95% CI = [18.16, 20.07], suggested that failing the speech task did not increase state anxiety.

Discussion

REBT theory holds that irrational and rational beliefs are mechanisms of change, such that they are responsible for changes in emotion, cognition, and behavior (David et al., 2010; Ellis, 1994). For example, REBT postulates that irrational beliefs largely engender the pathogenesis of psychopathological symptoms (David et al., 2010). Practitioners of REBT, in consequence, facilitate cognitive restructuring by logically, empirically, and pragmatically disputing irrational beliefs (Beal et al., 1996). Clients are encouraged as a result of this disputation process to adopt rational beliefs (functional, logical, and flexible evaluations) as an alternative to irrational ones. However, assessing change in irrational beliefs throughout the course of therapy requires a great deal of time. Investigation into effective methodologies by which to change irrational beliefs outside of therapy might address this temporal limitation.

FIGURE 1

Effects of Priming Dialectic Rational Beliefs on Irrational Beliefs



Note. Indicative of the condition in which participants were primed by dialectic rational beliefs is the significant decrease of General Attitude and Belief Scale (GABS) scores from Time 1 to Time 2 (p = .016). However, there was no significant difference in GABS scores when priming was absent (p = .219).

The current study attempted to address the issue of assessing mechanisms of change over time by developing a novel priming technique, namely, dialectic rational beliefs. Dialectic rational beliefs are a series of arguments that represent the psychotherapeutic process in REBT. Specifically, these arguments dispute the four irrational cognitive processes of demandingness, catastrophizing, frustration intolerance, and depreciation (Ellis & Dryden, 1997), and encourage as a conclusion the assimilation of rational beliefs.

The main empirical question of interest was whether irrational beliefs would change as an effect of using dialectic rational beliefs as a priming mechanism. Results denoted that participants who were primed with dialectic rational beliefs had a significant decrease in total levels of irrational belief, whereas those who were not primed did not have a significant decrease. In light of the experimental design of the present study, these findings suggested that irrational beliefs decrease as an effect of priming dialectic rational beliefs.

Several generalizations can be advanced. The first technical generalization is that the priming mechanism discussed above can be employed to engender changes to irrational beliefs, and the second is that changes in irrational beliefs can be assessed outside psychotherapeutic settings. The main practical generalization consists of the idea that dialectic rational beliefs can help render the psychotherapeutic process of change more expeditious, such that they could be used in conjunction with therapy. For instance, clients could be primed before and/or between therapy sessions. Dialectic rational beliefs could also be implemented into a form of Internet-based cognitive modification program.

However, the present study could not ascertain several things. Namely, it is unclear whether the effects of priming last because the experiment was conducted in one sitting; irrational beliefs were not assessed subsequent to posttest measurements. In fact, the priming effects are probably transient because psychotherapeutic change is often dependent on one frequently re-indoctrinating one's self with the rational insights acquired in therapy (Ellis, 1994). Thus, it is dubious that the priming effects will persist insofar as participants are not continually primed. One direction for future

research might involve contriving a means by which participants can consistently prime themselves.

Other limitations to the present study concern generalizability and power. Specifically, the present study lacked generalizability because participants were undergraduate psychology students. Therefore, a clinical sample would have rendered the findings of the present study more generalizable. Lastly, power might have been an issue. In particular, none of the analyses were conducted with adequate power (80%): linear regression analysis (14%), first ANCOVA (41%), and second ANCOVA (7%). The best way to address this issue would be to increase sample size. Namely, the minimum sample size requisite to reach adequate power for all three of the analyses used in the present study is 84.

The minor hypothesis of interest was to use an activating event in accordance with Ellis's definition (1962) of an activating event, namely, to obstruct goal achievement in real time. This was done by giving a piece of paper on which the words *task failed* were written to individuals who answered the opinion-based speech task. However, the present data did not support a significant effect of the activating event. Several explanations can be raised for this nonsignificant finding. One possibility is that the activating event was designed on the presupposition that participants had the goal of not being rejected. Another possibility might involve the power of the analysis that assessed this hypothesis, as discussed above. Future research on activating events should screen participants by measuring relevant goals and desires prior to conducting the experiment because this would ensure that the activating event would obstruct participants' goals.

In line with previous findings (Malouff et al., 1992), the hypothesis that irrational beliefs predict state anxiety was supported. However, the causative effects of irrational beliefs on state anxiety such as mediating the relationship between the activating event and state anxiety could not be instantiated in the present study because the requisite pathways between the activating event, irrational beliefs, and state anxiety were not satisfied (Baron & Kenny, 1986). Specifically, the relationship between the activating event and state anxiety was not instantiated.

In sum, the strength of the present study was in its experimental design and novel approach to using a priming mechanism to change irrational beliefs. Its weakness was not having an effective activating event, whereby evidence for the mediating role of irrational beliefs could be attained. The finding that dialectic rational beliefs can be used as a priming mechanism to decrease irrational beliefs was important because of what can follow from it. Namely, investigators could improve this priming technique to engender longer lasting effects, as well as implement it in conjunction with psychotherapy. Lastly, the use of priming mechanisms to investigate the ways in which cognitive vulnerability factors can be changed has the practical applicability of informing all CBT-based schools of psychotherapy and of possibly expediting the psychotherapeutic process of change.

References

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173–1182. doi:10.1037/0022-3514.51.6.1173

Barlow, D. H., & Durand, V. M. (1999). *Abnormal psychology: An integrative approach* (2nd ed.). Belmont, CA: Wadsworth/Thomson Learning.

Beal, D., Kopec, A. M., & DiGiuseppe, R. (1996). Disputing clients' irrational beliefs. *Journal of Rational-Emotive and Cognitive-Behavior Therapy, 14*, 215–229. doi:10.1007/BF02238137

Bernard, M. E. (1998). Validation of the General Attitude and Belief Scale. *Journal of Rational-Emotive and Cognitive-Behavior Therapy, 16*, 183–196. doi:10.1023/A:1024911014579

Chang, E. C. (1997). Irrational beliefs and negative life stress: Testing a diathesis-stress model of depressive symptoms. *Personality and Individual Differences, 22*, 115–117. Retrieved from http://search.proquest.com/docview/619126001?accountid=26172

David, D. (2003). Rational emotive behavior therapy (REBT): The view of a cognitive psychologist. In W. Dryden (Ed.), *Rational emotive behavior therapy: Theoretical developments*. (pp. 130–159) Retrieved from http://search.proquest.com/docview/1027510887?accountid=26172

David, D., Lynn, S., & Ellis, A. (2010). *Rational and irrational beliefs. Research, theory, and clinical practice*. New York, NY: Oxford University Press.

David, D., Schnur, J., & Belloiu, A. (2002). Another search for the 'hot' cognitions: Appraisal, irrational beliefs, attributions, and their relation to emotion. *Journal of Rational-Emotive and Cognitive-Behavior Therapy, 20*, 93–132. doi:10.1023/A:1019876601693

David, D., Szentagotai, A., Eva, K., & Macavei, B. (2005). A synopsis of rational emotive behavior therapy (REBT): Fundamental and applied research. *Journal of Rational-Emotive and Cognitive-Behavior Therapy, 23*, 175–221. doi:10.1007/s10942-005-0011-0

Davies, M. F. (2008a). Irrational beliefs and unconditional self-acceptance. II. Experimental evidence for a causal link between two key features of REBT. *Journal of Rational-Emotive and Cognitive-Behavior Therapy, 26*, 89–101. doi:10.1007/s10942-007-0060-7

Davies, M. F. (2008b). Irrational beliefs and unconditional self-acceptance. III. The relative importance of different types of irrational belief. *Journal of Rational-Emotive and Cognitive-Behavior Therapy, 26*, 102–118. doi:10.1007/s10942-007-0061-6

DiGiuseppe, R., Leaf, R., Exner, T., & Robin, M. W. (1988, September). *The development of a measure of rational/irrational thinking*. Paper presented at World Congress of Behavior Therapy, Edinburgh, Scotland.

DiLorenzo, T. A., David, D., & Montgomery, G. H. (2007). The interrelations between irrational cognitive processes and distress in stressful academic settings. *Personality and Individual Differences, 42*, 765–776. doi:10.1016/j.paid.2006.08.022

DiLorenzo, T., David, D., & Montgomery, G. H. (2011). The impact of general and specific rational and irrational beliefs on exam distress: A further investigation of the binary model of distress as an emotional regulation model. *Journal of Cognitive and Behavioral Psychotherapies, 11*, 121–142. Retrieved from http://search.proquest.com/docview/910378571?accountid=26172

Ellis, A. (1962). *Reason and emotion in psychotherapy*. New York, NY: Stuart.

Ellis, A. (1994). *Reason and emotion in psychotherapy* (Rev. ed.). doi:10.1037/h0087779

Ellis, A., & Dryden, W. (1997). *The practice of Rational Emotive Behavior Therapy* (2nd ed.). New York, NY: Springer Publishing Company, Inc.

Hart, K. E., Turner, S. H., Hittner, J. B., Cardozo, S. R., & Paras, K. C. (1991). Life stress and anger: Moderating effects of type A irrational beliefs. *Personality and Individual Differences, 12*, 557–560. doi:10.1016/0191-8869(91)90250-F

Ingram, R. E., & Luxton, D. D. (2005). Vulnerability-stress models. (pp. 32–46). In B. L. Hankin & J. R. Z. Abela (Eds.), *Development of psychopathology: A vulnerability stress perspective*. Thousand Oaks, CA: Sage Publications, Inc.

Kandel, E. R. (1983). From metapsychology to molecular biology: Explorations into the nature of anxiety. *American Journal of Psychiatry, 140*, 1277–1293. doi:doi.org/10.1176/ajp.140.10.1277

Lindner, H., Kirkby, R., Wertheim, E., & Birch, P. (1999). A brief assessment of irrational thinking: The shortened General Attitude and Belief Scale. *Cognitive Therapy and Research, 23*, 651–663. doi:10.1023/A:1018741009293

Macavei, B. (2005). The role of irrational beliefs in the Rational Emotive Behavior Theory of depression. *Journal of Cognitive and Behavioral Psychotherapies, 5*, 73–81. Retrieved from http://search.proquest.com/docview/620746354?accountid=26172

Malouff, J. M., Schutte, N. S., & McClelland, T. (1992). Examination of the relationship between irrational beliefs and state anxiety. *Personality and Individual Differences, 13*, 451–456. doi:10.1016/0191-8869(92)90074-Y

McDermut, J. F., Haaga, D. A. F., & Bilek, L. A. (1997). Cognitive bias and irrational beliefs in major depression and dysphoria. *Cognitive Therapy and Research, 21*, 459–476. doi:10.1023/A:1021936427625

Monroe, S. M., & Simons, A. D. (1991). Diathesis-stress theories in the context of life-stress research: Implications for the depressive disorders. *Psychological Bulletin, 110*, 406–425. doi:10.1037/0033-2909.110.3.406

Muran, E. M., & Motta, R. W. (1993). Cognitive distortions and irrational beliefs in posttraumatic stress, anxiety, and depressive disorders. *Journal of Clinical Psychology, 49*, 166–176. doi:10.1002/1097-4679(199303)49:23.0.CO;2-6

Muran, J. C., Kassinove, H., Ross, S., & Muran, E. (1989). Irrational thinking and negative emotionality in college students and applicants for mental health services. J*ournal of Clinical Psychology, 45*, 188–193. doi:10.1002/1097-4679(198903)45:2<188::AID-JCLP2270450202>3.0.CO;2-Y

Owings, L. R., Thorpe, G. L., McMillan, E. S., Burrows, R. D., Sigmon, S. T., & Alley, D. C. (2013). Scaling irrational beliefs in the general attitude and belief scale: An analysis using item response theory methodology. *SAGE Open*. doi:10.1177/2158244013484156

Popov, B., & Popov, S. (2013). Adverse working conditions, job insecurity, and occupational stress: The role of (ir)rational beliefs. *Journal of Rational-Emotive and Cognitive-Behavior Therapy, 31*, 27–38. doi:10.1007/s10942-012-0157-5

Smith, T. W., Houston, B. K., & Zurawski, R. M. (1984). Irrational beliefs and the arousal of emotional distress. *Journal of Counseling Psychology, 31*, 190–201. doi:10.1037/0022-0167.31.2.190

Solomon, A., Arnow, B. A., Gotlib, I. H., & Wind, B. (2003). Individualized measurement of irrational beliefs in remitted depressives. *Journal of Clinical Psychology, 59*, 439–455. doi:10.1002/jclp.10081

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *STAI Manual for the State-Trait Anxiety Inventory ('Self-Evaluation Questionnaire')*. Palo Alto, CA: Consulting Psychologists Press, Inc.

Walen, S. R., DiGiuseppe, R., & Dryden, W. (1992). *A practitioner's guide to Rational-Emotive Therapy* (2nd ed.). New York, NY: Oxford University Press.

Author Note. James E. Crum II, Adrian College. The author thanks Stacey Todaro for her comments on an earlier version of the manuscript and advisement on conducting statistical analyses.

Correspondence concerning this article should be addressed to James E. Crum II, 110 S Madison St, Adrian, MI 49221. Phone: (419) 410-2926. E-mail: jcrum@adrian.edu

APPENDIX A

Dialectic Rational Beliefs

Directions: Please carefully read the following views. Take as much time as you see fit to understand and seriously think about the views and their meanings; you understanding of the following will be tested.

1. Whenever you think things should go the way you want them to and that people should not act in certain ways toward you, you are holding an extreme, inflexible, and illogical belief that contradicts reality.

This is because things will occur in your life that are completely out of your control, and people will act rudely toward you despite your thinking that they shouldn't; you don't own the universe.

Therefore, it does you no good to continue holding onto beliefs that demand things to be a certain way when they are not that way. Instead, maintain your preferences toward what you desire; just don't escalate them into demands.

2. Whenever something undesirable happens to you, and you view it as a horrible or awful thing, you are holding an extreme and inaccurate belief.

This is because, if something was actually awful (100% bad), nothing else could happen to make it worse. Clearly, there are other things that could occur that are worse in any situation. Most of the undesirable things that happen to us are just unfortunate or inconveniencing.

Therefore, it does you no good to continue holding onto beliefs about things being awful.

3. Whenever you think you can't stand something or someone, you are holding an extreme unrealistic belief.

This is because of the fact that, if you really could not stand someone or something you don't like, you would be dead. You may not like something someone does, but you can stand it.

Therefore, it does you little good to continue holding onto a belief that places imaginary limits on what you can deal with.

4. Whenever something undesirable happens such as failing at something or someone thinking of you in a negative way, and you feel hurt, rejected, or worthless, you are holding an extreme unrealistic belief that makes a magical connection.

This is because, even if nobody in the world liked or accepted you, or even if you fail at literally everything, you only really become worthless to yourself when you agree with others by thinking that you have to place the same value on yourself as they do, and that you have to define your worth as a person in terms of your failures.

Therefore, it does you no good to continue holding onto beliefs about how good, bad, worthy, or worthless of a person you are. You are a human being who is too complex to be labeled or rated in terms of a few undesirable events or traits. Instead, accept yourself whether you succeed or fail, or are liked or disliked.

APPENDIX B

Questions of Speech Task

1. What is your favorite color?
2. What kinds of food do you like?
3. What is your favorite season?
4. What type of music do you like?
5. What is your favorite animal?
6. Do you like school?
7. Do you have a favorite sport?
8. Are you religious?
9. Which political party, if any, do you mostly agree with?
10. Do you think people can do morally right or wrong things?

The Effect of Verbal Praise on Maze Completion

Thomas Gambino
Kean University

ABSTRACT. The purpose of the present study was to examine the relationship between verbal praise and performance. Past literature has supported the positive impact that encouragement has on performance. Praise has been found to increase athletic performance (Anderson, Crowell, Doman, & Howard, 1988) as well as academic performance. However, the type of encouragement can lead to different outcomes. Participants in the current study completed a difficult line maze while either being praised in the form of encouraging comments ("You're doing fine," "You're doing great") or less encouraging comments ("You're taking too long," " Hurry up"). Time to complete the maze was recorded in seconds. Analyses showed that praise in the form of encouraging comments significantly reduced the time to complete the maze ($p = .001$) and to complete the maze in general ($p < .001$). Implications of the findings and suggestions for future research are discussed.

Verbal praise is often used to reinforce desired behaviors. It provides feedback about specific performance and may guide future performance. Praise has been shown to increase athletic performance (Anderson, Crowell, Doman, & Howard, 1988) and effort on subsequent trials of a task following task-relevant praise (Baumeister, Hutton, & Cairns, 1990). Research has suggested that praise influences not only the behavior itself but also attitudes about tasks performed.

Although praise is often directed at specific behaviors, it also influences attitudes about specific tasks, motivation, persistence to complete tasks, and attributions of task performance. Early work by Mueller and Dweck (1998) investigated how type of praise influences children's effort and motivation. They hypothesized that praise directed at ability (intelligence) and praise directed at effort, when administered after success, would lead children to have different goals for their achievement and have different responses when confronted with failure or challenge. Fifth graders completed a series of 10 matrices, each progressively becoming more difficult. Results found that students praised for intelligence were more concerned with performance goals, and the students praised for effort were more concerned with learning goals. Additionally, students praised for effort wanted to continue learning, and students praised for intelligence were concerned with looking smart. When examining explanations for failure, Mueller and Dweck (1998) found that students praised for effort blamed their performance on their effort, and the students praised for intelligence blamed their performance on their ability. They concluded that students praised for effort enjoyed the tasks much more than the students praised for ability. Droe (2013) found similar results in a music setting. Music students received either praise for effort, praise for talent, or no praise following a rhythm-tapping test and then rated their motivation and performance attribution (learning goals or performance goals). Similar to Muller and Dweck (1998), Droe (2013) found that students praised for their effort were more likely to choose learning goals, and students praised for musical talent were more likely to choose performance goals and had a more positive attitude toward task persistence.

Faculty mentor: Verneda Hamm Baugh, PhD

  (VOL. 21, NO. 1/ISSN 2164-8204)

Skipper and Douglas (2012) examined which behavior would follow certain positive or negative feedback. School-age children were given common everyday school scenarios. The students then answered questions about how they felt about the situation. The first two scenarios involved the students succeeding at math problems, and the last scenario involved them experiencing failure. After each scenario, the students received an objective praise, a person or process praise, or no praise. Skipper and Douglas (2012) found that students in the person praise condition rated lowest on all perceived performance and showed less persistence. The researchers concluded that children in the person praise condition showed a measure of negative response to a single failure than those who received process praise or no praise. This study was replicated at the university level using the same procedure and methodology. However, the level of persistence did not change between the three groups at the university level. Similarly, Neapolitan (1988) previously reported that, among a sample of college students, specific praise for performance was more likely to lead to improved performance, and general praise was less likely to lead to improved performance.

In addition to motivation and performance attribution, verbal praise has also been demonstrated to influence time spent on a desired task. Hancock (2000) found that college students, who received public verbal praise on the amount of time spent on homework in preparation for class, studied significantly more outside of the classroom. Hancock (2000) suggested that the specificity and immediacy of the praise, as well as the public nature of the praise, affected the students' motivation compared to students who did not receive the verbal praise. Similarly, Webster, Duvall, Gaines, and Smith (2003) examined the relationship between praise and the experience of pride. Participants completed the Tower of Hanoi, a mathematical puzzle, and either received praise by way of a congratulatory comment, received praise by way of a congratulatory comment in combination with a social comparison comment acknowledging superior performance, or were simply acknowledged for completing the task. Results found that both praise and praise in combination with social comparison led to higher levels of self-pride. Webster et al. (2003) suggested that praise alone might inspire feelings of pride because praise implies social comparison information. Those who feel pride in their performance might be more motivated to complete tasks.

Corpus, Ogle, and Love-Geiger (2006) also examined how different types of praise impacted motivation. Their study included elementary-aged children who completed three puzzles that increased in difficulty as they progressed. After each puzzle, the students in the first group received social-comparison praise and the second group received "mastery praise" for their work. The third group did not receive any praise for their work. Participants were then asked to participate in three stations. The first station was designed for the students to learn new things and new ideas. The second station helped students compare their score to others. The third station helped students determine their own "personal creative style." Corpus et al. (2006) found that children in the mastery praise condition reported the highest levels of intrinsic motivation followed by those in the control condition and finally by those in the social-comparison praise condition. Similarly, Koestner, Zuckerman, and Koestner's (1987) study on praise and intrinsic motivation found that, when participants were praised for their hard work at completing puzzles, they spent more time on the puzzles and reported higher intrinsic motivation compared to those who were praised for their ability or skill.

Although praise is often used to enhance performance, Baumeister et al. (1990) investigated the role of praise in impairing performance. Their first experiment examined the effects of praise after success. This was measured by a video game called Dodgem, which required participants to try to avoid crashing into cars while controlling another. Participants were told to aim for their best score, and after reaching, exceeding, or coming close to this score, a positive praise was given. The researchers then measured the score immediately following the praise, and found that performance following success and praise was below the performers' overall average, which provided initial evidence that praise for an outstanding public performance can cause a subsequent decrement in skilled performance. Another experiment examined the relationship between praise and effort when sorting half a deck of cards by suits. One group received praise, and a control group did not. Baseline times were reached after a few practice trials. After each trial, the experimental group was praised, and the researchers found that this task-relevant praise increased effort on the subsequent trial. In this case, praise produced effects opposite to what the preceding studies showed with skill tasks

(Baumeister et al., 1990). These results were supported by Hancock (2000) who stressed the role of the specificity of the praise in influencing performance.

Verbal praise has been demonstrated to positively impact specific behaviors related to task performance and completion and motivation to complete tasks. Another focus of the role of praise has been on classroom behavior. An experiment by Cossairt, Hall, and Hopkins (1973) examined the influence of positive feedback on *attending behavior* in the classroom. Positive feedback was defined as direct student praise (e.g., "Good job, Johnny!" or as a whole "Great job class!" by the teacher). Disruptive behavior was defined as any behavior interfering or disrupting the students' work often accompanied by a negative remark from the teacher. The baseline was determined a few days before the actual experiment by counting the number of times the teacher praised or gave feedback to the students. On the days of the experiment, most teachers' praise increased from one remark to nearly four per class. The results showed that, as praise and feedback increased, the percentage of students participating in attentive behavior also increased. Cossairt et al. (1973) found that intervals of student attending behavior rose from the baseline mean of 62% to a mean of 94%. Nearly the entire class was participating in attending behavior when the praise and positive comments increased. The students seemed to be more engaged during the class time and more willing to participate when called on, which led to a more productive class when compared to the baseline evaluations. Similarly, Moore Partin, Robertson, Maggin, Oliver, and Wehby (2010) reported that teachers trained to provide praise to reinforce students' appropriate behavior tended to agree that such praise improved the atmosphere in the classroom. Behavior specific praise can be taught to teachers and improve on-task behaviors of students (Allday et al., 2012).

Several factors related to praise have been identified that influence performance, persistence, motivation, and time spent on a task. The present study was designed to further examine the role of praise in the form of encouraging comments on the completion of a difficult maze. The maze completion task was chosen because it does not require any specific skills related to academic achievement or prior experience. Under a timed condition however, it might require a measure of persistence and motivation. Previous studies have similarly examined the role of praise on performance of tasks involving puzzles and games (Baumeister et al., 1990; Koestner et al., 1987). The hypothesis of the present study was that praising performance on the maze, through encouraging comments, would lead to a faster completion time compared to less encouraging comments.

Method

Participants

Forty adult participants ranged in age from 18 to 55 ($M = 25.45$, $SD = 11.83$). Eighteen participants were women. Most participants were college students (77.5%). Race was not recorded. However, most of the sample was White.

Materials

A complex maze was selected from the online website Printable Mazes for Adults (2011), for each participant to complete (maze available upon request). Two scripts were created, which were recited during the maze completion task (see Appendices A and B). The first script was an encouraging script. At the 30 s, 1 min, 1.5 min, 2 min, 3 min, and 4 min marks, participants heard a prepared statement designed to encourage the completion of the maze (e.g., "You're doing fine," "You're doing great"). At 1.5 min, an extra statement in the encouraging script was added to encourage further relaxation and reduce errors. The other script was less encouraging and was designed to make participants feel rushed and frustrated (e.g., "You're taking too long," "Hurry up"). At the 30 s, 1 min, 2 min, 3 min, 4 min, and 5 min marks, participants heard a prepared statement from this script. No extra statement was included at the 1.5 min mark in the less encouraging script.

Procedure

After institutional review board approval (#00005689) was given, participants were approached individually and invited to participate. Participants were given 5 min to complete the maze as fast as possible. Participants were divided into two groups. One group heard the encouraging script while completing the maze, and the other group heard the less encouraging script while completing the maze. If the maze was completed in less than 5 min, the time was recorded in seconds. If participants did not complete the maze in 5 min, the time of 5:01 (301 s) was recorded.

Results

A *t* test found a significant difference between the encouraging and less encouraging groups on time to complete the maze, $t(38) = 3.41$, $p = .001$, $d = 1.08$. The mean completion time for the encouraging group was 175.40 s ($SD = 61.42$ s) and the mean completion time for the less encouraging group was 248.80 s ($SD = 74.13$ s). No participants completed the maze in less than 1 min.

A chi-squared analysis found that participants in the less encouraging group were significantly less likely to finish the maze $X^2(1) = 15.17$, $p < .001$. Fifty-five percent of the less encouraging group gave up on attempting to complete the maze prior to the 5 min mark. No participants in the encouraging group gave up without completing the maze. Everyone in the encouraging group completed the maze in less than 5 min. Those in the less encouraging group who did complete the maze ($n = 9$) also completed the maze in less than 5 min. A *t* test found no significant difference between those in the encouraging group ($n = 20$) and those in the less encouraging group who actually completed the maze ($n = 9$) in time to complete the maze, $t(1) = 0.38$, $p = .71$. The mean completion time for the encouraging group was 175.40 s ($SD = 61.42$ s), and the mean completion time for the less encouraging group members who completed the maze ($n = 9$) was 185 s ($SD = 68.75$ s).

Discussion

The present study was designed to examine the effect of praise in the form of encouraging statements compared to less encouraging statements during the completion of a difficult maze. As expected, the encouraging group completed the maze faster than the less encouraging group and was more likely to persist in completing the task. Phrases such as "You're doing great," "Just take your time," and "Don't get frustrated" seemed to provide a level of support and encouragement that increased participants' motivation to complete the maze in a timely manner and also increased the likelihood of completing the task prior to the 5 min mark without giving up. These results reflected those of Koestner et al. (1987) who found that, when participants were praised for their hard work at completing puzzles, they spent more time on the puzzles and reported higher intrinsic motivation. By contrast, phrases such as "You are going too slow," "You need to speed up," "Just give up now" and "It is not worth it" appeared to create a more challenging atmosphere, led to a slower time of completion, lowered performance motivation, and for more than half of the participants, resulted in the desire to quit. These results supported those of previous studies, which found that encouragement might have a positive influence on performance for some tasks such as Anderson et al. (1988) who found that verbal encouragement improved athletic performance and Taffel, O'Leary, and Armel (1974) who showed that, even on difficult tasks, encouragement and praise increased problem solving. These results might have implications for various tasks in areas such as academics, industry, and even parenting. In the classroom, teachers can make use of encouraging language to inspire and challenge students, and encourage more attending behavior. Rushing students or rushing through a lesson may be discouraging and lead to poorer performance. In the field of athletics, coaches can use this research to better interact with their players to unite a team and get the best out of their players. Similar techniques can be used in the workplace. Parents can employ such techniques to inspire perseverance and hard work.

The present study had some limitations that might limit the generalizability of the findings. The small convenience sample of college students might not generalize to an older population. The sample was also mostly White. Future research should not only increase sample size but also examine a broader, more diverse population. Expanding the sample to include a wider range of ages and races could expand the understanding of the role of praise. Additionally, the completion of the maze might not have provided participants with sufficient incentive to disregard the less than encouraging statements and thereby complete the maze. The task was not tied to any tangible rewards. Therefore, students might have had little motivation to perform with their best efforts. Finally, the type of task could also be broadened to be more relevant to participants. Although challenging, the maze task may not be sufficiently meaningful to participants. More meaningful tasks may influence motivation levels, which should then be examined in relation to type of task.

In summary, the results suggested that verbal praise during the process of completing a timed difficult task might have beneficial effects on time to complete the task as well as the likelihood of completing the task. The results suggested that simple encouraging statements may be sufficient to encourage persistence and task completion. Future research should examine the extent to which verbal

praise affects performance in other settings.

References

Allday, R. A., Hinkson-Lee, K., Hudson, T., Neilsen-Gatti, S., Kleinke, A., & Russel, C. S. (2012). Training general educators to increase behavior specific praise: Effects on students with EBD. *Behavioral Disorders, 37*, 87–98. Retrieved from http://search.proquest.com/docview/1022488807?accountid=11809

Anderson, D. C., Crowell, C. R., Doman, M., & Howard, G. S. (1988). Performance posting, goal setting, and activity-contingent praise as applied to a university hockey team. *Journal of Applied Psychology, 73*, 87–95. doi:10.1037/0021-9010.73.1.87

Baumeister, R. F., Hutton, D. G., & Cairns, K. J. (1990). Negative effects of praise on skilled performance. *Basic and Applied Social Psychology, 11*, 131–148. doi:10.1207/s15324834basp1102_2

Corpus, J. H., Ogle, C. M, & Love-Geiger, K. E. (2006). The effects of social-comparison versus mastery praise on children's intrinsic motivation. *Motivation and Emotion, 30*, 333–343. doi:10.1007/s11031-006-9039-4

Cossairt, A., Hall, R. V., & Hopkins, B. L. (1973). The effects of experimenter's instructions, feedback, and praise on teacher praise and student attending behavior. *Journal of Applied Behavior Analysis, 6*, 89–100. doi:10.1901/jaba.1973.6-89

Droe, K. (2013). Effect of verbal praise on achievement goal orientation, motivation, and performance attribution. *Journal of Music Teacher Education, 23*, 63–78. doi:10.1177/1057083712458592

Hancock, D. R. (2000). Impact of verbal praise on college students' time spent on homework. *Journal of Educational Research, 93*, 384–389. doi:10.1080/00220670009598733

Koestner, R., Zuckerman, M., & Koestner, J. (1987). Praise, involvement, and intrinsic motivation. *Journal of Personality and Social Psychology, 53*, 383–390. doi:10.1037/0022-3514.53.2.383

Moore Partin, T. M., Robertson, R. E., Maggin, D. M., Oliver, R. M., & Wehby, J. H. (2010). Using teacher praise and opportunities to respond to promote appropriate student behavior. *Preventing School Failure, 54*, 172–178. doi:10.1080/10459880903493179

Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's motivation and performance. *Journal of Personality and Social Psychology, 75*, 33–52. doi:10.1037/0022-3514.75.1.33

Neapolitan, J. (1988). The effects of different types of praise and criticism on performance. *Sociological Focus, 21*, 223–231.

Printable mazes for adults (2011). Retrieved from http://photoaltan3.blogspot.com/2011/12/printable-mazes-for-adults.html

Skipper, Y., & Douglas, K. (2012). Is no praise good praise? Effects of positive feedback on children's and university students' responses to subsequent failures. *British Journal of Educational Psychology, 82*, 327–339. doi:10.1111/j.2044-8279.2011.02028.x

Taffel, S. J., O'Leary, K., & Armel, S. (1974). Reasoning and praise: Their effects on academic behavior. *Journal of Educational Psychology, 66*, 291–295. doi:10.1037/h0036509

Webster, J., Duvall, J., Gaines, L. M., & Smith, R. H. (2003). The roles of praise and social comparison information in the experience of pride. *Journal of Social Psychology, 143*, 209–232. doi:10.1080/00224540309598441

Author Note. Thomas Gambino, School of Psychology, Kean University.

Thomas Gambino is now at Graduate School of Applied and Professional Psychology.

The author would like to personally thank Verneda Hamm Baugh, Associate Psychology Professor at Kean University for her unconditional support throughout this process, the countless hours she took out of her busy weeks to help me, and believing in me when I wanted to give up.

Correspondence concerning this article and requests for a copy of the maze should be addressed to Thomas Gambino, Graduate School of Applied and Professional Psychology, Rutgers University, 152 Frelinghuysen Road, Piscataway, NJ 08854. E-mail: tjg152@scarletmail.rutgers.edu

APPENDIX A

Encouragement Script

Experimenter: Thank you again for agreeing to be a part of the study. The goal again is to see how fast you can complete this maze. You will have 5 min to complete this. I have done this maze a few times and it is not that difficult. Please begin when you are ready.
At 30 s: You are doing fine. Just take your time. You have plenty of time. Don't get frustrated.
At 1 min: You are doing great. There are still 4 min left. Remember to erase your lines if you come to a dead end.
At 1 min 30 s: This maze took me some time to complete. Just be patient.
At 2 min: Most participants went over 4 min, so don't feel bad. Just keep trying your hardest.
At 3 min: You have 2 min remaining. Keep breathing and relaxing. Do not panic. You are doing fine.
At 4 min: Only 1 min left. Give it your best shot. You cannot lose anything from this. Keep working at it.

APPENDIX B

Less Encouraging Script

Experimenter: Thank you again for agreeing to be a part of the study. The goal again is to see how fast you can complete this maze. You will have 5 min to complete this. I have done this maze a few times, and it is hard. Trust me. This is one of the hardest mazes I could find online. Please begin when you are ready.
At 30 s: You are going too slow. You need to speed up. You are going much slower than the other people who have taken this. You're a college student; this should be easy for you.
At 1 min: You are not even close. This maze is hard, but not that hard. Are you taking this experiment seriously?
At 2 min: Three min are left. Please hurry. You're taking too long. You're not going to make it. Just give up now. It is not worth it.
At 3 min: I am surprised you lasted this long. Again, you are not close to the finish. You have about 2 min left, which is not a lot of time. Good luck, I guess.
At 4 min: Only 1 min left. I sound like a broken record, but again you're not close. Go as far as you can.

INVITED EDITORIAL: Let's Do It Again: A Call for Replications in *Psi Chi Journal of Psychological Research*

John E. Edlund
Rochester Institute of Technology

Science is said to be suffering from a crisis of replicability (Ioannidis, 2005). This crisis occurs when scientific studies fail to be supported by subsequent research. The challenges posed by the replication crisis address the fundamental nature of science and the public's understanding of it. Numerous contributing reasons for the replication crisis have been noted including data falsification (Steen, 2011), the pressures of tenure and promotion (Varian, 1998), questionable research practices (Simmons, Nelson, & Simonsohn, 2011), the tendency of journals to want to publish particularly novel papers (Steen, 2011), and the preference for publishing significant results (de Winter & Happee, 2013). These factors all increase the odds of inaccurate information being published, which in turn is incorporated into texts, as happened with the details of the original investigation in the Kitty Genovese case, which led to the famous bystander apathy studies (Griggs, 2015). The primary goal of this editorial is to briefly discuss the factors that have contributed to the replication crisis, techniques employed by various journals in the field to deal with the crisis, and how *Psi Chi Journal of Psychological Research* (PCJ) is responding.

Build Up to the Replication Crisis

Perhaps the biggest indication of the psychological replication crisis was a series of papers that were completely fabricated by several different authors (Levelt Committee, 2012). In these cases, the authors in question were discovered to have completely fabricated their data based on a number of factors ranging from the inability of coauthors to get access to data to a statistical analysis of raw data from the papers suggesting that the data was faked (Simonsohn, 2013).

Some have looked at the data fabrication crisis as a series of unrelated and isolated incidents, perhaps driven by personal flaws or ambition. Others, however, have looked at systemic features in academia as a potential influence on this phenomena (Nosek, Spies, & Motyl, 2012). For instance, it has long been noted that tenure and promotion in academia is driven largely by the number and quality of publications (Varian, 1998). Early career researchers in the field (graduate students, post-docs, and assistant faculty) are pressured to publish early and often, and this can lead to academics taking steps to drive up their publication counts. It is important to note that these steps rarely include data fabrication. Rather, these steps often include publishing single-study short reports, which increase the likelihood of a type one error (Ledgerwood & Sherman, 2012), using selective analyses and manipulations of degrees of freedom to reach statistical significance (known as "p-hacking"; Simonsohn, Nelson, & Simons, 2014), and engaging in unwarranted self-citations to increase the number of citations one has (Purvis, 2006).

Other issues are more nuanced. The problems with journals seeking to publish novel findings and journals having a publication bias toward publishing significant results are arguably quite intertwined. It has long been known by scientists that studies without significant effects often end up in a file drawer, never to be seen again. Occasionally, meta-analyses reveal these file-drawer effects, but often there is a significant lag time if these meta-analyses are ever run. Additionally, in my experience and that of my colleagues, journal editors have been noted to say that significant replications and extensions belong in specialty journals, rather than more widely distributed journals. Of course, there are exceptions

The *Psi Chi Journal* editorial team invited Dr. Edlund to write an editorial as a member of the Psi Chi Research Advisory Commitee (RAC). As part of discussions between the RAC and the PCJ editorial team, we have embarked on a Replication Initiative to stimulate engagement with replication of psychological research studies.

to these general trends. For example, studies on the sex difference in jealousy have many nonsignificant (and arguably underpowered: Berman & Frazier, 2005) and significant findings published in prominent journals (Sagarin et al., 2012). However, the comparative ease of publishing the nonsignificant findings in this field are likely attributable to nuanced reasons surrounding the effect and the theoretical approached taken.

Changing Practices to Address the Crisis

As a field, numerous suggestions have emerged on how to deal with the underlying reasons for the crisis of confidence. One approach employed by journals is encouraging preregistered studies. In this approach, a study's background, hypotheses, and methods are independently reviewed before any data are collected. The goal of this approach is to ameliorate the focus on publishing significant results because these studies are guaranteed publication based on the quality of the research rather than obtaining results that reach a significance level of $p < .05$.

Another technique that has been employed is the use of massive collaborative projects that conduct multiple replications at the same time such as the ManyLabs studies (Alogna et al., 2014) or the Collaborative Replications and Educational Project (Grahe, Brandt, IJzerman, & Cohoon, 2014). This technique has many advantages such as the inclusion of more diverse participants, and a greater confidence in the veracity of the data collected, due to the large numbers of collaborators and sharing of the raw data. This approach also provides advantages to researchers who have more limited resources at their home institutions to be involved in the larger scientific enterprise and discourse.

These approaches certainly have their strengths and advantages. However, they work best when incorporated into a long-term research agenda looking at an already established research question. New researchers are less likely to have successful preregistrations or to be leading a multiple-lab based project. As such, there remains a need for outlets that are willing to publish high-quality replications.

Moving Forward

PCJ has always published high-quality psychological papers, ranging from papers featuring novel hypotheses (Peters, Holgreen, & Oswald, 2015) to studies focused on replication (Casad & Lee, 2014). In collaboration with the Psi Chi Research Advisory Committee, the PCJ editorial team is launching a replication initiative with this issue. As part of this initiative, PCJ will encourage the submission of replication studies, provide a special notation in PCJ for replication studies, and add the keyword "replication" to reviewers' expertise. PCJ enthusiastically welcomes reviewers with expertise in reviewing replication studies. The PCJ editorial team hopes that these structural changes will communicate the importance of replication studies and encourage researchers to engage in their execution and dissemination of findings, whether significant or not.

There are two ends of the spectrum on replication: direct replication and conceptual replication (Schmidt, 2009). A direct replication attempts to most directly recreate the study that is being replicated (in materials, procedures, and participants). In practice, there are very few published direct replications. More commonly a study will feature a direct replication and an additional manipulation or extension. Alternatively, in a conceptual replication, the basic research question is replicated, but with different materials, procedures, or participants that are still conceptually linked. PCJ has always been open to both conceptual and direct replications.

Ultimately, the biggest factor that will be evaluated in the submission of any PCJ manuscript will be the quality of the manuscript. The adequacy of the sample size for the conclusions reached (Anderson & Maxwell, 2015) will remain an important factor in decisions. Additionally, the quality of the materials and methods will be evaluated (see Uncles & Kwok, 2013, for a discussion of materials in the context of replication science). Finally, the adequacy of the analyses and the reporting of the entire manuscript will be considered as well.

As an illustration of what good replication science can look like to Psi Chi, we point to Keeran and Burmeister (2015) featured in the current issue of PCJ. Here, Keeran and Burmeister employed a primarily direct replication approach, although several changes and their potential impact were noted. Like all manuscripts employing a replication approach, the paper was evaluated on its own merits with the replicative approach being neither a benefit nor a hindrance to acceptance of the manuscript.

Ultimately, it is our hope that our field continues to embrace the benefits of replications in psychology. The field is strengthened by increasing

the precision and confidence of our conclusions through using both conceptual and direct replications. It is with these goals in mind that PCJ explicitly invites you to submit your replications for consideration in PCJ.

References

Alogna, V. K., Attaya, M. K., Aucoin, P., Bahník, Š., Birch, S., Birt, A. R., . . . Zwaan, R. A. (2014). Registered replication report: Schooler and Engstler-Schooler (1990). *Perspectives on Psychological Science, 9*, 556–578. doi:10.1177/1745691614545653

Anderson, S. F., & Maxwell, S. E. (2015, July 27). There's more than one way to conduct a replication study: Beyond statistical significance. *Psychological Methods*. Advance online publication. doi:10.1037/met0000051

Berman, M. I., & Frazier, P. A. (2005). Relationship power and betrayal experience as predictors of reactions to infidelity. *Personality and Social Psychology Bulletin, 31*, 1617–1627. doi:10.1177/0146167205277209

Casad, B. J., & Lee, J. K. (2014). Benevolent sexism and perceptions of gender conforming and nonconforming women abuse victims. *Psi Chi Journal of Psychological Research, 19*, 136–143. Retrieved from http://www.psichi.org/?page=193JNFALL2014

de Winter, J., & Happee, R. (2013). Why selective publication of statistically significant results can be effective. *PLoS ONE, 8*(6), e66463. doi:10.1371/journal.pone.0066463

Grahe, J. E., Brandt, M., IJzerman, H., & Cohoon, J. (2014). Replication education. *APS Observer, 27*. Retrieved from http://www.psychologicalscience.org/index.php/publications/observer/2014/march-14/replication-education.html

Griggs, R. A. (2015). The Kitty Genovese story in introductory psychology textbooks: Fifty years later. *Teaching of Psychology, 42*, 149–152. doi:10.1177/0098628315573138

Ioannidis, J. P. A. (2005). Why most published research findings are false. *PLoS Medicine, 2*(8), e124. doi:10.1371/journal.pmed.0020124

Keeran, D. C., & Burmeister, J. (2015). Side-effect effect take 2. *Psi Chi Journal of Psychological Research, 21*, 2–5. Retrieved from http://www.psichi.org/?page=211JNSpring2016

Ledgerwood, A., & Sherman, J. W. (2012). Short, sweet, and problematic? The rise of the short report in psychological science. *Perspectives on Psychological Science, 7*, 60–66. doi:10.1177/1745691611427304

Levelt Committee. (2012, November 28). F*alende wetenschap: De frauduleuze onderzoekspraktijken van sociaal-psycholoog Diederik Stapel [Flawed science: The fraudulent research practices of social psychologist Diederik Stapel]*. Retrieved from http://pubman.mpdl.mpg.de/pubman/item/escidoc:1569964/component/escidoc:1569967/Eindrapport_Commissie_Levelt.pdf

Nosek, B. A., Spies, J. R., & Motyl, M. (2012). Scientific utopia: II. Restructuring incentives and practices to promote truth over publishability. *Perspectives on Psychological Science, 7*, 615–631. doi:10.1177/1745691612459058

Peters, N., Holmgreen, L., & Oswald, D. (2015). It's just a joke: Reactions to and justifications for sex stereotypes in advertisements. *Psi Chi Journal of Psychological Research, 20*, 160–168. Retrieved from https://www.psichi.org/?203JNFall2015

Purvis, A. (2006). The *h* index: Playing the numbers game. *Trends in Ecology and Evolution, 21*, 422. doi:10.1016/j.tree.2006.05.014

Sagarin, B. J., Martin, A. L., Coutinho, S. A., Edlund, J. E., Patel, L., Skowronski, J. J., & Zengel, B. (2012). Sex differences in jealousy: A meta-analytic examination. *Evolution and Human Behavior, 33*, 595–614. doi:10.1016/j.evolhumbehav.2012.02.006

Schmidt, S. (2009). Shall we really do it again? The powerful concept of replication is neglected in the social sciences. *Review of General Psychology, 13*, 90–100. doi:10.1037/a0015108

Simmons, J. P., Nelson, L. N., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science, 22*, 1359–1366. doi:10.1177/0956797611417632

Simonsohn, U. (2013). Just post it: The lesson from two cases of fabricated data detected by statistics alone. *Psychological Science, 24*, 1875–1888. doi:10.1177/0956797613480366

Simonsohn, U., Nelson, L. D., & Simmons, J. P. (2014). P-curve: A key to the file-drawer. *Journal of Experimental Psychology: General, 143*, 534–547. doi:10.1037/a0033242

Steen, R. G. (2011). Retractions in the scientific literature: Do authors deliberately commit research fraud? *Journal of Medical Ethics: Journal of the Institute of Medical Ethics, 37*, 113–117. doi:10.1136/jme.2010.038125

Uncles, M. D., & Kwok, S. (2013). Designing research with in-built differentiated replication. *Journal of Business Research, 66*, 1398–1405. doi:10.1016/j.jbusres.2012.05.005

Varian, H. R. (1998). Future of electronic journals: Some speculations about the evolution of academic electronic publishing. *The Journal of Electronic Publishing, 4*(1). doi:10.3998/3336451.0004.105

Author Note. John E. Edlund, Rochester Institute of Technology.

The author wishes to thank the members of the Psi Chi Research Advisory Committee for their help with this initiative and especially Charlie Ebersole, Jon Grahe, and Rick Miller for their insightful comments on an early draft.

Correspondence concerning this article should be addressed to John E. Edlund at john.edlund@rit.edu.

Journal Submissions

The Psi Chi Journal of Psychological Research encourages all Psi Chi members—undergraduate students, graduate students, and faculty—to submit manuscripts for publication. Submissions are accepted for review throughout the year. Although manuscripts are limited to empirical research, they may cover any topical area in the psychological sciences. Replication studies, which are vital for reinforcing the science of psychology, are also welcome.

Submission basics:

- Please send ALL submissions and inquiries through our portal. Manuscripts are peer reviewed, which takes approximately 10–12 weeks.
- Authors' work is judged in comparison to others at their developmental level. The Journal's Editorial Board are especially dedicated to providing undergraduates with special direction when needed so that the quality of their manuscripts will ultimately match graduate and faculty submissions.
- Once the work is peer reviewed, the primary author will receive e-mail notification (approximately three months after initial submission) for
  - acceptance,
  - acceptance with minor revisions,
  - the encouragement for major revisions and resubmission, or
  - rejection.
- Accepted manuscripts are generally published within a year after initial submission according to submission dates, revision turnaround time, and at the discretion of the Editor.
- If you have any questions about the submission process, please e-mail the Managing Editor at psichijournal@psichi.org.

What to Submit:

1. A **cover letter** that includes
   - identifying information for the primary author, including an e-mail address;
   - the primary author's Psi Chi membership ID number;
   - a description of the primary author's educational status (e.g., an estimated or actual date of graduation, or description of faculty appointment);
   - a statement that the manuscript is original (not published or accepted for publication elsewhere); and
   - a statement that the research was carried out with approval of an institutional review board and following proper procedures for the protection of human participants or animal subjects.
2. For research papers with an undergraduate listed as the first author, submit a **sponsoring statement** that specifies
   - the research adhered to APA ethical standards;
   - the mentor has read and critiqued the manuscript on
     - content,
     - method,
     - APA style,
     - grammar, and
     - overall presentation; and
     - the planning, execution, and writing of the manuscript represent primarily the work of the undergraduate student.
3. A **cover page** in APA style (with manuscript title, authors' names, institutional affiliations, and possibly an author note).
4. A **masked manuscript** following these guidelines:
   - All authors' identifying information (e.g., name and school) is removed from all sections of the entire manuscript.
   - The manuscript is in Microsoft Word®.
   - The manuscript includes figures, tables, and charts generated in either Microsoft Word or Excel® (in black and white only).
   - Scanned images or illustrations (also in black and white or grayscale only) must have a resolution of at least 600 dpi resolution, and authors must be able to show that they have permission to use all images/illustrations..
   - The manuscript must adhere to APA style.

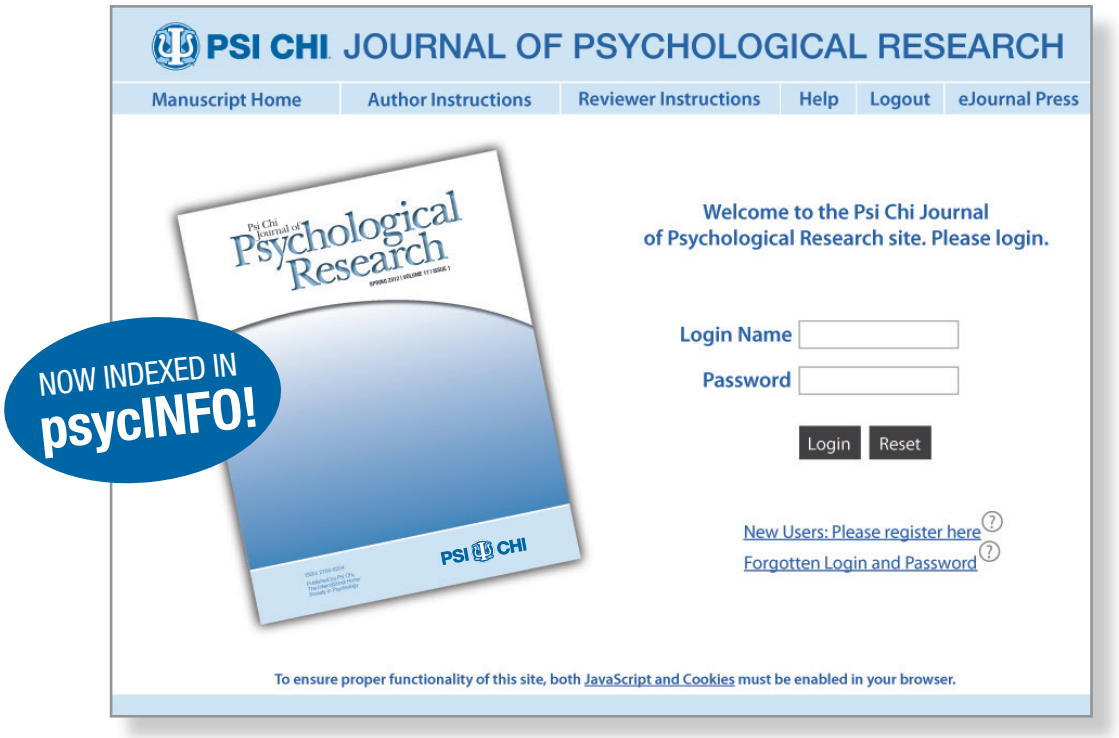
Journal Submissions

The Psi Chi Journal of Psychological Research encourages all Psi Chi members—undergraduate students, graduate students, and faculty—to submit manuscripts for publication. Submissions are accepted for review throughout the year. Although manuscripts are limited to empirical research, they may cover any topical area in the psychological sciences. Replication studies, which are vital for reinforcing the science of psychology, are also welcome.

Author Checklist:

Prior to submission, check:

1. Is the primary author a Psi Chi member?
   - o The **first author** of a submitted manuscript must be a member of Psi Chi at the time of submission.
   - o Additional authors may include non-Psi Chi members.
2. Is the manuscript empirical?
   - o **Empirical** articles include original data collection, secondary data analysis, or meta-analysis.
   - o Manuscripts must follow a solid research design, use appropriate research analyses, and report all relevant statistical data including internal consistency and effect sizes for *p* values.
   - o Specific values (think =, not > or <) should always be provided regardless of statistical significance, unless the number is < .001.
3. Is the contribution original?
   - o Only **original manuscripts** (not published or accepted for publication elsewhere) will be accepted.
4. Is this paper ready to be judged by reviewers?
   - o Reviewers will be prompted to evaluate your paper based on the **level of work** expected of undergraduate students, graduate students, or faculty.
   - o Authors who completed their research as an undergraduate student may submit it after graduation; however, if those students are enrolled in a graduate program, the work will be compared to that of graduate students rather than other undergraduates.
5. Is the research timely?
   - o The Editor reserves the right not to review projects completed more than one year before submission.
6. For faculty authors, is a student coauthor included?
   - o Faculty must have **at least one student coauthor**. All authors who submit work they completed as an undergraduate must have a faculty mentor who has reviewed the manuscript and affirmed the work was primarily that of the student(s).
7. Is the manuscript **fewer than 35 pages** including all references, tables, figures, and appendices?
8. Has the manuscript been written according to **APA Style**?
   - o All manuscripts must be prepared according to the Publication Manual of the American Psychological Association (6th ed.).
   - o Refer to the "Checklist for Manuscript Submission" found on APA's website to check the accuracy of your paper for APA style prior to submission.
9. Does the manuscript reference other *Psi Chi Journal* articles? (We highly encourage this!) Our Publication Search tool at psichi.org/?Publications_Search will help you find interesting and relevant articles.



Online Journal Submission Process

All Psi Chi undergraduates, graduates, and faculty* are invited to submit their research to the *Psi Chi Journal of Psychological Research* through the new web based manuscript submission, tracking, and peer review software solution. Better than email submissions used in the past, this software allows users to create personal accounts to make the submission process more efficient.

Four items are required for all submissions:

1) **Cover Letter**
   Include primary author's education status, manuscript originality statement, IRB approval
2) **Sponsoring Statement**
   Undergraduate first authors only
3) **Cover Page**
   Author names, school affiliation, and any author note
4) **Masked Manuscript**
   MS Word with all personal information removed

Simply register an account, then click Submit Manuscript:

1) **Upload Files**
   Files can be removed, replaced, or reorganized
2) **Enter Manuscript Information**
   E.g., title, abstract, authors, keywords, etc.
3) **Review Manuscript Material**
   Summary of all information/ files submitted
4) **Submit Manuscript**
   Receive email confirmation

New software benefits:

- Allows users to track their manuscripts' progress
- Inserts multiple files including cover letters, manuscripts, and figures
- Permits users to prioritize files and coauthors
- Checks for mistakes in the submission process and points out any errors
- Streamlines the process for authors and reviewers

* Psi Chi member ID number required

Register an account: http://pcj.msubmit.net/cgi-bin/main.plex
Tutorial videos: http://www.ejpress.com/demos

PSI CHI