ABOUT PSI CHI
Pschi is the International Honor Society in Psychology, founded in 1929. Its mission: “recognizing and promoting excellence in the science and application of psychology.” Membership is open to undergraduates, graduate students, faculty, and alumni making the study of psychology one of their major interests and who meet Pschi’s minimum qualifications. Pschi 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). Pschi’s sister honor society is Psi Beta, the national honor society in psychology for community and junior colleges.

Pschi functions as a federation of chapters located at over 1,180 senior colleges and universities around the world. The Pschi Headquarters is located in Chattanooga, Tennessee. A Board of Directors, composed of psychology faculty who are Pschi members and who are elected by the chapters, guides the affairs of the Organization and sets policy with the approval of the chapters.

Pschi membership provides two major opportunities. The first of these is academic recognition to all 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 Pschi Journal of Psychological Research is to foster and reward the scholarly efforts of Pschi members, whether students or faculty, 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; the Journal is dedicated to increasing its scope and relevance by accepting and involving diverse people of varied racial, ethnic, gender identity, sexual orientation, religious, and social class backgrounds, among many others. To further support authors and enhance Journal visibility, articles are now available in the PsycINFO®, EBSCO®, Crossref®, and Google Scholar databases. In 2016, the Journal also became open access (i.e., free online to all readers and authors) to broaden the dissemination of research across the psychological science community.

JOURNAL INFORMATION
The Pschi Journal of Psychological Research (ISSN 2325-7342) is published quarterly in one volume per year by Pschi, Inc., The International Honor Society in Psychology. For more information, contact Pschi Headquarters, Publication and Subscriptions, 651 East 4th Street, Suite 600, Chattanooga, TN 37403, (423) 756-2044. www.psichi.org; pschijournal@psichi.org.

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 Pschi.

Advertisements that appear in Pschi Journal do not represent endorsement by Pschi of the advertiser or the product. Pschi neither endorses nor is responsible for the content of third-party promotions. Learn about advertising with Pschi at http://www.psichi.org/Advertise

COPYRIGHT
Permission must be obtained from Pschi to reprint or adapt a table or figure; to reprint quotations exceeding the limits of fair use from one source, and/or to reprint any portion of poetry, prose, or song lyrics. All persons wishing to utilize any of the above materials must write to the publisher to request nonexclusive world rights in all languages to use copyrighted material in the present article and in future print and nonprint editions. All persons wishing to utilize any of the above materials are responsible for obtaining proper permission from copyright owners and are liable for any and all licensing fees required. All persons wishing to utilize any of the above materials must include copies of all permissions and credit lines with the article submission.
178 Correlating Barriers to Medication Adherence With Trait Anxiety, Social Stigma, and Peer Support in College Students With Chronic Illness
Christina Curtis and Astrida S. Kaugars*
Department of Psychology, Marquette University

185 Well-Being and the Outdoors: An Environmentalism Study Among a Religious Student Population
Laura Pires-Gifford, Shaylee Hoffmann, Edmond Arroyo, Nathan Jones, Bethany Waite, and Robert R. Wright*
Department of Psychology, Brigham Young University-Idaho

197 Lysergic Acid Diethylamide Produces Anxiogenic Effects in the Rat Light/Dark Text and Elevated Plus Maze
Catherine N. Conway and Lisa E. Baker*
Department of Psychology, Western Michigan University

205 There Is Crying in Football: Reactions to an Athlete’s Weeping
Brandon C. Martin, William Hill, Grace McIntosh, Nelson Peterson, Olivia Sanborn, and Karol Maybury*
Division of Psychology and Human Development, University of Maine at Farmington

212 Imagining the Hangover: Anticipated Regret and Binge Drinking
Erika J. Koch
Department of Psychology, St. Francis Xavier University

223 INVITED EDITORIAL: Sharing Effective Models of Student Research Mentoring: Stories From Associate Editors
Robert Wright1, Kimberli R. H. Treadwell2, and Jennifer L. Hughes3
1Department of Psychology, Brigham Young University – Idaho
2Department of Psychological Sciences, University of Connecticut
3Department of Psychology, Agnes Scott College
Correlating Barriers to Medication Adherence With Trait Anxiety, Social Stigma, and Peer Support in College Students With Chronic Illness

Christina Curtis and Astrida S. Kaugars
Department of Psychology, Marquette University

**ABSTRACT.** Taking one’s prescribed medication is an important aspect of chronic illness management. It is important to better understand individual and community factors that may be associated with barriers to medical adherence. Eighty-three undergraduate students with a chronic illness took an online survey assessing perceived barriers to medication adherence, levels of anxiety, social stigma, and peer support. Participants reported on their chronic illness diagnosis. Anxiety and social stigma were positively correlated with barriers to medication adherence, $p < .001$, and peer support was negatively correlated with barriers to medication adherence, $p = .02$. Participants with a psychological illness reported statistically significantly higher levels of anxiety, $p = .007$, and social stigma, $p = .002$, than participants with a medical illness. This study contributes to the growing literature examining factors that may be associated with college students’ medication adherence.

**Keywords:** barriers, medication adherence, college students, chronic illness

Managing a chronic illness may require a variety of activities recommended or prescribed by one’s doctor including taking prescribed medications (DiMatteo et al., 2012). However, adherence to a treatment regimen may be difficult or not possible for many reasons: Patients may never begin or may stop their medication, they may experience problems with executive functioning, they may not have adequate knowledge, and they may experience low motivation (Gushman et al., 2020; Ruppar, 2017).

The lack of adherence to a treatment regimen can have a negative impact on one’s health, and it can frustrate the individual with the chronic illness and their medical provider (DiMatteo et al., 2012). Patient nonadherence negatively impacts the health care system in the form of increased health care costs. Approximately $100–300 billion of U.S. direct care healthcare dollars are associated with nonadherence each year (Ruppar, 2017). Because 50–75% of children and adolescents with chronic illnesses are nonadherent, it is especially important to examine medication adherence in pediatric populations with chronic illnesses (Modi et al., 2012). For example, nonadherence in adolescents with cancer puts them at risk of lower treatment efficacy and increased risk of relapse (Butow et al., 2010). Additionally, nonadherence affects about 40–67% of adolescent and young adult transplant recipients (Quast et al., 2020). Research with this population has demonstrated how nonadherence behaviors may be stable over time. Barriers to medication adherence remained the same immediately posttransplant to 18 months later in a study with adolescent transplant recipients (Simons et al., 2010).

College students living away from home have primary responsibility for managing their chronic illness. This is likely different than the experiences of adolescents living at home, who may still have one or more adults assisting with their daily illness.
Self-management responsibilities. Although most college students find this time of transition challenging due to increased independence and responsibility, college students with chronic illnesses face even more challenges in being solely responsible for maintaining their health (Sharkey et al., 2017).

Existing research has identified many barriers to medication adherence. Although many studies have identified barriers to medication adherence using self-report measures (Bullington et al., 2007; Dziuban et al., 2010), some studies have accomplished the same objective using structured interviews (Smith et al., 2008). Regardless of the method of the study, research has suggested that barriers to medication adherence include lack of privacy, frequency of taking medication, treatment interfering with freedom, and fear of peer relationships being negatively affected (Bullington et al., 2007; Dziuban et al., 2010; Hnaghoj & Boisen, 2014; Smith et al., 2008).

Modi et al. (2012) developed a model of self-management behaviors that explains the systems and factors that contribute to medication regimen adherence in pediatric populations diagnosed with a chronic illness. This model depicts how individual, family, community, and health care system levels influence medication adherence. Further, modifiable and nonmodifiable domain-specific influences impact self-management through cognitive, emotional, and social processes. Self-management processes are the actions that a person takes to treat chronic illnesses, modifiable influences are components of disease management that can be changed with intervention, and nonmodifiable influences are components of disease management that cannot be changed. Modifiable individual (i.e., anxiety) and community (i.e., peer support and social stigma) factors were selected for the present study.

**Anxiety**
Anxiety is defined as “a mental state characterized by an intense sense of tension, worry or apprehension relative to something that might happen in the future” (Saviola et al., 2020, p.1). College students with chronic illnesses have a higher risk of increased levels of anxiety compared to college students without chronic illnesses (Bhattacharya et al., 2014; Gray et al., 2011; Sharkey et al., 2017). Adolescents with chronic illnesses may have a higher risk of developing anxiety due to the unpredictable nature of many chronic illnesses (Gray et al., 2011). Anxiety has been associated with disease outcome and may exacerbate illness symptoms (Bhattacharya et al., 2014; Gray et al., 2011). Additionally, anxiety is correlated with greater difficulty adhering to treatment regimen (Gray et al., 2011; Modi et al., 2012).

**Peer Support**
Adolescent peer relationships can influence how adolescents with chronic illnesses manage their health (Modi et al., 2012). Peer support describes a positive relationship among multiple individuals roughly the same age who can depend on one another, empower, and encourage each other (Vayshenker et al., 2016). To reduce peer attention to their illness, some adolescents may rely less on peer support (Modi et al., 2012). Research has shown that adolescents endorse the desire to be “normal” and a lack of social support as significant barriers to medication adherence (Logan, 2003; Simons et al., 2009). Further, adherence has also been shown to be positively correlated with family and social support (Butow et al., 2010).

**Social Stigma**
One salient social influence is social stigma. Social stigma is defined as expectations given and spread by society typically regarding an illness and which tend to have negative connotations (Raque-Bogdan, 2019). Adolescents with asthma reported that one barrier to medication adherence is placing high importance on social influences (Rhee et al., 2009). Auslander and colleagues (2010) examined barriers to medication adherence among adolescents with type 2 diabetes and found that two types of stigma were a major barrier to medication adherence: the fear of not fitting in with peers and stigma from insurance companies associated with the disease itself. Concerns about stigma may stem from fear of being isolated and labeled as different than one’s peers (Smith et al., 2008).

The purpose of the present study was to determine associations between barriers to medication adherence and anxiety, peer support, and social stigma in college students with chronic illnesses. It was hypothesized that more barriers to adherence would be associated with higher levels of trait anxiety, less perceived peer support, and higher perceived social stigma.

**Method**
**Procedures**
The study was approved by the institutional review board at the authors’ institution (HR-3524). Participants were recruited for this study via a
Correlates of Barriers to Medication Adherence | Curtis and Kaugars

weekly university email and flyers that were posted in the university’s medical clinic, Office of Disability Services, academic buildings, and apartments and residence halls on campus. The flyer stated that participants must be currently enrolled at the university, 18–23 years old, English speaking, diagnosed with a chronic medical condition, and regularly taking prescribed medication at least once a week. Graduate students were excluded from participating.

Participants accessed the online survey from a link provided in an email sent to all students or on the posted flyers. The first screen displayed information regarding why this study was being conducted, the risks, benefits, and potential compensation. If the respondent agreed, the survey began. The survey then asked if the respondent has a chronic health condition that requires taking prescription medication on an ongoing basis. If the respondent indicated “yes,” the survey continued. After completing all of the questionnaires, participants had the option to type an email that counted as a raffle ticket to win a gift card.

Participants
Of the 120 people who responded to the survey, 31 did not meet the eligibility criteria, and six partially completed the questionnaires. Thus 83 participants (88.0% women, 8.4% men, and 3.6% nonbinary; mean age = 20.12 years, SD = 1.32; 83.1% White or European American, 3.6% Asian American, 2.4% Black or African American, 2.4% Multiracial, 1.2% American Indian/Alaskan Indian, 1.2% Middle Eastern, 1.2% Native Hawaiian or other Pacific Islander, and 4.8% Did not respond; 90.4% Not Hispanic or Latina/o and 9.6% Hispanic or Latina/o; see Table 1) completed all demographic information and measures. Approximately half (51.8%) of participants had a medical illness, less than half (43.4%) had a psychological illness, and 4.8% had both. Of those with medical illnesses (see Table 2), there was great variability in the type of illness reported with the most participants (21.3%) reporting a gastrointestinal condition. Numerous psychological conditions were reported with depression being the most common (62.5%). The average age at chronic illness diagnosis was 14.55 years with a standard deviation of 4.35.

Measures
The Spielberger State-Trait Anxiety Inventory (STAI Form Y-2; Spielberger et al., 1983) is made up of 20 statements (e.g., “I worry too much over something that doesn’t really matter.”) that evaluate overall levels of trait anxiety, not specific to one point in time. Responses are given on a 4-point scale (1 = almost never to 4 = almost always); nine items are reverse scored. The sum of all items is then calculated;
higher total scores indicate higher levels of trait anxiety. Evidence of validity has been obtained in previous studies that used a college student population (Pang et al., 2019). The Cronbach’s alpha for the scale in the present study was .92.

The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988) has 12 statements about social support in the form of family, friends, or a significant other (e.g., “I can count on my friends when things go wrong.”). Participants rate each item on a Likert scale (1 = very strongly disagree to 7 = very strongly agree). Subscales (with four items per subscale) can be calculated for support from family, friends, and significant others. In this study, because the construct of interest was peer support, only responses for the friends and significant other subscales were used and combined for a total peer support score. The responses for those eight items were summed and divided by the number of items to obtain a mean score. Higher scores indicate more social support. Previous studies have found evidence for the validity of this measure in a college student population (Zhang et al., 2019). The Cronbach’s alpha for the combined significant other and friends subscales was .90 in the present study.

The Stigma Scale for Chronic Illnesses-Short Form (SSCI-8; Molina et al., 2013) is comprised of eight statements about stigma experienced as a result of a chronic illness (e.g., “Because of my illness, some people avoided me.”). Participants rate each item on a 5-point scale (1 = never to 5 = always). The sum of scores is then calculated with higher scores indicating more social stigma experienced. This measure had good internal consistency with a Cronbach’s alpha of .83 in the present study.

The Adolescent Medication Barriers Scale (AMBS; Simons & Blount, 2007) is comprised of 17 statements regarding possible barriers to medication adherence (e.g., “I feel that it gets in the way of my activities.”) that participants rate on a Likert scale (1 = strongly disagree to 5 = strongly agree). The sum of all responses is calculated to get a final score; higher scores indicate more barriers to medication adherence. Research has provided evidence of validity for this measure in a population of adolescents and young adults aged 12–20 years, which overlaps with the college student population used in the current study (Quast et al., 2020). In the present study, the Cronbach’s alpha was .82.

Demographic characteristics of participants were obtained by asking participants to indicate their age, gender, race/ethnicity, year in college, age at illness diagnosis, type of chronic illness, and medication taken to treat the chronic illness. A physician reviewed the participants’ self-reported medical conditions to ensure that they were correctly classified and summarized.

**Results**

Consistent with the hypothesis, more barriers to medication adherence were associated with higher levels of anxiety, $r = .44$, $p < .001$, and higher levels of social stigma, $r = .45$, $p < .001$. More barriers to medical adherence were associated with lower levels of peer support, $r = -.25$, $p = .02$ (see Table 3). Multiple linear regression was used to test if barriers to medical adherence was significantly predicted by anxiety, social stigma, and peer support. The overall regression was statistically significant, $F(3, 79) = 9.10$, $p < .001$, and explained 23% of the variance. Anxiety, $β = .27$, $p = .03$, and social stigma, $β = .30$, $p = .01$, were significant predictors of barriers to medical adherence, but peer support was not a statistically significant predictor, $β = -.01$, $p = .95$.

Post-hoc analyses were done (a) to examine the pattern of correlations for the two subgroups (i.e., participants with a medical illness and participants with a psychological illness) and (b) to examine differences in the constructs of interest for the two subgroups. For analyses comparing the two subgroups, the total sample size was $n = 79$ because four participants reported both a medical illness and a psychological illness. The pattern of correlations for the two subsamples was similar to one another and to the full sample (see Table 3). When comparing the two subgroups, there were no statistically significant differences for the two subgroups for barriers to medication adherence, $t(77) = -1.40$, $p = .17$, and levels of peer support, $t(77) = 1.35$, $p = .18$. Participants with a psychological illness reported higher levels of anxiety, $t(77) = -2.78$, $p = .007$, and social stigma, $t(77) = -3.20$, $p = .002$, than participants with a medical illness.

### Table 3

| Correlations Among Barriers to Medication Adherence and Anxiety, Peer Support, and Social Stigma for the Total Sample and by Illness Categories |
|---|---|---|
| Construct | Total Sample | Medical Illness (n = 43) | Psychological Illness (n = 36) |
| Anxiety | .43*** | .35** | .56*** |
| Peer support | −.25* | −.26 | −.24 |
| Social stigma | .45*** | .38* | .53** |

*Note: $p < .05$, **$p < .01$, ***$p < .001$. 


Associations among the constructs were examined separately for participants with a medical illness and a psychological illness (see Table 4).

**Discussion**

The purpose of this study was to gain a better understanding of the associations between barriers to medication adherence and anxiety, peer support, and social stigma in college students with chronic illness. The results of the present study support all proposed hypotheses. Although not expected, a comparable number of participants identified as having a medical illness or a psychological illness, which allowed for comparison between these two subgroups of participants.

The results of this study are consistent with existing literature that has found a positive correlation between anxiety and having more challenges adhering to a prescribed treatment regimen (Gray et al., 2011; Modi et al., 2012). Unlike previous studies (Bhattacharya et al., 2014; Gray et al., 2011; Sharkey et al., 2017), this study did not compare anxiety levels in college students without chronic illness to college students with chronic illness. This study utilized the Spielberger State-Trait Anxiety Inventory (Spielberger et al., 1983), which assesses trait anxiety; future research may consider using different questionnaires to assess different dimensions of anxiety. For example, the Beck Anxiety Inventory assesses somatic symptoms of anxiety, and the Hospital Anxiety and Depression Scale—Anxiety assesses anxiety in people diagnosed with medical conditions (Julian, 2011). It may be informative to understand whether different dimensions of anxiety are related in similar or different manners to medication adherence.

Similar to research reviewed by Ahmad and Sorensen (2016), which found peer social support to promote adherence to asthma medication, this study found a negative correlation between peer support and barriers to medication adherence. Specifically, college students who had higher levels of peer support had fewer barriers to medication adherence. However, peer support was not a significant predictor of medication adherence when entered with other variables in a multiple regression. Peer relationships impact whether and how adolescents with chronic illness follow their treatment regimen (Modi et al., 2012). The work of Saylor et al. (2018) highlights how young adults increasingly rely on peers for support, and in doing so, they feel more social connection and less anxiety and depression related to their illness.

The positive correlation between social stigma and barriers to medication adherence found in this study is consistent with Auslander et al. (2010), which found stigma to be a barrier to medication adherence. Adolescents’ desire for others to view them as “normal” (Logan, 2003; Simons et al., 2009) highlights the large impact social stigma can have on their behavior, including adherence to medication regimen. Future research might consider an intervention addressing social stigma and its impact on treatment adherence to improve medication adherence in college students with chronic illness.

Present study participants identified having a wide variety of both medical and psychological illnesses. The inclusion criteria on the flyer and email listed that participants must have a chronic illness; typically, “chronic illness” refers to physical health conditions, but students with psychological illness also identified with this description and participated in the survey. The distribution of medical and psychological illnesses in the present study reflects that of previous studies. Oswalt et al. (2018) looked at 454,029 college students’ mental health diagnoses from 2009 to 2015 and found a very similar distribution for psychological illnesses.

The levels of anxiety symptoms and social stigma were higher in the participants with psychological illnesses than those with medical illnesses, but there were no subgroup differences for peer support. Because almost half (47.5%) of the participants with a psychological illness reported a diagnosis of anxiety, this would explain the higher anxiety symptoms in the psychological illness subgroup. The higher social stigma scores among those with psychological disorders likely reflects the stigma around mental health diagnosis. Specifically, mental illness is a concealable stigma because it is not readily visible to others (Quinn & Chaudoir, 2009). Thus, college students may encounter challenges as they decide whether and to whom to

**TABLE 4**

<table>
<thead>
<tr>
<th>Comparisons of Mean Scores for Constructs of Interests for Medical Illness and Psychological Illness Subgroups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Illness (n=43)</td>
</tr>
<tr>
<td>M (SD)</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Barriers to medication adherence</td>
</tr>
<tr>
<td>Anxiety</td>
</tr>
<tr>
<td>Peer support</td>
</tr>
<tr>
<td>Social stigma</td>
</tr>
</tbody>
</table>

Note: *p < .05, **p < .01, ***p < .001.
disclose their diagnosis and whether they will be rejected or stigmatized for doing so.

Limitations
Although this study had many strengths, including the variety of both medical and psychological chronic illnesses that participants reported, there are also some limitations. This study did not incorporate a medical chart review, so there was no way to confirm that the participants had the chronic illness that they said they did. However, recruitment was done in settings where undergraduate students diagnosed with a chronic illness might receive services (e.g., the medical center and the Office of Disability Services), which might have increased the likelihood that participants did have a chronic illness. This study design was correlational, which means that no conclusions about causality can be made. The sample was predominantly women from one university located in the Midwestern United States. Thus, caution is warranted in generalizing the findings to other female or male students at the same or different universities, and additional research is needed with more diverse populations.

Future Directions
There are several directions for future research. Although the present study examined barriers to medication adherence, a future study should assess medication adherence directly and examine associations with the three constructs of interest. Additionally, anxiety, peer support, and social stigma are all areas that physicians and psychologists can address, and interventions can be developed to reduce barriers to medication adherence and possibly improve treatment regimen adherence. Other factors also likely determine how much college students with chronic illness adhere to their treatment regimen, such as grit, illness uncertainty, resilience, and illness intrusiveness (Sharkey et al., 2017).

This study supplements the existing body of research by documenting aspects of physical and psychological functioning among undergraduates with chronic illness. The results can inform university administrators on the needs of students throughout their college career. This study shows how advances in medical care have allowed students to attend and succeed in college (Lipson et al., 2019; Ravert et al., 2017). This study is also informative because it shows that an increasing number of people diagnosed with a psychological illness identify as having a chronic illness. The findings of this study are beneficial because they reveal that there are associations between barriers to medication adherence and anxiety, peer support, and social stigma; these three constructs then are potential avenues to target awareness and interventions to increase medication adherence in this population and ultimately to improve illness outcomes.

References
Julian, L. J. (2011). Measures of anxiety: State-Trait Anxiety Inventory (STAI), Beck Anxiety Inventory (BAI), and Hospital Anxiety and Depression Scale-Anxiety (HADS-A). Arthritis Care & Research, 63(S11), S467–S472. https://doi.org/10.1002/acr.20561
Correlates of Barriers to Medication Adherence | Curtis and Kaugars


Author Note. Astrida S. Kaugars

https://orcid.org/0000-0003-0538-2768

This manuscript is dedicated to the memory of Christina Curtis, the lead author, who passed away in July 2020. Christina completed the research design, data collection, data analysis, and a draft of this article for her Honors in Psychology independent research project. She was a hardworking, motivated, and curious student, who is greatly missed by many.

We have no known conflicts of interest to disclose. A poster summarizing the results of this study was presented at Marquette University’s 3rd Annual Undergraduate Psychology Research Symposium in May 2020 and at the Wisconsin Psychological Association’s Student Poster Session in October 2020.

Correspondence concerning this article should be directed to Astrida Kaugars, Department of Psychology, Marquette University, P.O. Box 1881, Milwaukee, WI, 53209-1881, United States. Email: astrida.kaugars@marquette.edu
Environmental attitudes (EAs), environmental behaviors (EBs), and environmental concerns (ECs) related to environmental preservation, outdoor activities, and food sustainability are essential as they are often related to proenvironment actions, which are viewed as ways to benefit the environment and humans simultaneously (e.g., Wells & Lekies, 2006). Additionally, factors including mental and physical health benefits, community norms, and the level of concern for the environment (specifically, the perception of environmental threats; Schmitt et al., 2018) impact the likelihood of individuals having positive EAs and engaging in EBs (Basedau...
et al., 2017; Dietz & Whitley, 2018; Greeley, 1993; Hunter & Toney, 2005). In some instances, having and engaging in EAs and EBs can further one’s willingness to engage in other EBs (Dahm et al., 2009). Religious beliefs have also been shown to impact EAs and willingness to engage in EBs (Greeley, 1993; Hunter & Toney, 2005). However, these studies come from a different sociopolitical context, as the studies took place in different locations and as a considerable amount of time has passed since these studies were conducted. This suggests that a follow-up study examining these relationships could provide a more contemporary understanding. As such, for the present study, we examined the relationship between EAs, EBs, ECs and the interaction they have with outdoor recreation, diet quality, and mental wellness in a population of members of the Church of Jesus Christ of Latter-day Saints.

Outdoor Recreation
Outdoor recreation has been looked at in several contexts related to EAs, EBs, and ECs (Dunlap & Heffernan, 1975; Milfont et al., 2010; Teisl & O’Brien, 2003). To examine the relationship between outdoor recreation and EAs and EBs, Homer and Kahle (1988) developed the cognitive hierarchy model. Their model states that values, attitudes, and behaviors have a hierarchical relationship, flowing from abstract and general values to attitudes, leading to specific behaviors. According to this model, an individual’s view of the environment could be conceptualized as a pyramid, where values lie as the foundation to basic beliefs, which influence one’s attitudes, affecting behavior intentions and specific behaviors (Homer & Kahle, 1988). Taking this model into perspective, one can assume that particular behaviors, such as environmentally friendly behaviors or participation in outdoor recreational activities, would be influenced by the EAs held by an individual. Additionally, Milfont et al. (2010) expanded this model to include perceived threats affecting attitudes which then affect behaviors. This updated theory implies that perceived environmental threats can impact people’s attitudes, such as attitudes about climate change, and behaviors (Milfont et al., 2010).

However, it is essential to distinguish between appreciative activities (e.g., hiking, visiting parks, sightseeing) and consumptive activities (e.g., hunting, fishing). Dunlap and Heffernan (1975) explained that consumptive activities involve taking something away from the environment, whereas appreciative outdoor activities aim to enjoy nature, taking a more “preservationist” approach. Therefore, the different values underlying both types of outdoor activities could influence one’s attitudes toward the environment and consequent behaviors in different ways. Additionally, Teisl and O’Brien (2003) found that individuals who engage in more appreciative outdoor recreation tended to have higher levels of EBs and ECs. Their study also found that individuals who participate in forest-based recreation tended to have significantly higher EBs and ECs than people who listed no outdoor recreation (Teisl & O’Brien, 2003). This indicates a relationship between outdoor recreation in general with EBs and ECs and whether the recreation is appreciative or consumptive.

Health Behaviors
It is important to consider other factors such as health behaviors that might be related to EAs. Eisinger-Watzl et al. (2015) showed that, in Germany, people who buy organic food, which is widely recognized as sustainable food, tended to eat more fruits and vegetables than those who did not purchase organic food, while also consuming less sugary drinks and meat. Their findings indicate that those who bought more sustainable food had a healthier choice of diet. However, the study did not look at the direct correlation between EAs and diet quality, which suggests that EAs are a possible underlying factor that has not been widely explored. As this study was conducted in a location with access to a wide variety of healthy dietary options, other possible underlying factors may also be related, such as access to healthier food options.

The literature suggests that individuals with pro-EAs tend to recognize the need for more sustainable food practices (Scalvedi et al., 2018). However, often these people show contradicting behavior, being less willing or unable to purchase sustainable foods. Therefore, pro-EAs do not necessarily correlate with sustainable diets or willingness to buy sustainable food (Scalvedi et al., 2018). Indeed, in their study, Scalvedi et al. (2018) explored the relationship between eating habits and ecosustainable food behaviors in Italy. They found that consumers concerned with convenience and taste generally did not have enough time in their schedules to worry about choosing sustainable foods or planning a healthy diet. They were usually working full-time and buying ready-to-eat dishes. The researchers stated that the low involvement shown by these people in their food purchase and
preparation indicated a lack of awareness of the dietary quality and sustainability of what they were consuming (Scalvedi et al., 2018).

Students’ food choices are similarly influenced by several factors such as convenience, taste, and price. Several studies have provided evidence that students’ food choices often neglect the intake of fruits and vegetables while showing an increased intake of high-fat foods (Deshpande et al., 2009). Situational effects, such as buffet-style cafeterias and big serving sizes, can also impact college student intake (Boyle & LaRose, 2008). Apart from the previously listed food-related issues, environmental awareness and moral obligations may also impact consumer purchase decisions. People who place a high value on sustainable food practices eat more fruits and vegetables while showing an increased intake (Boyle & LaRose, 2008). Apart from the previously listed food-related issues, environmental awareness and moral obligations may also impact consumer purchase decisions. People who place a high value on sustainable food practices eat more fruits and vegetables while showing an increased intake (Boyle & LaRose, 2008). Another study of college students revealed that, when they completed a course on societal concerns around food and food production, they consumed more vegetables and less high-fat dairy, high-fat meat, and sweets (Pelletier et al., 2013). This suggests that students may not initially consider their diet’s impact on the environment and how their beliefs regarding the environment, or EAs, can impact their dietary choices.

One’s perceptions of “green” or organic foods can also impact wellness. Schuldt and Schwarz (2010) conducted a two-part study examining how the label of organic foods and ingredients can influence perceptions of calorie content and exercise. Diet and exercise are known factors for impacting health, so it is essential to understand that things typically considered unhealthy (i.e., cookies) but have an organic label can affect one’s diet and exercise decisions (Schuldt & Schwarz, 2010). In this sense, environmental attitudes are related to health behaviors, including diet and exercise.

Mental Health
Mental health is another domain that offers a different arena in which to explore relationships, such as life satisfaction measures and pro-EAs and EBs (Netuveli & Watts, 2020; Schmitt et al., 2018; Verhofstadt et al., 2016). Netuveli and Watts (2020) examined the relationship between EAs and EBs with emotional health. They found that people who lived in more environmentally friendly households (e.g., households that engaged in recycling, used green energy, and had positive attitudes toward the environment) reported better mental health and life satisfaction. However, their study indicated that personal EAs did not correlate with improved mental health and life satisfaction. They speculated that this might be due to negative personal feelings regarding climate change and high levels of ECs (Netuveli & Watts, 2020). Similarly, Schmitt et al. (2018) found that ECs, or the perception of environmental threats, were strongly negatively correlated to life satisfaction, despite implementing positive EBs. Thus, it makes sense that they also found that nearly all of the personal EBs they examined had significant positive correlations with life satisfaction.

Verhofstadt et al. (2016) looked at how certain behaviors are good for both the environment and subjective or mental well-being. Specifically, they found that not using electricity to heat one’s home and switching to a more environmentally friendly diet increased subjective well-being. These situations are ideal as they create a win-win situation both for individuals and the environment, despite individual proEAs having neutral or even negative impacts on mental wellness, as found by Netuveli and Watts (2020). As a whole, the current literature indicates that EAs and EBs are correlated positively with mental health, while ECs tend to be correlated negatively with life satisfaction and mental wellness.

Religious Beliefs
Positive attitudes and concern for the environment do not always predict whether individuals will engage in EBs or have strong EAs. Indeed, some individuals who express concern for the environment may choose not to engage in EBs if their community does not promote EBs or communicate ECs (Dietz & Whitley, 2018; Hunter & Toney, 2005). In a study with a small sample of adult members of The Church of Jesus Christ of Latter-day Saints in Logan, UT, this was the case when compared to the general U.S. population (Hunter & Toney 2005). Their results showed that these respondents were concerned about the environment, and they believed it was essential to protect it. However, these individuals were unwilling to change their behaviors for the environment or participate in proenvironmental activities. These religious participants also recorded higher perceived levels of individual ability to impact the environment than the general U.S. population (Hunter & Toney 2005). Hunter and Toney (2005) speculated that this might be affected by the fast level of economic development in the Logan, Utah, area and by local religious leaders. They also assumed that the high levels of concern with low levels of behavior could be related
Well-Being, Outdoors, and Environmentalism | Pires-Gifford, Hoffmann, Arroyo, Jones, Waite, and Wright

...to how much time and money members of The Church of Jesus Christ of Latter-day Saints donate to the church, which has an extensive humanitarian program (e.g., Helping Hands, Latter-day Saints Charities). Hunter and Toney’s (2005) study is one of few that examined the relationship of a religious population with EAs, EBs, and ECs. It is also important to note that this religious population may have unique church doctrine and practices that may impact psychosocial phenomena like EAs, EBs, and ECs (e.g., Wright et al., 2016; Wright, Hardy, et al., 2018). As of now, little literature has explored this topic, and Hunter and Toney’s (2005) study may be limited in terms of contemporary understanding of this relationship, indicating there is a need for further research.

Present Study
We sought to investigate outdoor recreation, health behaviors (i.e., diet quality), and mental wellness related to EAs, EBs, and ECs within a specific religious population. By examining the population of college student members of the Church of Jesus Christ of Latter-day Saints, we hoped to identify how their particular behaviors, attitudes, and emotions correlated with their views of the environment. We hypothesized that EAs, EBs, and ECs would positively correlate with appreciative outdoor activities, diet quality, and mental health, all of this within a homogenous group of religious college students.

Method
Participants
Following approval from the university’s Institutional Review Board, participants were solicited from a convenience sample of students enrolled in introductory psychology courses at Brigham Young University-Idaho who completed this study’s online questionnaire. Participation in a research study was a required component of the course, but students’ grades were participation-based only. Participants were given the option to choose from several different research projects conducted on campus. Data were collected over six semesters with a total of 693 participants. Of those participants, 81 participants were excluded because they either did not complete the survey, did not permit the use of their data in this study, or indicated they were not members of the Church of Jesus Christ of Latter-day Saints, for a total sample size of 612. The sample consisted primarily of women (72%) and was predominantly White (78%), with most of the participants being first-year students (75%). Participants’ mean age was 28.09, with a median age of 23 and a standard deviation of 11.2, which is somewhat higher than the traditional college age. This may be attributed to the years of voluntary work that members of this church complete during their early adulthood.

Measures
Our survey examined several constructs, including EAs, EBs, ECs, appreciative outdoor activities, exercise, diet quality, and affective/emotional/cognitive health (see Appendix for all survey items). Following the informed consent, participants were entered into a gift card drawing and were given course credit. To see all reliability coefficients for the measures, refer to Table 1.

Environmental Attitudes, Behaviors, and Concerns
We used six items to assess participants’ EAs. Examples of items used are, “We worry too much about the future of the environment, and not enough about prices and jobs today” and “I have a moral obligation to care for the environment.” The six items were on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree; Hunter & Toney, 2005). Seventeen items were included in the questionnaire to determine EBs measured as the willingness to change behavior for the environment. Examples of items used to determine EBs include, “How willing are you to recycle?” and “How willing are you to buy products made from recycled products?” These 17 items utilized a 7-point Likert scale from 1 (very unwilling) to 7 (very willing; Hunter & Toney, 2005). Thirteen items in the questionnaire determined ECs. Examples of items used to determine ECs include, “How concerned are you about natural resource depletion?” and “How concerned are you with loss of biodiversity?” These 13 items utilized a 7-point Likert scale from 1 (very not concerned) to 7 (very concerned; author-generated). Mean scores were calculated for EAs, EBs, and ECs.

Outdoor Behaviors
Outdoor recreation activities were assessed using a 5-point frequency scale from 1 (never) to 5 (very often; author-generated) created for this study. Seven applicable behaviors were identified based on informal conversations with students. Participants reported the frequency in which they visited or engaged in each of the following activities: national parks, national monuments, state parks, picnic outdoors, hiking in the mountains or other outdoor locations, sightseeing among natural formations,
sceneries, or overlooks, boating on a natural or manmade lake, ocean, or other body of water. Ten items were created to assess hunting and fishing attitudes based on informal conversations with students. To improve the validity of these scales, four reverse-scored items were included. Ten items were used to assess participants’ attitudes toward hunting and fishing. These items utilized a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree; author-generated), with an average score created for hunting and fishing. Examples of items on this scale are: “Hunting is a human practice that helps protect the environment” and “Fishing is more detrimental to the environment than beneficial to humans.” Similar to outdoor recreation, we created a scale of six items to represent gardening attitudes based on informal conversations with students. Attitudes toward gardening and willingness to garden were measured using six items on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree; author-generated). Examples of gardening items are: “I am willing to grow my own food in a home garden” and “I think that growing my own food in a garden is good for my mental health.”

### TABLE 1

Correlation Matrix for Study Variables

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (SD)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>1. Environmental Attitudes</td>
<td>4.70 (0.81)</td>
<td>.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Environmental Behaviors</td>
<td>5.17 (0.82)</td>
<td>.56***</td>
<td>.88</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Environmental Concern</td>
<td>4.85 (1.10)</td>
<td>.49***</td>
<td>.62***</td>
<td>.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Cook Not-Microwave</td>
<td>57.70 (42.97)</td>
<td>.10</td>
<td>.19***</td>
<td>.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Cook Microwave</td>
<td>33.76 (37.77)</td>
<td>.06</td>
<td>.02</td>
<td>.44***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Fast Food</td>
<td>0.16 (0.23)</td>
<td>.04</td>
<td>.09</td>
<td>.08</td>
<td>.11</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Fruits</td>
<td>1.27 (1.15)</td>
<td>.16***</td>
<td>.24***</td>
<td>.16***</td>
<td>.17***</td>
<td>.06</td>
<td>.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Exercise Behaviors</td>
<td>31.93 (28.15)</td>
<td>.10</td>
<td>.11</td>
<td>.02</td>
<td>.07</td>
<td>.06</td>
<td>.19***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Sugary Drinks</td>
<td>0.45 (0.79)</td>
<td>.01</td>
<td>.10</td>
<td>.04</td>
<td>.05</td>
<td>.03</td>
<td>.35***</td>
<td>.08</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Vegetables</td>
<td>1.41 (1.25)</td>
<td>.18</td>
<td>.28***</td>
<td>.11</td>
<td>.28***</td>
<td>.08</td>
<td>.14***</td>
<td>.69***</td>
<td>.24***</td>
<td>.13***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Whole Grains</td>
<td>1.34 (1.16)</td>
<td>.16***</td>
<td>.18***</td>
<td>.10</td>
<td>.12***</td>
<td>.03</td>
<td>.08</td>
<td>.55***</td>
<td>.15***</td>
<td>.01</td>
<td>.47***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Gardening</td>
<td>5.52 (1.30)</td>
<td>.22***</td>
<td>.37***</td>
<td>.24***</td>
<td>.21***</td>
<td>.04</td>
<td>.12</td>
<td>.16***</td>
<td>.12***</td>
<td>.08</td>
<td>.23***</td>
<td>.16***</td>
<td>.93</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Hunting/Fishing Attitudes</td>
<td>4.69 (1.18)</td>
<td>.15***</td>
<td>.28***</td>
<td>.32***</td>
<td>.02</td>
<td>.00</td>
<td>.04</td>
<td>.01</td>
<td>.11***</td>
<td>.06</td>
<td>.02</td>
<td>.03</td>
<td>.07</td>
<td>.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. National Park/ Monument Behaviors</td>
<td>9.59 (9.60)</td>
<td>.16***</td>
<td>.16***</td>
<td>.04</td>
<td>.14***</td>
<td>.02</td>
<td>.09</td>
<td>.14***</td>
<td>.11***</td>
<td>.07</td>
<td>.22***</td>
<td>.07</td>
<td>.13***</td>
<td>.17***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. National Park/ Monument Attitudes</td>
<td>5.60 (1.06)</td>
<td>.31***</td>
<td>.44***</td>
<td>.59***</td>
<td>.06</td>
<td>.00</td>
<td>.09</td>
<td>.08</td>
<td>.02</td>
<td>.10***</td>
<td>.09***</td>
<td>.17***</td>
<td>.15***</td>
<td>.07</td>
<td>.90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Recreation Frequency</td>
<td>2.69 (0.62)</td>
<td>.11***</td>
<td>.02</td>
<td>.01</td>
<td>.00</td>
<td>.00</td>
<td>.01</td>
<td>.08</td>
<td>.21***</td>
<td>.03</td>
<td>.10***</td>
<td>.10***</td>
<td>.06</td>
<td>.23***</td>
<td>.16***</td>
<td>.04</td>
<td>.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Anxiety</td>
<td>2.87 (0.76)</td>
<td>.05</td>
<td>.02</td>
<td>.13***</td>
<td>.12***</td>
<td>.00</td>
<td>.07</td>
<td>.12***</td>
<td>.12***</td>
<td>.13***</td>
<td>.17***</td>
<td>.06</td>
<td>.08</td>
<td>.14***</td>
<td>.05</td>
<td>.12***</td>
<td>.11***</td>
<td>.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Depressive Symptoms</td>
<td>9.08 (3.39)</td>
<td>.02</td>
<td>.00</td>
<td>.12</td>
<td>.05</td>
<td>.00</td>
<td>.11***</td>
<td>.12***</td>
<td>.09***</td>
<td>.07</td>
<td>.11***</td>
<td>.09***</td>
<td>.02</td>
<td>.11***</td>
<td>.02</td>
<td>.10</td>
<td>.04</td>
<td>.62***</td>
<td>.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Negative Affect</td>
<td>2.62 (0.80)</td>
<td>.15***</td>
<td>.11***</td>
<td>.03</td>
<td>.11***</td>
<td>.02</td>
<td>.15***</td>
<td>.18***</td>
<td>.08</td>
<td>.15***</td>
<td>.22***</td>
<td>.09***</td>
<td>.14***</td>
<td>.08</td>
<td>.11***</td>
<td>.08</td>
<td>.07</td>
<td>.66***</td>
<td>.60***</td>
<td>.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Positive Affect</td>
<td>3.33 (0.67)</td>
<td>.09***</td>
<td>.02</td>
<td>.06</td>
<td>.08***</td>
<td>.02</td>
<td>.10***</td>
<td>.17***</td>
<td>.15***</td>
<td>.07</td>
<td>.15***</td>
<td>.12***</td>
<td>.10***</td>
<td>.12***</td>
<td>.04</td>
<td>.01</td>
<td>.14***</td>
<td>.55***</td>
<td>.49***</td>
<td>.35***</td>
<td>.63</td>
<td></td>
</tr>
<tr>
<td>21. Perceived Stress</td>
<td>2.64 (0.72)</td>
<td>.09***</td>
<td>.02</td>
<td>.15***</td>
<td>.11***</td>
<td>.03</td>
<td>.10***</td>
<td>.15***</td>
<td>.17***</td>
<td>.10</td>
<td>.20***</td>
<td>.14***</td>
<td>.10</td>
<td>.17***</td>
<td>.07</td>
<td>.10***</td>
<td>.15***</td>
<td>.72***</td>
<td>.62***</td>
<td>.50***</td>
<td>.57***</td>
<td></td>
</tr>
<tr>
<td>22. Life Satisfaction</td>
<td>4.76 (1.35)</td>
<td>.10</td>
<td>.09</td>
<td>.10</td>
<td>.11***</td>
<td>.01</td>
<td>.09</td>
<td>.14***</td>
<td>.10</td>
<td>.09***</td>
<td>.15***</td>
<td>.13***</td>
<td>.13***</td>
<td>.18***</td>
<td>.11***</td>
<td>.04</td>
<td>.16***</td>
<td>.49***</td>
<td>.49***</td>
<td>.43***</td>
<td>.51***</td>
<td>.58***</td>
</tr>
</tbody>
</table>

Note: Cronbach’s alpha internal consistency estimates appear in parentheses along the diagonal.

*p < .05; **p < .01; ***p < .001.
Well-Being, Outdoors, and Environmentalism | Pires-Gifford, Hoffmann, Arroyo, Jones, Waite, and Wright

health.” Five items were used to assess participants’ attitudes toward national parks and monuments. These items were included alongside Hunter and Toney’s (2015) measure to represent student attitudes toward national parks and monuments. They utilized a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree; author-generated), and an average score was created for attitudes toward national parks and monuments. Examples of national park and monument items are (a) “National parks (e.g., Grand Canyon, Yellowstone, Yosemite) are important to preserving the environment” and (b) “We should do more to protect the natural environment by creating more protected areas (e.g., national parks, state parks, national monuments).” Participants were asked to select which national parks and monuments they had previously visited out of a list of 60 national parks and 101 national monuments that were established at the time of data collection.

Health Behaviors
Participants were asked to indicate, in minutes from 0–200, how much time they spent each day on average on each of the following to determine eating and cooking practices: “Cooking your own food including meal preparation and using a stovetop range, toaster oven, toaster, and/or oven but NOT a microwave” and “Cooking your own food including meal preparation and using a microwave to heat up your food.” It is important to note that, given the requirements for students to live in approved campus housing, we assumed that all apartments had a microwave per compliance with the university regulations. Other items were used to determine how often participants consumed various types of food on a 10-point scale from 1 (never) to 10 (5 or more times per day), including drinks with added sugar, fast food, fruits, vegetables, and whole grains (Wright et al., 2017). Exercise behaviors were assessed using a 6-item scale in which participants were asked to report how much time they spent engaging in different forms of exercise during the previous week. Items were scored on a 5-point scale (1 = none, 2 = less than 30 min/week, 3 = 30–60 min/week, 4 = 1–3 hr/week, 5 = more than 3 hr/week; Lorig et al., 1996).

Mental Health
Participants’ moods were assessed using an 8-item measure on a 5-point scale from 1 (not at all) to 5 (extremely; Wright et al., 2017). Participants reported how much each of the items listed was representative of their mood during the previous month. The mood items were divided into positive (i.e., happy, alert, enthusiastic, relaxed) and negative (i.e., sad, irritable, bored, nervous) categories. Each category was summarized into an average positive-mood and negative-mood score. Depressive symptoms were assessed using the 5-item Center for Epidemiologic Studies Depression Scale (Bohannon et al., 2003) containing items on a 4-point occurrence scale from 1 (rarely or none of the time) to 4 (most or all of the time). Participants reported the frequency in which they experienced anxiety-related feelings during the previous month using a 4-item measure on a 5-point frequency scale from 1 (never) to 5 (very often) from Butz and Yogeewaran (2011). Satisfaction with life was measured using the Satisfaction With Life Scale (Diener et al., 1985), including five items on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). Perceived stress was assessed using the Perceived Stress Scale (Cohen et al., 1983), including seven items on a 5-point frequency scale from 1 (never) to 5 (very often).

Data Analysis
All quantitative data analyses were conducted using the open-source statistical software JASP version

<p>| TABLE 2 |
| Environmental Attitudes Bivariate Regression Results |</p>
<table>
<thead>
<tr>
<th>(Constant)</th>
<th>R²</th>
<th>Adj R²</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. National Park/Monument Behavior</td>
<td>.03</td>
<td>.03</td>
<td>.16</td>
<td>4.03</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>2. Hunting/Fishing Attitudes</td>
<td>.02</td>
<td>.02</td>
<td>−.15</td>
<td>−3.62</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>3. Recreation Frequency</td>
<td>.01</td>
<td>.01</td>
<td>.11</td>
<td>2.67</td>
<td>.01</td>
</tr>
<tr>
<td>4. National Park/Monument Attitudes</td>
<td>.10</td>
<td>.10</td>
<td>.31</td>
<td>8.09</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>5. Gardening</td>
<td>.05</td>
<td>.05</td>
<td>.22</td>
<td>5.51</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>6. Fast Food</td>
<td>.00</td>
<td>.00</td>
<td>−.04</td>
<td>−0.97</td>
<td>.33</td>
</tr>
<tr>
<td>7. Fruits</td>
<td>.03</td>
<td>.03</td>
<td>.16</td>
<td>4.04</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>8. Sugary Drinks</td>
<td>.00</td>
<td>.00</td>
<td>.01</td>
<td>0.23</td>
<td>.82</td>
</tr>
<tr>
<td>9. Vegetables</td>
<td>.03</td>
<td>.03</td>
<td>.18</td>
<td>4.39</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>10. Whole Grains</td>
<td>.02</td>
<td>.02</td>
<td>.16</td>
<td>3.86</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>11. Cook Not-Microwave</td>
<td>.01</td>
<td>.01</td>
<td>.10</td>
<td>2.53</td>
<td>.01</td>
</tr>
<tr>
<td>12. Cook Microwave</td>
<td>.00</td>
<td>.00</td>
<td>−.06</td>
<td>−1.57</td>
<td>.12</td>
</tr>
<tr>
<td>13. Exercise Behaviors</td>
<td>.01</td>
<td>.01</td>
<td>.10</td>
<td>2.39</td>
<td>.02</td>
</tr>
<tr>
<td>14. Anxiety</td>
<td>.00</td>
<td>.00</td>
<td>−.05</td>
<td>−1.26</td>
<td>.21</td>
</tr>
<tr>
<td>15. Depressive Symptoms</td>
<td>.00</td>
<td>.00</td>
<td>−.02</td>
<td>−0.47</td>
<td>.64</td>
</tr>
<tr>
<td>16. Negative Affect</td>
<td>.02</td>
<td>.02</td>
<td>−.15</td>
<td>−3.79</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>17. Positive Affect</td>
<td>.01</td>
<td>.01</td>
<td>.09</td>
<td>2.25</td>
<td>.03</td>
</tr>
<tr>
<td>18. Perceived Stress</td>
<td>.01</td>
<td>.01</td>
<td>−.09</td>
<td>−2.15</td>
<td>.03</td>
</tr>
<tr>
<td>19. Life Satisfaction</td>
<td>.01</td>
<td>.01</td>
<td>.10</td>
<td>2.33</td>
<td>.02</td>
</tr>
</tbody>
</table>
Correlations and simple linear regressions were computed for all variables using EAs, EBs, and ECs as the predicted outcomes. A stepwise multivariable regression analysis was used to establish the link between the previously mentioned factors to EAs, EBs, and ECs. All variables were examined in all models, and only those with a p value < .05 were retained within the analysis. Nonsignificant variables were not included in the stepwise tables. Four multivariable models were developed for each dependent variable. The first model included all of the predictor variables in the study. The second model included only the outdoor behaviors variables. The third model included health behavior variables, and the fourth model included only mental health variables. Adjusted R² was used to determine the amount of variance accounted for by the models.

**Results**

Means, standard deviations, correlations between study variables, and reliability coefficients of the measures are reported in Table 1. The bivariate regression analysis showed that national park/monument attitudes, gardening attitudes, and fruit intake were statistically significant predictors of EAs (see Tables 1 and 2), EBs (see Tables 3 and 4), and ECs (see Tables 5 and 6). Hunting/fishing attitudes were also significant predictors of all three outcome variables (p < .001), showing a negative relationship with each of them. Fruit, vegetable, and whole-grain intake, cooking without a microwave, and life satisfaction showed significant and positive relationships with EAs, EBs, and ECs. Interestingly, cooking with a microwave did not show significant relationships with any of the outcome variables.

**Environmental Attitudes**

Frequent or extensive national park/monument attendance, outdoor recreation frequency, exercise behaviors, and positive affect showed significant positive relationships to EAs. In contrast, negative affect and perceived stress had negative and significant relationships with EAs (Table 2). The stepwise analysis showed that national park/monument attitudes and attendance, gardening, hunting/fishing attitudes, and whole-grain consumption were the best and most significant predictors of EAs. Together, they accounted for 20% of the variation in EAs (see Table 3, Model 1). Both the negative affect and hunting/fishing variables showed negative relationships to EAs. Consistent with our hypothesis, outdoor behaviors were significant predictors of EAs (see Table 3, Model 2), suggesting that interacting with nature was related to more pro-EAs.

**Willingness to Change Behavior for the Environment**

National park/monument attendance and exercise behaviors showed positive and significant relationships with EBs, while the intake of fast food, sugary drinks, and negative affect showed significant negative relationships (see Table 4). The stepwise analysis showed that national park/monument attitudes and attendance, gardening, hunting/fishing attitudes, vegetable intake, and life satisfaction were the strongest significant predictors of EBs, together accounting for 39% of the variation in EBs (see Table 5, Model 1). The hunting/fishing variable showed a negative relationship to EBs. Consistent with our hypothesis, outdoor behaviors were significant predictors of EBs (see Table 5, Model 2), suggesting that interacting with nature was related to a higher willingness to engage in pro-EBs (see Table 5, Model 2).

<table>
<thead>
<tr>
<th>TABLE 3: Environmental Attitudes Stepwise Regression Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(Constant)</strong></td>
</tr>
<tr>
<td>National Park/Monument Attitudes</td>
</tr>
<tr>
<td>Gardening</td>
</tr>
<tr>
<td>Hunting/Fishing Attitudes</td>
</tr>
<tr>
<td>Negative Affect</td>
</tr>
<tr>
<td>Recreation Frequency</td>
</tr>
<tr>
<td>National Park/Monument Behavior</td>
</tr>
<tr>
<td>Whole Grains</td>
</tr>
<tr>
<td>Outdoor Behaviors</td>
</tr>
<tr>
<td>National Park/Monument Attitudes</td>
</tr>
<tr>
<td>Gardening</td>
</tr>
<tr>
<td>National Park/Monument Behavior</td>
</tr>
<tr>
<td>Hunting/Fishing Attitudes</td>
</tr>
<tr>
<td>Recreation Frequency</td>
</tr>
<tr>
<td>Health Behaviors</td>
</tr>
<tr>
<td>Vegetables</td>
</tr>
<tr>
<td>Whole Grains</td>
</tr>
<tr>
<td>Mental Health</td>
</tr>
<tr>
<td>Negative Affect</td>
</tr>
<tr>
<td>Depressive Symptoms</td>
</tr>
<tr>
<td>Positive Affect</td>
</tr>
</tbody>
</table>
Well-Being, Outdoors, and Environmentalism | Pires-Gifford, Hoffmann, Arroyo, Jones, Waite, and Wright

**Concern for Environment**
Anxiety, depressive symptoms, perceived stress, life satisfaction, and fast-food intake showed significant relationships with ECs, with life satisfaction having a negative relationship (see Table 6). The stepwise analysis showed that national park/monument attitudes, hunting/fishing attitudes, gardening, fruit intake, perceived stress, and fast food were the best and most significant predictors of ECs, together accounting for 44% of the variation in ECs (see Table 7, Model 1). Negative affect and hunting/fishing variables both showed negative relationships to ECs. Consistent with our hypothesis, outdoor behaviors were significant predictors of ECs (see Table 7, Model 2), suggesting that interacting with nature was related to higher levels of concern for the environment (see Table 7, Model 2).

**Discussion**
There is a shortage of information regarding EAs, EBs, and ECs among members of the Church of Jesus Christ of Latter-day Saints within the current research literature. With a consistent growth rate of membership within this religion (Mormon R, n.d.), explaining the EAs, EBs, and ECs becomes important for understanding this growing demographic. We aimed to provide this information by examining the effects of students’ health behaviors, mental health, and frequency of outdoor recreational activities on their EAs, EBs, and ECs. The results presented here corroborate the current literature in many aspects, such as how the intake of fruits, vegetables, and whole grains is positively correlated with EAs, EBs, and ECs. Similar to prior literature, this study also shows that outdoor recreational activities explain an individual’s EAs, EBs, and ECs. Activities such as hunting and fishing were associated with lower reported EAs, EBs, and ECs, whereas a higher frequency of visits to national parks and monuments was associated with higher EAs and EBs. Surprisingly, there is a significant relationship between nonmicrowave cooking and EAs, EBs, and ECs, but microwave cooking did not show statistically significant relationships with EAs, EBs, and ECs.

EAs have a strong relationship with a high-quality diet, specifically concerning the intake of fruits, vegetables, and whole grains and cooking primarily without a microwave. We speculate that this may be due to a possible relationship between pro-EAs and food sustainability, as shown in prior research (Scalvedi et al., 2018). These factors are also correlated with negative affect and life satisfaction. This aligns with the findings of Netuveli and Watts (2020), who stated that people living in households that held more environmentally friendly attitudes reported higher levels of life satisfaction and overall better mental health. Our study shows a strong negative correlation between EAs and negative affect, further corroborating their findings. However, they found that personal EAs did not relate to better mental health. In contrast, our study shows a relationship between individual EAs and lower levels of negative affect with high life satisfaction. Netuveli and Watts (2020) did not look at EAs and ECs as separate variables. By approaching EAs and ECs separately, one can see the relationship between EAs and mental health without having ECs as a confounding variable.

Increased EBs have a strong correlation with a high-quality diet and a moderate correlation with exercise behaviors, low negative affect, and high life satisfaction. Additionally, our findings indicate that religious students are more likely to engage in pro-EBs on average, contrary to the findings of Hunter and Toney (2005). A possible explanation for this discrepancy could be differences in the focus of the community. Our study took place in

---

**TABLE 4**
Willingness to Change Behavior for Environment Bivariate Regression Results

<table>
<thead>
<tr>
<th>(Constant)</th>
<th>R²</th>
<th>Adj R²</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. National Park/Monument Behavior</td>
<td>.03</td>
<td>.03</td>
<td>.16</td>
<td>4.07</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>2. Hunting/Fishing Attitudes</td>
<td>.08</td>
<td>.08</td>
<td>-.28</td>
<td>-7.15</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>3. Recreation Frequency</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>1.00</td>
</tr>
<tr>
<td>4. National Park/Monument Attitudes</td>
<td>.19</td>
<td>.19</td>
<td>.44</td>
<td>11.89</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>5. Gardening</td>
<td>.13</td>
<td>.13</td>
<td>.37</td>
<td>9.58</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>6. Fast Food</td>
<td>.01</td>
<td>.01</td>
<td>-.09</td>
<td>-2.18</td>
<td>.03</td>
</tr>
<tr>
<td>7. Fruits</td>
<td>.06</td>
<td>.06</td>
<td>.24</td>
<td>6.05</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>8. Sugary Drinks</td>
<td>.01</td>
<td>.01</td>
<td>-.10</td>
<td>-2.45</td>
<td>.01</td>
</tr>
<tr>
<td>9. Vegetables</td>
<td>.08</td>
<td>.07</td>
<td>.28</td>
<td>6.99</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>10. Whole Grains</td>
<td>.03</td>
<td>.03</td>
<td>.18</td>
<td>4.33</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>11. Cook Not-Microwave</td>
<td>.04</td>
<td>.04</td>
<td>.19</td>
<td>4.77</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>12. Cook Microwave</td>
<td>.00</td>
<td>.00</td>
<td>-.02</td>
<td>-.40</td>
<td>.69</td>
</tr>
<tr>
<td>13. Exercise Behaviors</td>
<td>.01</td>
<td>.01</td>
<td>.11</td>
<td>2.60</td>
<td>.01</td>
</tr>
<tr>
<td>14. Anxiety</td>
<td>.00</td>
<td>.00</td>
<td>-.02</td>
<td>-.47</td>
<td>.64</td>
</tr>
<tr>
<td>15. Depressive Symptoms</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.11</td>
<td>.91</td>
</tr>
<tr>
<td>16. Negative Affect</td>
<td>.01</td>
<td>.01</td>
<td>-.11</td>
<td>-2.69</td>
<td>.01</td>
</tr>
<tr>
<td>17. Positive Affect</td>
<td>.00</td>
<td>.00</td>
<td>.02</td>
<td>.54</td>
<td>.59</td>
</tr>
<tr>
<td>18. Perceived Stress</td>
<td>.00</td>
<td>.00</td>
<td>-.02</td>
<td>-.38</td>
<td>.70</td>
</tr>
<tr>
<td>19. Life Satisfaction</td>
<td>.01</td>
<td>.01</td>
<td>.09</td>
<td>2.26</td>
<td>.024</td>
</tr>
</tbody>
</table>
an area surrounded by national parks and locations to engage in outdoor recreational activities. While Cache County, referred to in Hunter and Toney’s (2005) study, is also located near several national parks, our study is in a smaller, more rural city and less industrialized than Cache County. This is likely to impact how accessible and nearby outdoor recreational areas are. The local norms of the community are heavily influenced by the beliefs of The Church of Jesus Christ of Latter-day Saints. These norms and the geographical location and setting may promote EBs more than the community included in Hunter and Toney’s (2005) study, whose norms may not be as heavily influenced by a singular religion. Another possible explanation for this difference could be that our study includes a larger number of individuals who feel that it is their responsibility to engage in EBs. When individuals perceive it is their responsibility to protect and preserve the environment, they are more likely to engage in EBs (Syropoulos & Markowitz, 2021). Hunter and Toney (2005) speculated that obligations might have already met; therefore, there was no longer a need to engage in more EBs. Our sample may include more individuals who feel it is their responsibility to engage in more EBs, which would account for the increased likelihood of engaging in pro-EBs. Alternatively, this may be due to changing environmental attitudes in the general population, such as an increased emphasis on “green” energy and transportation in recent years. Finally, it is also possible that participants are responding in a socially desirable manner and reporting higher levels of behavioral intentions than they actually possess.

Lastly, ECs had similar findings regarding diet quality, with other results showing that individuals high in ECs would experience more negative affect, such as anxiety and symptoms of depression. These findings fit in well with the study done by Netuveli and Watts (2020), who speculated that it might be due to concern regarding climate change. With much general concern worldwide regarding sustainability and impending climate change, it makes sense that individuals high in ECs would feel more negative affect, such as anxiety and depressive symptoms.

**Implications**

Our analysis provides evidence of the relationship between outdoor behaviors and EAs, EBs, and ECs. It is, therefore, essential to consider the bidirectional relationship between exposure to nature

---

**TABLE 5**

| Willingness to Change Behavior for Environment Stepwise Regression Results |
|---------------------------------|---|---|---|---|
| (Constant) | $R^2$ | $\text{Adj } R^2$ | $\beta$ | $t$ | $p$ |
| 1. National Park/Monument Attitudes | .39 | .39 | .33 | 10.04 | <.001 |
| Gardening | .27 | 7.96 | <.001 |
| Hunting/Fishing Attitudes | −.29 | −8.56 | <.001 |
| Vegetables | .15 | 4.49 | <.001 |
| National Park/Monument Behavior | .11 | 3.26 | .001 |
| Life Satisfaction | .09 | 2.57 | .01 |
| 2. Outdoor Behaviors | | | | | |
| National Park/Monument Attitudes | .36 | .36 | .33 | 9.89 | <.001 |
| Gardening | .31 | 9.21 | <.001 |
| Hunting/Fishing Attitudes | −.28 | −8.18 | <.001 |
| National Park/Monument Behavior | .15 | 4.34 | <.001 |
| 3. Health Behaviors | | | | | |
| Vegetables | .09 | .09 | .24 | 5.91 | <.001 |
| Cook Not-Microwave | .13 | 3.06 | .002 |
| 4. Mental Health | | | | | |
| Negative Affect | .03 | .02 | −.16 | −3.05 | .002 |
| Depressive Symptoms | .15 | 2.76 | .01 |
| Life Satisfaction | .10 | 2.10 | .04 |

**TABLE 6**

| Concern for Environment Bivariate Regression Results |
|---------------------------------|---|---|---|---|
| (Constant) | $R^2$ | $\text{Adj } R^2$ | $\beta$ | $t$ | $p$ |
| 1. National Park/Monument Behavior | .00 | .00 | .04 | 0.93 | .35 |
| Hunting/Fishing Attitudes | .10 | .10 | −.32 | −8.19 | <.001 |
| Recreation Frequency | .00 | .00 | −.01 | −0.34 | .73 |
| 4. National Park/Monument Attitudes | .34 | .34 | .59 | 17.68 | <.001 |
| Gardening | .06 | .05 | .24 | 0.60 | <.001 |
| 6. Fast Food | .01 | .01 | .08 | 2.01 | .04 |
| 7. Fruits | .03 | .02 | .16 | 3.91 | <.001 |
| 8. Sugary Drinks | .00 | .00 | .04 | 0.95 | .34 |
| 9. Vegetables | .01 | .01 | .11 | 2.81 | .01 |
| 10. Whole Grains | .01 | .01 | .10 | 2.34 | .02 |
| 11. Cook Not-Microwave | .01 | .01 | .11 | 2.80 | .005 |
| 12. Cook Microwave | .00 | .00 | .01 | 0.29 | .77 |
| 13. Exercise Behaviors | .00 | .00 | .02 | 0.46 | .64 |
| 14. Anxiety | .02 | .02 | .13 | 3.20 | .001 |
| 15. Depressive Symptoms | .02 | .01 | .12 | 3.06 | .002 |
| 16. Negative Affect | .00 | .00 | .03 | 0.83 | .41 |
| 17. Positive Affect | .00 | .00 | −.06 | −1.57 | .12 |
| 18. Perceived Stress | .02 | .02 | .15 | 3.68 | <.001 |
| 19. Life Satisfaction | .01 | .01 | −.10 | −2.54 | .01 |
and willingness to change behavior and attitudes toward the environment. If the desire is to motivate people to care more about the environment and worry about its preservation, it seems that exposure to and interacting with nature in outdoor activities is an excellent place to start (Dunlap & Heffernan, 1975; Teisl & O’Brien, 2003). Greater calls to action for caring for the environment or cleaning heavily polluted areas would be imperative to enable outdoor recreation to occur, in turn relating to caring more about the protection of the environment. Our results also corroborate the literature on the relationship between diet quality and EAs, EBs, and ECs. Intake of fruits and vegetables was among the strongest predictors. Meal preparations that do not include the use of a microwave imply a higher quality diet. This may be due to the more frequent consumption of fruits, vegetables, and whole grains, as we saw a strong positive correlation between all these variables.

Individuals who reported higher levels of negative affect also showed higher levels of negative EAs and lower willingness to engage in EBs. This suggests that individuals experiencing more negative moods seem to have more negative feelings regarding the environment. However, positive affect was correlated with EAs but not with EBs or ECs. This is evidence that people with a more positive mood overall have a better attitude about the environment but are not likely to act on those attitudes or be concerned about the environment.

Individuals who scored higher on the hunting/fishing scale (e.g., enjoy hunting or fishing, believe that the activities help protect the environment, manage animal populations responsibly, or are more detrimental to the environment than beneficial to humans) reported overall more negative EAs, EBs, and ECs. These findings corroborate the current literature regarding the difference between consumptive and appreciative outdoor activities (Dunlap & Heffernan, 1975; Teisl & O’Brien, 2003). Individuals who demonstrated prohunting/fishing attitudes, which suggest taking something away from nature, have different EAs, EBs, and ECs than those who reported more appreciative interactions with nature.

**Potential Limitations and Future Research**

One possible limitation of our study is the potentially narrow generalizability due to its specific population. In addition, the self-reported measures used could be misleading due to participants’ tendency to present themselves in a perceived positive manner. It is also important to note another possible limitation in that four of our variables had Cronbach’s alpha scores of α < .70 (see Table 1, e.g., Environmental Attitudes: α = .66; Recreation Frequency: α = .66). Finally, this study was conducted geographically close to multiple national parks and other outdoor recreational activity centers so that, with these resources readily available, students’ attendance and interaction with nature might differ from those observed in other locations. Future research should explore these differences and consider how students from other similar universities (e.g., BYU-Provo) and religiously oriented universities (e.g., Gonzaga University) differ in these characteristics. Our survey was a convenience sample taken from students attending Brigham Young University-Idaho. While this does give us great insight into students at this university who are religious, once again, our study may not be generalizable to students attending other schools or to a more general population.

Future research should look at the direct correlation between nonmicrowave cooking and the level of EAs, EBs, and ECs. Because nonmicrowave cooking implied a healthier diet and was a statistically significant predictor of all three outcome variables, further research should be done to see the possible influence nonmicrowave cooking may have on individuals’ EAs, EBs, and ECs. It may be

### TABLE 7

**Concern for Environment Stepwise Regression Results**

<table>
<thead>
<tr>
<th></th>
<th>R²</th>
<th>Adj R²</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. National Park/Monument Attitudes</td>
<td>.45</td>
<td>.44</td>
<td>.50</td>
<td>15.61</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Hunting/Fishing Attitudes</td>
<td>−.24</td>
<td>−.70</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gardening</td>
<td>.17</td>
<td>5.36</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>.11</td>
<td>3.55</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Stress</td>
<td>.08</td>
<td>2.61</td>
<td>.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fast Food</td>
<td>.07</td>
<td>2.36</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Outdoor Behaviors</td>
<td>.43</td>
<td>.42</td>
<td>.52</td>
<td>16.29</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>National Park/Monument Attitudes</td>
<td>.43</td>
<td>.42</td>
<td>.52</td>
<td>16.29</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Hunting/Fishing Attitudes</td>
<td>−.25</td>
<td>−.96</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gardening</td>
<td>.17</td>
<td>5.32</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Health Behaviors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>.05</td>
<td>.04</td>
<td>.15</td>
<td>3.76</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Fast Food</td>
<td>.11</td>
<td>2.74</td>
<td>.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cook Not-Microwave</td>
<td>.10</td>
<td>2.45</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Mental Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Stress</td>
<td>.02</td>
<td>.02</td>
<td>.15</td>
<td>3.68</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
worthwhile to examine geographic location in relation to EAs, EBs, and ECs; proximity to outdoor recreation areas or accessibility to higher quality diet foods may impact these factors. The current study did not focus on demographic variables predicting the outcomes. Still, future research should explore the relationship between ethnicity, age, socioeconomic status, gender, subjective health (Wright, Perkes, et al., 2018), and technology use (Wright, et al., 2020), which may impact student attitudes toward the environment. Future research may also benefit from examining whether there is a direct relationship from EAs to EBs, or vice versa. The main distinction between the predictor variables for EAs, EBs, and ECs was mental health. Perceived stress, depressive symptoms, and anxiety symptoms only significantly predicted ECs, not EAs or EBs. These differences should be further explored in future research. Our study showed that higher ECs correlate to reported higher depressive symptoms, anxiety symptoms, perceived stress, and lower life satisfaction, similar to prior research (Netuveli & Watts, 2020). Future research should also investigate possible correlations between attitudes about climate change and negative affect.

We hope that this research might shed more light on the factors that influence environmentalism. By knowing what these factors are, action can be directed toward implementing pro-environment behavioral changes, thus leading to a greater sense of environmental stewardship within groups and communities.

**References**

- https://doi.org/10.1027/015277752/jpa4901_13
- JASP Team. JASP (Version 0.12) [Computer software]. 2020. https://jaspstats.org/

https://doi.org/10.1080/07448480903295292


https://doi.org/10.1007/s11136-019-02162-4

Author Note. Laura Pires-Gifford  @
https://orcid.org/0000-0002-0471-7143

Shaylee Hoffmann  @
https://orcid.org/0000-0001-6601-7938

Edmond Arroyo  @ https://orcid.org/0000-0002-8270-3476

Nathan Jones  @ https://orcid.org/0000-0001-6177-7161

Bethany Waite  @ https://orcid.org/0000-0001-6042-0603

Robert R. Wright  @ https://orcid.org/0000-0002-4101-784

Nathan Jones is now at the Department of Education at Kansas University in Lawrence, Kansas.

All research was completed by undergraduate students attending Brigham Young University-Idaho. This research was supported by internal funding from Brigham Young University-Idaho for student and faculty-directed research. As such, we declare a potential conflict of interest given the latter funding source.

Correspondence concerning this article should be addressed to Laura Pires-Gifford, Department of Psychology, Brigham Young University-Idaho, 210 West 4th South, MS2140 Rexburg, ID 83460, United States. Email: laurastafussi@outlook.com
Lysergic Acid Diethylamide Produces Anxiogenic Effects in the Rat Light/Dark Test and Elevated Plus Maze

Catherine N. Conway and Lisa E. Baker
Department of Psychology, Western Michigan University

ABSTRACT. Recent clinical trials indicate favorable therapeutic outcomes of psychedelic-assisted psychotherapy for anxiety and treatment-resistant depression. Whereas the neurobiological systems underlying these effects are not well understood, animal behavioral models can serve to investigate these mechanisms. For the current study, we implemented 2 rodent models predictive of anxiolytic drug effects, a light/dark test and an elevated plus maze (EPM), to investigate the acute and subchronic effects of LSD, respectively. Forty-eight, adult male Sprague-Dawley rats were randomly assigned to receive LSD (0.00, 0.02, 0.04, 0.08 mg/kg) and assessed in the light/dark test 15 min after the first injection. Five additional injections were given, once every 48 hours, after which rats were assessed in the EPM either 48 (n = 24) or 72 hours (n = 24) after the last injection. A dose-dependent and statistically significant decrease was observed in number of entries into, \( F(3, 44) = 12.79, p < .001, \eta^2 = .47 \), and time spent, \( F(3, 48) = 14.15, p < .001, \eta_p^2 = .47 \), in the brightly lit compartment. In the EPM, closed arm entries, \( F(1, 17) = 28.85, p < .001, \eta_p^2 = .63 \), and time spent in closed arms, \( F(1, 17) = 20.14, p < .001, \eta_p^2 = .99 \), were significantly higher compared to entries or time in open arms by rats assessed 48 hours after the last LSD injection, but not by rats tested 72 hours after the last injection. These findings indicate that acute and subchronic LSD treatment produce transient anxiogenic effects. In consideration of positive therapeutic outcomes of psychedelic-assisted psychotherapy, alternative preclinical models may be warranted to discern the mechanisms underlying the putative therapeutic effects of serotonergic hallucinogens.

Keywords: Lysergic acid diethylamide, elevated plus maze, light/dark test, anxiety, rats

The psychedelic drug, lysergic acid diethylamide (LSD), has been used recreationally since the 1960s. Despite early indications of possible psychotherapeutic effects of various psychedelics (Liechti, 2017), negative public and political views of these substances stagnated clinical research for nearly 50 years. Consequently, controlled clinical investigations were not conducted until recently. For example, a recent investigation by Carhart-Harris et al. (2016) indicated that a single, acute dose of LSD (75 µg) can improve mood and increase cognitive flexibility among healthy participants. Additionally, anecdotal reports of psychedelic use indicate a popular trend in “microdosing” regular-interval use of LSD doses 10 to 20-fold lower than the typical hallucinogenic dose (Anderson et al., 2019; Fadiman & Korb, 2019). These self-reports have consistently indicated that microdosing of hallucinogens improved mood, enhanced sociability, and reduced symptoms of depression and anxiety among users (Johnstad, 2018; Polito & Stevenson, 2019). However, current trends in low-dose administration of psychedelics have been minimally researched. To consider the use of hallucinogens as an alternative therapy for treatment-resistant anxiety and depressive

*Faculty mentor

COPYRIGHT 2022 BY PSI CHI, THE INTERNATIONAL HONOR SOCIETY IN PSYCHOLOGY (VOL. 27, NO. 3/ISSN 2325-7342)
LSD Anxiogenic Effects in Rats | Conway and Baker

disorders, more substantial controlled clinical and preclinical analyses are warranted.

Similar to conventional antidepressant drugs, LSD and other classic hallucinogens exert their actions on brain serotonergic systems (Carhart-Harris & Goodwin, 2017). Specifically, LSD primarily binds to and activates the serotonin (5-HT) receptor subtypes, 5-HT1A and 5-HT2A, both of which are presumed to regulate symptoms associated with the onset of depression (Buchborn et al., 2014). Recent studies also suggest that LSD has a pleiotropic mechanism of action, affecting 5-HT, DA, and glutamatergic receptors (Gregorio et al., 2018). LSD is a partial agonist at 5-HT2A receptors, with its main psychoactive effects thought to be mediated via 5-HT2A receptors (Carhart-Harris & Goodwin, 2017).

Related to LSD’s potentially therapeutic pharmacological mechanisms of action, recent clinical investigations have explored psychedelic-assisted psychotherapy with psilocybin, a hallucinogen with similar actions to LSD. Psychedelic-assisted psychotherapy typically involves drug-free sessions before and after treatment, which aid in acclimating participants to the therapeutic environment and consolidating new information after each session. During treatment, subjects are supervised and assisted by a mental health professional and provided music to listen to while exploring introspective thoughts and memories (Schenberg, 2018). Recent studies have demonstrated clinically significant benefits of psilocybin-assisted psychotherapy among patients suffering from treatment-resistant anxiety and depressive disorders (Carhart-Harris et al., 2018; Griffiths et al., 2016). Furthermore, a report by Dolder et al. (2016) indicated that a single dose of LSD could increase trustfulness, suggestibility, reduce anxiety, and provide substantial mental health benefits during LSD-assisted psychotherapy in healthy volunteers. Carhart-Harris et al. (2016) also investigated the effects of a single, acute dose of LSD (75 μg) among healthy participants. They observed self-reported heightened mood among treatment groups and a lasting effect for at least two weeks. Although these studies provide encouraging results regarding reduced negative emotions and enhanced emotional empathy, the translational aspect of hallucinogens and its effects on negative affect in depressed and anxious populations is yet to be studied systematically in a controlled clinical setting. Therefore, research on the long-term behavioral consequences of LSD use is limited and requires a more substantial characterization before serious considerations can be made for widespread clinical use.

Although the aforementioned findings offer a compelling rationale for the consideration of hallucinogens for treatment-resistant mood disorders, current trends in low-dose administration of these substances have been minimally researched. Moreover, no controlled clinical studies have been implemented on the short and long-lasting outcomes of microdosing. Most published research on these effects have been obtained through online interviews, surveys, or private chats. Although limited research has been conducted using face-to-face participant involvement, a few articles have directly analyzed the acute effects of psychedelic microdosing among human subjects. Specifically, Prochazkova et al. (2018) recently assessed acute effects of ingested psychedelic truffles in an open-labeled setting and found a significant difference in divergent and convergent thinking among participants. In a separate within-subject study, volunteers were given varying low-doses of LSD (0 μg, 6.5 μg, 13 μg, or 26 μg) in one-week intervals (Bershad et al., 2019). Participants completed behavioral tasks and mood questionnaires around peak drug effect, with results indicating dose-related effects among higher LSD doses. Additionally, Bershad et al. (2019) reported a significant increase in reports of anxiety as LSD dose increased, with no effect on depression symptoms. However, participants were healthy volunteers with no previously diagnosed mental disorders, which may explain the lack of anxiolytic effect as compared to other studies involving self-reports.

Despite a resurgence in clinical investigations of the psychotherapeutic effects of hallucinogens, only a few published preclinical studies have evaluated the psychotherapeutic potential of these substances (Cameron et al., 2019; Hibicke et al., 2020; Horsley et al., 2018; Favaro et al., 2015). For example, a recent study conducted by Horsley et al. (2018) evaluated the persistent effects of intermittent microdosing with ketamine (0.5 or 3 mg/kg) or psilocin (0.05 or 0.075 mg/kg) in male rats. Over the course of six days, rats received three injections of one of the aforementioned drugs: ketamine, psilocin, or saline, with the last injection occurring 48 hours before behavioral assessment in an elevated plus maze (EPM). Ketamine (0.05 mg/kg) significantly decreased frequency of entries into the open arms and increased mean distance traveled per visit to the open arms, whereas psilocin (0.05 mg/kg) significantly reduced open arm entries. The main findings suggested that brief,
intermittent treatment with low doses of these substances induced a mild anxiogenic effect.

In a similar investigation, long-term administration of ayahuasca was used to examine memory and anxiety among male rats (Favaro et al., 2015). In that study, rats received daily oral treatments with water or ayahuasca (120 mg/kg, 240 mg/kg, 480 mg/kg) for 30 days and were assessed in the EPM 48 hours after the last treatment. No significant treatment effects were observed. These findings suggested that chronic oral administration of ayahuasca does not induce either anxiogenesis or anxiolysis in this rodent model (Favaro et al., 2015). Another study using the primary psychoactive agent contained within ayahuasca (DMT) evaluated the effects of chronic, intermittent injections on behavior in a battery of assessments predictive of anxiety and depression (Cameron et al., 2019). In this investigation, male and female rats were injected with DMT (1 mg/kg) every third day over an eight-week period. Rodents were assessed at various times over this period in a battery of assays predictive of anxiety. No significant treatment effects were evident in the novelty-induced locomotion or EPM paradigms. However, this drug regimen produced antidepressant-like effects in the forced swim test (Cameron et al., 2019). Collectively, these studies have produced marginally significant and varied results regarding the effects of intermittent psychedelic treatments.

In consideration of the lack of preclinical investigation of LSD’s psychotherapeutic potential, the objective of the current study was to aid in expanding the limited knowledge regarding the behavioral effects of LSD in preclinical models predictive of anxiolytic drug effects. Behavioral assessments predictive of anxiolytic drug action provide an important and necessary component for determining the potential uses of novel substances such as psychedelics. The current study implemented two rodent models predictive of anxiolytic drug effects, a light/dark test and an elevated plus maze (EPM) to assess the potential acute and subchronic behavioral effects of low-dose LSD treatment, respectively. The light/dark box assessment measures anxiety-like behaviors in rodents by using their natural aversion to bright light and novel environments, whereas the EPM evaluates anxiety in rodents by producing an approach-avoidance conflict (Crawley & Goodwin, 1980; Walf & Frye, 2007). It was hypothesized that acute treatment would produce anxiogenic effects, particularly at higher doses (LSD 0.08 mg/kg), and that intermittent treatment with low doses (LSD 0.02 mg/kg) might produce anxiolytic effects.

### Methods

#### Subjects

Forty-eight, adult male Sprague-Dawley rats (Charles River Laboratories, Wilmington, MA, USA), weighing 420 to 600 grams, were used in this study. The rats were housed individually in polycarbonate cages lined with corncob bedding (Harlan Laboratories, Haslett, MI, USA) in animal facilities maintained at a constant temperature (20 ± 2 °C) and humidity (50 ± 5%). In addition, rodents were under a reverse 12:12 light/dark cycle with lights on from 19:00 to 07:00 h. Commercial rodent chow (Purina®, Richmond, IN, USA) and water was provided at all times in the home cages.

#### Apparatus

The light/dark test was conducted in six identical test chambers (MED-CPP2-RS; MED Associates Inc., St. Albans, VT, USA), each composed of two distinct compartments. The dark compartment had black walls and steel rod flooring. The light compartment consisted of white walls and steel grid flooring, with extra illumination provided by overhead standard desktop lamps. Each chamber was connected to an interface and computer running MED-PC version IV software (MED Associates Inc.). Infrared beam breaks were recorded to determine activity and time spent in each compartment.

A custom built EPM was used to evaluate the subchronic effects of LSD treatment. The apparatus was constructed of wood and painted black. The maze was elevated approximately 50 centimeters above the floor, and contained two enclosed arms (50 cm long, 10 cm wide, and walls 40 cm high) and two open arms (50 cm long, 10 cm wide, and walls 2 cm high). A video camera mounted above the maze was used to record each 5 min test session. Behavioral tracking software (ANY-maze®, Stoelting Co., Wood Dale, IL, USA) was used to analyze time spent and number of entries into each arm.

#### Drugs

Lysergic acid diethylamide was provided by the National Institute on Drug Abuse Drug Control Supply (Bethesda, MD). LSD was dissolved in 0.9% bacteriostatic saline and administered by intraperitoneal injections. Doses were determined based on the weight of the salt.

#### Procedures

Study procedures were reviewed and approved by the Western Michigan University Institutional Animal Care and Use Committee (IACUC Protocol...
Light/Dark Test
Subjects were randomly assigned to one of four treatment groups: saline, 0.02 mg/kg of LSD, 0.04 mg/kg of LSD, or 0.08 mg/kg of LSD. To be consistent with a previous published study by Horsley et al. (2018), rats were tested during the light phase (19:00–24:00). Before beginning the light/dark box test, rats were acclimated in their home cages to the laboratory environment for one hour before treatment. Injections were given 15 min prior to placement into the test apparatus for a 5 min period. Rats were individually placed into the dark compartment of each test chamber. Latency to enter the brightly lit compartment as well as activity and time spent in each compartment were recorded. Eight squads of six rats were tested at the same time, with treatment groups counterbalanced among test squads.

Elevated Plus Maze
The same rats used in the light/dark test continued to receive the aforementioned treatments (LSD 0, 0.02, 0.04, 0.08) every other day for a total of six injections. Following a two or three-day drug washout phase, each rat was individually placed in the EPM for a 5-minute test period during their light phase. Half of the animals in each treatment group were assessed 48 hours after the last injection and the remaining animals were assessed 72 hours after the last injection. Each rat was individually placed facing an open end of the arm, alternating the direction for every other animal. Activity was recorded by a camera mounted above the EPM. The behavioral tracking software, ANY-maze®, was used to record number of entries into the closed and open arms, latency to enter the closed and open arms, time spent in each arm of the maze, and distance travelled. If a rat fell or jumped off the maze, it was excluded from analysis.

Data Analysis
Light/Dark Test
A one-way ANOVA was used to determine any statistically significant effect of treatment on time spent in the lit chamber, light side entries, latency to enter the lit chamber, or total activity counts. This was followed by a Holm-Sidak multiple comparisons test to ascertain which treatment groups differed significantly from the saline-treated control group.

Elevated Plus Maze
EPM test results were analyzed using a two-way ANOVA (arm type, treatment group) to deduce if LSD had a statistically significant effect on latency to enter the closed or open arms, number of entries into the closed or open arms, or percentage of time spent in the closed or open arms. In addition, a two-way ANOVA was conducted to determine any statistically significant effects of treatment group or washout period (48 or 72 hours) on these dependent measures. Statistically significant findings were further evaluated with multiple comparisons using the Holm-Sidak multiple comparisons test.

Results
The main objective of this study was to evaluate acute and subchronic LSD treatment in behavioral tests predictive of anxiolytic drug effects, the light dark box and EPM, respectively. Of the 48 subjects, five were excluded from analysis due to experimenter error (3), failure to meet exclusionary criteria (1), or unexpected death (1) unrelated to the experiment.
Light/Dark Box
All dependent variables were assessed separately with a one-way ANOVA to determine any statistically significant differences among treatment groups. As shown in Figure 1, acute LSD treatment produced a dose-dependent and statistically significant decrease in time spent, $F(3, 48) = 14.15$, $p < .001$, $\eta^2 = .47$, and entries into, $F(3, 44) = 12.79$, $p < .001$, $\eta^2 = .47$, the brightly lit chamber. Additionally, Holm-Sidak multiple comparisons indicated statistically significant differences in time spent ($p < .01$) and entries into ($p < .001$) the lit chamber for all LSD treatment groups compared to the saline-control group. No statistically significant differences were observed among treatment groups in latency to enter the lit chamber or in total activity during the light/dark test.

Elevated Plus Maze
Half the animals in each treatment group were assessed in the EPM 48 hours after the last injection, and the remaining animals were assessed 72 hours after the last injection. Therefore, each EPM dependent variable was statistically analyzed for the 48-hour and the 72-hour washout period separately. These results are displayed in Figure 2.

Among subjects tested after a 48-hour washout phase, a two-way ANOVA (dose, arm type) of time spent in each arm type indicated a statistically significant effect of dose, $F(3, 17) = 4.59$, $p = .016$, $\eta^2 = .23$, and arm type, $F(1, 17) = 20.14$, $p = .001$, $\eta^2 = .55$, but no dose by arm type interaction. A Holm-Sidak multiple comparisons analysis indicated that all LSD doses produced a statistically significant difference in time spent in open versus closed arms ($p < .05$), whereas saline-treated controls displayed no significant difference between time spent in open and closed arms. Additionally, multiple comparisons indicated a statistically significant difference ($p < .05$) in time spent in either arm type only between the LSD 0.08 mg/kg treated animals and the saline-treated animals. A similar analysis of these results from animals assessed after a 72-hour washout period indicated no statistically significant effect of dose, arm type, or dose by arm type interaction.

A two-way ANOVA (dose, arm type) on the number of arm entries by the 48-hour washout group yielded statistical significance of arm type, $F(1, 17) = 28.85$, $p < .001$, $\eta^2 = .64$, but no statistical significance of dose. In addition, multiple comparisons revealed statistically significant differences between open and closed arm entries for subjects assessed 48 hours after 0.02 mg/kg LSD ($p < .01$) or 0.04 mg/kg LSD ($p < .05$). A similar analysis revealed no statistically significant differences among treatment groups or between closed and open arm entries among subjects assessed 72 hours after the last injection.

Statistical analysis of latency to enter arms among the 48-hour washout group revealed no statistically significant differences among treatment group or between open and closed arms. In contrast, a two-way ANOVA (dose, arm type) on latency to enter arms for the 72-hour washout group indicated statistical significance of arm type, $F(1, 18) = 43.97$, $p < .0001$, $\eta^2 = .71$, but no statistically significant dose effect. A Holm-Sidak multiple comparisons analysis revealed statistically significant
differences ($p < .01$) in latency to enter the closed versus open arms for subjects assessed 72 hours after saline, 0.02 mg/kg, and 0.08 mg/kg LSD.

Additional statistical analyses were conducted to determine any statistically significant effects of washout period. A two-way ANOVA (dose, washout period) on time spent in the open arms indicated a statistically significant main effect of washout period, $F(1, 35) = 18.69$, $p < .001$, $\eta_p^2 = .35$, but no statistically significant dose effect or dose by washout interaction. A similar statistical analysis on time spent in the closed arms indicated a statistically significant main effect of washout period, $F(1, 35) = 16.45$, $p < .001$, $\eta_p^2 = .32$, but no significant dose effect or dose by washout period interaction. Holm-Sidak multiple comparisons indicated that these differences between the 48- and 72-hour washout period were statistically significant only for the 0.02 mg/kg LSD treated animals ($p < .05$).

A two-way ANOVA (dose, washout) revealed a statistically significant main effect of washout period on open arm entries, $F(1, 35) = 12.95$, $p = .001$, $\eta_p^2 = .27$, but no significant dose effect and/or dose by washout period interaction. Although the main effect of washout period was statistically significant, Holm-Sidak multiple comparisons revealed no significant differences between 48- and 72-hour washout tests for any particular treatment group. A similar analysis of closed arm entries indicated no statistically significant effects of dose or washout period. Finally, no statistically significant effects of dose or washout period were observed for latency to enter either open arms or closed arms.

**Discussion**

The current findings indicate that acute LSD produces dose-dependent anxiogenic effects in male rodents. Specifically, LSD treatment decreased time spent and number of entries into the brightly lit chamber in the light/dark test. An extensive search of the research literature revealed few published preclinical studies on the acute effects of psychedelics on behavioral measures of anxiety. However, a few clinical reports have indicated that moderate, single-dose treatments of LSD produce anxiolytic effects (Carhart-Harris et al., 2016; Santos et al., 2016). In contrast, a recent study assessing the acute effects of low-dose LSD in healthy subjects found increases in self-reported anxiety as dosage increased (Bershad et al., 2019).

Statistical analyses of EPM results accounting for washout period revealed that animals assessed 48 hours after the last injection exhibited statistically significant differences in the number of closed arm entries and time spent in closed arms, whereas animals assessed 72 hours after the last injection did not exhibit these differences. These findings indicate mild anxiogenic effects of brief, intermittent LSD treatment, but these effects do not appear to persist beyond 48 hours.

Although no previous studies were found assessing the subchronic effects of LSD on anxiety in a preclinical research paradigm, a few published studies have evaluated the effects of other psychedelic drugs, including psilocin, ketamine, or DMT. However, the few reports found were inconsistent regarding anxiolytic or anxiogenic effects of these substances. The current findings are consistent with those of Horsley et al. (2018) who reported mild anxiogenic effects following brief, intermittent dosing with psilocin or ketamine in the EPM test. Oppositely, Cameron et al. (2019) reported that chronic, intermittent DMT administration in rodents resulted in antidepressant-like effects in a battery of behavioral assessments. Perhaps differences in pharmacological mechanisms of action across different subtypes of hallucinogens account for these conflicting findings. Moreover, the aforementioned studies implemented different dosing regimens. Across clinical research, numerous self-reports have suggested that regular interval ingestion of low-dose hallucinogens relieves anxiety symptoms and improves mood (Cameron et al., 2020; Fadiman & Korb, 2019; Johnstad, 2018; Polito & Stevenson, 2019). However, few studies have assessed the long-term effects of low-dose administration of psychedelic substances on mood in a controlled clinical setting.

In consideration of the full scope of available literature on the subjective effects of psychedelics, the current results reflect a clear translational boundary between preclinical behavioral assessments and clinical applications. Rodent models of unconditioned anxiety have a long history of inconsistent findings with antidepressant and antianxiety medications (Ennaceur, 2014). The construct validity of these assessments depends mainly on their ability to detect substances that have anxiolytic effects, which have been primarily upheld with benzodiazepines. However, mixed results have been found among 5-HT1A agonists, selective serotonin reuptake inhibitors, and tricyclic antidepressants (Ennaceur, 2014). Although preclinical investigations are a necessary component for determining the potential psychotherapeutic effects of novel treatments, standardized animal models...
have failed to provide consistency in determining the full therapeutic potential of hallucinogens in clinical settings.

Two common issues, construct and face validity, arise when determining the accuracy of behavioral assessments predictive of anxiety. As defined by Ennaceur (2014, p.56), “anxiety is a negative emotional state associated with the perception of potential or ambiguous threat,” which is typically modeled with aversion or avoidance-learning in preclinical tests. These models utilize unconditioned aversive stimuli, such as bright light or open spaces, to predict treatment responses to various anxiety-altering drugs. However, animal assessments fail to accurately model or measure elements of human anxiety involving emotional processing and reactivity. Hence, the construct validity of these tests has repeatedly come into question as preclinical findings fail to address the emotional aspect of anxiety in addition to behavior.

The face validity of unconditioned anxiety assessments in rodents is also commonly disputed. In particular, changes in behavioral responses to aversive stimuli may be due to drug-induced sensory distortion, perception, or motor functioning rather than anxiety-like behavior. For example, benzodiazepines have consistently produced “anxiolytic” responses in rodents, but these changes in behavior are largely due to their sedative and cognitive/motor impairing effects (Ennaceur, 2014). Thus, sensitivity to external stimuli, like light or open spaces, is reduced. Oppositely, the current study found acute doses of LSD to decrease time spent in the lit chamber of the light/dark box. The sensory and perceptual changes from psychedelic-induced activation of cerebral cortex regions dense in 5-HT2A receptors may have enhanced sensitivity to bright light in the light/dark box test. This in turn implies that psychedelics stimulate sensory systems but may not accurately measure how they affect anxiety in terms of higher-order emotional processing. Therefore, these models may reflect simpler behavioral characteristics of anxiety that may be unrelated to introspective processing associated with psychedelic effects reported by humans.

The psychoactive effects of serotonergic hallucinogens vary greatly from typical antidepressants. As noted by Nutt and colleagues (2020), the current understanding of psychedelics is that they reduce anxiety symptoms by altering networks associated with high emotional reactivity, which in turn increases introspectiveness and openness among users. Perhaps the beneficial effects of hallucinogens are not directly measurable in animal models that rely solely on behavioral modification in the presence of novel stimuli.

The current findings provide preliminary indications of the anxiety-increasing effects of low-dose LSD in animal models. Due to the limited knowledge of psychedelic effects on anxiety, this study assessed both acute and subchronic effects of LSD. However, the limited number of behavioral assessments and the brief subchronic dose regimen limit the generalizability of the current findings. To fully characterize the potential psychotherapeutic effects of hallucinogens, more substantial preclinical research is needed to examine the mechanisms underlying their putative treatment efficacy. Subsequent preclinical analyses could evaluate various hallucinogens and their effects in a multitude of behavioral models predictive of anxiety. In addition, wider dose variations and longer dose regimens are recommended to elucidate the dose-length and threshold for potential therapeutic effects. The inclusion of female rodents in future preclinical studies would also add to the generalizability of findings.

This study is the first to assess the anxiety-altering effects of low-dose LSD treatment in a preclinical behavioral paradigm. In addition, our procedures were intended to propose a standardized method for screening the acute and subchronic effects of psychedelics. Although the current study results are comparable to those of Horsley et al. (2018), who assessed psilocin and ketamine in the EPM, additional preclinical research is needed to fully discern the impact of LSD on anxiety and its potential clinical uses. Moreover, continued development of appropriate preclinical models is essential to understanding the behavioral and neurobiological mechanisms underlying their putative therapeutic effects.

References
LSD Anxiogenic Effects in Rats | Conway and Baker


Author Note. We have no known conflict of interest to disclose. This work was supported by funds from Western Michigan University’s Lee Honors College, College of Arts & Science, and Office of Research & Innovation.

We thank Robert Kohler for technical assistance with this study.

Correspondence concerning this article should be addressed to Lisa E. Baker, Department of Psychology, Western Michigan University 1903 W Michigan Ave, Kalamazoo, MI 49008-5439. Email: lisa.baker@wmich.edu
There Is Crying in Football: Reactions to an Athlete’s Weeping
Brandon C. Martin, William Hill, Grace McIntosh, Nelson Peterson, Olivia Sanborn, and Karol Maybury*
Division of Psychology and Human Development, University of Maine at Farmington

ABSTRACT. The current study hypothesized that the status of a professional American football player would influence how observers perceived his weeping after losing a game. It was also predicted that the importance of the game (the NFL Super Bowl vs. a regular season game) would influence perceptions of his tears. Two hundred twenty-two adults, recruited nationally, read 1 of 4 vignettes in a 2 (player status: high- or low-performing) x 2 (game status: Super Bowl or regular season game) between-subjects design. The vignette describes a close game that is ultimately lost by the target’s team, with the target weeping at its conclusion. Participants (N = 213) rated his postgame weeping as more appropriate and justifiable, using an allowance composite score, as it was found that there was a significant difference for both player, $F(2, 196) = 10.13, p < .001$; Wilks’ Lambda = .91; $\eta^2 = .09$, and game, $F(2, 196) = 4.27, p = .02$; Wilks’ Lambda = .96; $\eta^2 = .04$, status. There were also significant differences found in analyses for player status on perceived emotional stability, $F(1, 202) = 20.22, p < .001, \eta^2 = .09$, and game status on perceived competency, $F(1, 200) = 173.63, p < .001, \eta^2 = .47$. The ramifications of these findings, that situational details and personal attributes of the target influence observers’ judgments of emotional appropriateness, are discussed.

Keywords: football, masculinity, gender norms, crying behavior

Palabras clave: fútbol, masculinidad, normas de género, conducta de llanto
When people observe someone’s emotion expression, their evaluation of the acceptability of the person’s emotion depends upon a number of factors. Observers weigh the precipitating circumstances, the manner in which the emotion is expressed (e.g., subtly or excessively), the status of the person, and how much they like or dislike them (Maybury, 1997; Shields & MacDowell, 1987). Observer judgements are also influenced by how closely the expression aligns with display rules: culturally specific rules about emotion expression, including which emotion to display, how much to show, and when to show it (Ekman & Friesen, 1975).

Display rules are first acquired in childhood with more intricate rules added throughout adolescence and adulthood (e.g., neutralizing a joyful expression upon winning a card game). As children age, they develop an increasingly nuanced understanding of appropriate emotion encoding in response to various circumstances (e.g., expressing joy upon opening a present, even if disappointed). Adeptness at following display rules is positively correlated with social competence throughout childhood and adolescence (McDowell & Parke, 2005). Both boys and girls mask emotions more with peers than with parents (Zeman & Garber, 1996), but both of these groups (peers and family) may have their own idiosyncratic display rules, which are further mediated by race and culture (Morelen et al., 2013).

Research on the development of display rules reveals some gender-related differences, such as girls masking disappointment earlier in life than boys (Saarni, 1988). Although there are several differences in display rules by gender, especially greater disapproval of tears for boys (Mendendez-Santiago & Campbell, 2013; Stadel et al., 2019; Vigil, 2008), cultural differences add another layer of complexity (e.g., greater acceptance of female anger in Germany vs. in the United States; Sommers & Kosmitzki, 1988).

However, universally, judgements of another’s emotion are impacted by the observers’ partiality toward the target, including their perceived status in the eyes of the viewer. For instance, when viewing a political debate, viewers’ evaluations of the debater’s emotional appropriateness depend upon their allegiance to the candidate (Shields & MacDowell, 1987). In sum, emotion research shows that when observers view another’s emotion, they judge the target by their adherence to display rules, as well as their subjective predisposition toward them. Judgement of too much or too little emotion (appropriateness) “…depends upon who is doing the naming, who is named, and the circumstance in which the emotion occurs” (Shields, 2002, p. 185).

Men’s and boys’ emotion display rules may be uniquely bound by masculine norms, which includes expectations surrounding stoicism and emotional restraint, sexual prowess, and dominance and power (Reigeluth & Addis, 2021). Although these norms differ depending upon a number of factors (e.g., the age of the person displaying emotion, the degree to which observers endorse hegemonic masculinity), there may be some overarching imperatives about emotion displays (e.g., sadness), the manner in which the emotion is expressed (either subtly or extravagantly), and the environment in which it occurs (e.g., privately or in a public sphere such as a sporting arena). Conformity to hegemonic masculinity norms regarding the suppression of sadness may be particularly commonplace.

Although display rules around weeping have historically been gender-specific (e.g., greater acceptance of female crying), emotion researchers have noted a shift over the past 40 years. In 2002, Shields posited that in the realm of politics (namely, weeping by U.S. Presidents George W. Bush, Bill Clinton, and Ronald Reagan) and in professional sports (both coaches and players), tears and “manly weeping” had become more commonplace. Shields presented evidence that, since 1970, display rules against men’s tears have eased. However, research shows that the seriousness of the precipitating event, liking of the target, and the manner in which the tears are shed (e.g., preference for “passionate restraint of tears”) are all variables that continue to influence how a man’s weeping is perceived (MacArthur & Shields, 2019).

For the current study, we examined men’s weeping in professional American football. MacArthur and Shields (2019) recently summarized the body of research examining how different contextual cues impact judgements of tears in sport. The reasons the target is crying, domain (where the crying takes place), and intensity (tearing up or weeping openly) all influence observers’ acceptance of men weeping in sport contexts (Warner & Shields, 2007).

American football is a compelling domain in which to examine perceptions of male weeping because masculine norms include expectations to enact stoicism and emotional restraint (Reigeluth & Addis, 2021) and competitive, aggressive athleticism is a hallmark of the sport. However, the acceptability of male weeping (as mentioned above) has increased over the past 50 years. In 2011, athletes...
themselves provided insight into emotion display rules in football. Wong et al. (2011) asked 150 college football players to evaluate players’ appropriateness when they teared up (or sobbed) after a win or a loss. Players reported “tearing up” to be more appropriate and typical than open weeping; and tears after losing a game were perceived as more normative than after winning a game. Other investigations underscore that tears after a loss appear to be somewhat expected by teammates, and weeping is not universally viewed negatively (Adler & Adler, 1991). Although this may seem surprising, especially because hegemonic masculinity among men is often associated with stoicism and masking emotions such as sadness (David & Brannon, 1976), subordinated masculinity also expects men to show emotion in close and intimate relationships (Connell, 2005; Randell et al., 2015), such as among teammates. These competing imperatives suggest that evaluations of weeping in football may be a fruitful topic to pursue in emotion research.

The backdrop of American football was chosen deliberately for this investigation; it is a “manly sport” (Nelson, 1994) that is engulfed in the use of physical aggression (Messner, 1992), unsurprisingly making it part of the dominant masculine culture in the United States. Given this, and the admiration of “passionate restraint” of tears, known as tearing up but limiting flow to demonstrate control over emotions in a sad situation (Vingerhoets et al., 2000), MacArthur and Shields (2005) suggested that subtle tears may be acceptable in “manly” sports such as football, especially because it is a domain where masculinity is otherwise unassailable. However, we anticipated that different evaluations of emotion would emerge as a function of level-of-competition (professional vs. preprofessional sport). Likewise, previous research (e.g., Shields, 2005) has suggested that a player’s performance or stature on a team could affect perceptions of his crying behavior.

**Hypothesis**

We hypothesized that a professional football player would be perceived as more appropriate if he wept (a) as a result of the loss of an important game vs. a regular season game, and (b) was a high-status vs. low-status player. In a separate but related part of this investigation, participants were also asked about display rules they learned about crying (from family, teachers, and peers) in order to examine whether a relationship exists between acceptance of others’ crying and one’s learned beliefs about the advisability of shedding, or suppressing, tears.

**Method**

**Participants**

Participants were recruited through Amazon’s Mechanical Turk (mTurk) surveying system. mTurk allows surveyors, called requesters, to upload their surveys with an incentive of a predetermined payment if completed. Qualifications can be placed on the survey to focus on collecting data from certain populations; the current study placed a qualification of residency in the United States. Participants, called Workers, are awarded a specified amount of payment automatically by Amazon (within three days) after completing the survey. The current study was incentivized with a $0.25 payment, which took approximately five minutes to complete. There was an initial total of 222 participants; however, to evaluate the legitimacy of data collected through mTurk, IP addresses were reviewed to avoid overlapping of responses. Through this filtering, nine participants were omitted from data analysis to 213 total participants. Of these participants, 112 (52.6%) identified as male, 99 (46.3%) identified as female, and two (<1%) identified as nonbinary. Participants ranged in age from 20 to 76 years with a mean age of 38.8 years ($SD = 12.1$).

**Design**

The current study was a 2 x 2 between-subjects design. The independent variables were player status (high- or low-performing) and game status (a regular season professional football game or the Super Bowl, the National Football League’s championship game). The dependent variables were scaled ratings of the player’s emotional stability, appropriateness, honesty, competence, and justification of weeping.

**Materials**

**Vignettes**

Participants read a vignette of a fictional professional football player who weeps after the loss of either (a) a regular season game or (b) the Super Bowl, and is described as either (a) a high-performing or (b) a low-performing wide receiver. Participants were randomly assigned one of four conditions: regular season/high-performing, Super Bowl/high-performing, regular season/low-performing, Super Bowl/low-performing (see Appendix). They then were asked questions on variables assessing for perceived reactions and thoughts relating to the vignette and the player.

**Measures**

A total of 20 questions were developed for
participants to answer based on their randomly assigned vignette and relating to the independent and dependent variables. These items were followed by some closed and open-ended questions about emotion display rules from their childhood, and current (adult) display rules they had about crying behavior. For the purpose of the current study, dependent variables were categorized into subgroups for organizational and thematic purposes.

**Allowance.** After reading the vignette, the first three questions assessed how participants perceived the weeping behavior of the fictional football player (Kyle, the target) based on appropriateness of the behavior, justification for the behavior, and emotional stability of the target. Participants responded on a 6-point scale from 1 (*not at all*) to 6 (*completely*). Perceived competency of the target was also asked, but will be conducted as a dependent variable for separate analyses.

Other questions, not directly related to emotional acceptability, assessed for perceived honesty and extraversion of the target. However, these were not further evaluated for the current study.

**Emotional Background.** The next four questions assessed participants’ display rules learned from friends and family from childhood through current-day. Quantitative questions to assess how participants’ friends and themselves might react in a similar situation presented in the vignette were presented, as well as if they had any rules around crying learned from adult caregivers, and current rules or beliefs around personal crying behavior. Participants were also asked how often they cried in a similar situation presented in the vignette were presented, as well as if they had any rules around crying learned from adult caregivers, and current rules or beliefs around personal crying behavior. Participants were also asked how often they cried to assess personal crying behavior for background, which was assessed on a 6-point scale from 1 (*never*) to 6 (*very frequently*). However, these questions were not a goal of the study and were not included in analyses.

**Stimulus Checks.** To ensure participants understood the presented vignette (and that the stimulus was interpreted as intended), participants were asked how good of a player the target seemed for the player status conditions, and how important the game seemed for the game status conditions; both were rated on a 6-point scale from 1 (*not at all*) to 6 (*completely*).

**Demographics.** The last two questions of the study pertained to the participant’s demographics, which included age and gender. Race/ethnicity was not asked in the current study and is later discussed in the Discussion section.

**Procedure**
Before the study was distributed for recruitment of subjects on mTurk, university Institutional Review Board approval was sought and granted. Four separate studies were created on SurveyMonkey to change the vignettes for the corresponding conditions. The four conditions (high-performing/regular season, high-performing/Super Bowl, low-performing/regular season, low-performing/Super Bowl) were posted separately to mTurk on December 16, 2020 through January 4, 2021.

After the study was completed, participants were thanked for their participation and redirected back to the mTurk home page. Their data were then transferred to SPSS for data cleaning and analysis.

**Results**

**Preliminary Results**
The stimulus checks for the player and game status conditions were first evaluated to determine the effectiveness of the condition descriptions. These were tested by calculating independent *t*-tests. For player status, participants in the high-performing condition rated the target, Kyle, as significantly better (*M* = 4.00, *SD* = 0.79) than those in the low-performing condition (*M* = 2.38, *SD* = 1.08), *t*(211) = 12.51, *p* < .001, *d* = 1.71. For game status, participants in the Super Bowl condition rated the game to be significantly more important (*M* = 4.47, *SD* = 0.80) than those in the regular season condition (*M* = 3.41, *SD* = 0.99), *t*(209) = 8.69, *p* < .001, *d* = 1.20. Both Cohen’s *d*-scores indicated a large effect size (Cohen, 1988), suggesting that both conditions were considered to be appropriately described and measured. Therefore, these descriptions for the conditions were retained.

**Allowance**
We predicted that player status and game-import main effects would emerge with participants rating weeping as significantly more appropriate if it occurred after the loss of a high-stakes (Super Bowl) game and by a high-status player. Before running a 2 x 2 MANOVA with the three dependent variables (perceived appropriateness, justification, and emotional stability), binary correlations were conducted to test for multicollinearity. Emotional acceptability and justification were found to be highly correlated (*r* = .80). To avoid multicollinearity, a composite score of allowance (perceived appropriateness and justification scores summed) was created to sum the two variables, a technique suggested by Tabachnick and Fidell (2001). A 2 x 2 MANOVA, modified to
evaluate allowance and perceived emotional stability, was then conducted.

Controlling for participant age, gender, and crying frequency, we found a statistically significant difference between conditions for both player status, $F(2, 196) = 10.13, p < .001$; Wilks’ Lambda = .91; $\eta^2 = .09$, and game import, $F(2, 196) = 4.27, p = .02$; Wilks’ Lambda = .96; $\eta^2 = .04$, in the multivariate analysis. Considering dependent variables individually, using a Bonferroni adjusted alpha level of .11, there were significant differences for perceived emotional stability on player status, $F(1, 197) = 17.55, p < .001, \eta^2 = .08$, and allowance on game import, $F(1, 197) = 8.56, p = .004, \eta^2 = .04$. It should be noted that, interestingly, there was no statistical significance for allowance on player status, $F(1, 197) = 0.87, p = .35$, or perceived emotional stability on game import, $F(1, 197) = 2.58, p = .11$. Therefore, emotional acceptability had mixed results and partially support the hypothesis.

Demographics
To evaluate for potential significant differences between gender and age, independent $t$ tests were conducted for the dependent variables. For gender and emotional appropriateness, both allowance ($p = .56$) and perceived emotional stability ($p = .48$) were found to be nonsignificant. For other dependent variables, two significant findings were observed for (a) how the participant would respond in the same situation when evaluating a professional football player weeping, observers are influenced by both the status of the player (also found to significantly affect emotional stability) and the import of the game (found to significantly affect allowance; perceived appropriateness and justification).

This study found further support for previous research, which has demonstrated the impact of target status on evaluations of emotion displays (Maybury, 1997; Shields, 2002; Shields & MacDowell, 1987). Previous research has demonstrated that higher status individuals are granted greater leeway to show strong emotion, even if the emotion is disruptive, such as angry outburst (e.g., Maybury, 1997), than lower status individuals. Although it was not explicitly measured in this investigation, an intriguing independent variable that might bear fruit would be likeability of the target, which could perhaps also impact evaluations of tears. Professional football would, once again, be an intriguing backdrop for such an investigation. For instance, researchers might examine whether the target is a member of the observers’ home or rival team. Alternatively, one could manipulate the likeability of the player via a backstory describing his character in a written scenario. Background context about a player, such as criminal behavior (e.g., domestic violence), could have an even more profound impact on evaluations of emotion appropriateness.

The current study may be the first to demonstrate that within the setting of professional football, a game of greater import, such as the Super Bowl, grants players greater allowance for strong displays of sadness. Although this intriguing development should be interpreted with some caution, it is in keeping with display rule theory that observers take into account the concurrent circumstances when judging another’s emotion (MacArthur & Shields, 2019; Maybury, 1997; Shields, 2002; Shields & MacDowell, 1987; Warner & Shields, 2007). Future research on contextual cues and judgements might examine how viewers might weigh the seriousness of the precipitating event of other sport-related circumstances when evaluating appropriateness.

Future research might also tackle questions that emerged from the current study. For one, it remains unknown how people judge weeping as a function of the player’s age and level of play (high school, college, professional). Although the current study suggests it is acceptable for a high status...
professional player competing in the Super Bowl to cry, it remains to be seen how people evaluate younger players (e.g., a high school player) or how age of respondent (e.g., high school peers) might impact ratings of weeping.

It bears mentioning that there are major limitations specific to race, including the race of the target in this study and asking for participant race/ethnicity as part of the demographic questions. Because the race/ethnicity of the target was not specified in the presented vignette, participants’ assumptions of the target’s race are relatively unknown. Previous research indicates that when race isn’t specified, participants generally assume the target is a member of the majority group, although this may be impacted by response bias of the participant (Gushu & Carter, 1999) or social features that are present in the experimental stimuli (Strangor et al., 1992). However, 70% of NFL football players are African-American (Lawrence, 2019) and 88% of wide receivers are African-American (Josefsson, 2018). Therefore, it remains uncertain whether participants were picturing an African-American player as a member of the majority in the NFL, or a European American player as a member of the majority in the United States population. This is a crucial descriptor to clarify in future investigations, because race may be a factor that exerts an influence on observers’ evaluation of emotion appropriateness; for example, a study of African-American professionals, Wingfield (2010) found that suppressing negative emotions was a common work expectation. Although Wingfield is one of the few studies examining race and display/feeling rules in the workplace, it did not include professional athletes, so it remains to be seen how findings relate to a setting like professional football.

Studying display rules on the football field, as a function of player race, would help develop this area of emotion research further. Future investigations might benefit from including explicit descriptions of the race of the target, and the race of the participants, in order to further reveal emotion expression display rules as a function of race. Black, Indigenous, and People of Color (BIPOC) stereotypes surrounding emotion expression have been underresearched, and Wingfield’s (2010) study suggests race of target might impact evaluations of emotion appropriateness.

Relatedly, future investigations might examine how people assess emotion as a function of sport and culture. Examining cultural differences across sport (e.g., Spanish soccer vs. American football) could provide a more nuanced understanding of display rules in different sporting domains.

The current study suggests that, consistent with findings of other research in the field of emotion (MacArthur & Shields, 2019; Maybury, 1997; Shields, 2002; Shields & MacDowell, 1987; Warner & Shields, 2007), player status and game import have a significant effect on the perceptions of a professional wide receiver weeping after a game. Specifically, emotional stability on player status and emotional allowance on game import adds to research on the effects of status on emotional and general perceptions of others (Maybury, 1997; Shields & MacDowell, 1987). However, mixed results and aforementioned major limitations should be considered and utilized to not only support previous research, but also provide a direction for future research on the topic of perceptions of emotion in the sport setting.

References


https://doi.org/10.1177/0891243205278639


Kyle (28) plays professionally in the National Football League (NFL). He is a wide receiver who is on the field for most of the team’s offensive plays; he contributes a significant amount to the team and has performed among the top wide receivers in the league. Kyle and his team are playing in the Super Bowl, the championship game, and lose in a tough back-and-forth match. Right after the final whistle, Kyle is overcome with emotion. Tears well up in Kyle’s eyes and drip down his cheeks. He tucks his head into the neck of his jersey and squats down for a moment, then gets up and slowly walks off the field.

Scenario 2 (Good/Regular)
Kyle (28) plays professionally in the National Football League (NFL). He is a wide receiver who is on the field for most of the team’s offensive plays; he contributes a significant amount to the team and has performed among the top wide receivers in the league. Kyle and his team are playing in the first game of the team’s 16-game regular season schedule, and lose in a tough back-and-forth match. Right after the final whistle, Kyle is overcome with emotion. Tears well up in Kyle’s eyes and drip down his cheeks. He tucks his head into the neck of his jersey and squats down for a moment, then gets up and slowly walks off the field.

Scenario 3 (Bad/Super Bowl)
Kyle (28) plays professionally in the National Football League (NFL). He is a wide receiver who is on the field for most of the team’s offensive plays; he has been performing inconsistently for two seasons and is statistically now one of the worst wide receivers in the league. Kyle and his team are playing in the Super Bowl, the championship game, and lose in a tough back-and-forth match. Right after the final whistle, Kyle is overcome with emotion. Tears well up in Kyle’s eyes and drip down his cheeks. He tucks his head into the neck of his jersey and squats down for a moment, then gets up and slowly walks off the field.

Scenario 4 (Bad/Regular)
Kyle (28) plays professionally in the National Football League (NFL). He is a wide receiver who is on the field for most of the team’s offensive plays; he has been performing inconsistently for two seasons and is statistically now one of the worst wide receivers in the league. Kyle and his team are playing in the first game of the team’s 16-game regular season schedule, and lose in a tough back-and-forth match. Right after the final whistle, Kyle is overcome with emotion. Tears well up in Kyle’s eyes and drip down his cheeks. He tucks his head into the neck of his jersey and squats down for a moment, then gets up and slowly walks off the field.
“Drinking heavily among young people, even before university, is often viewed as normal and expected behavior by youth and frequently condoned by their parents and the community because it is viewed as a rite of passage” (Nova Scotia Department of Health and Wellness, 2012). This statement appears in a Nova Scotia government report, and statistics support the assumed prevalence of heavy drinking. For example, in Canada, the 18 to 34 age group has the highest proportion of heavy drinking, with 34.4% of men and 23.4% of women reporting bingeing (Government of Canada, 2017). Similarly, in the United States, most young adults under the legal drinking age of 21 report binge drinking (CDC, 2019). North America is not unique in its high levels of binge drinking; in the 20 to 24 age group, 24.1% of women and 62% of men living in the European Union reported heavy episodic drinking (WHO Europe, 2019). Not only is binge drinking pervasive; it also carries heavy societal costs, including automobile accidents, alcohol poisoning, sexual assault, and various cancers (CDC, 2019). Thus, binge drinking is a widespread societal problem, and considerable research has examined various factors that predict it. The present research examined anticipated regret as a unique predictor of binge drinking among university students in a North American context.

**Binge Drinking**

Although specific criteria vary, a commonality in definitions of binge drinking is the consumption of large quantities of alcohol in a short time. The National Institute of Alcohol Abuse and Alcoholism (NIAAA) defines binge drinking as the consumption of four or more drinks by a woman or five or more drinks by a man over the course of about two hours (NIAAA, n.d.).

Researchers have tested various interventions designed to curb binge drinking, with varying levels of success (Kuntsche et al., 2017). One popular...
strategy involves educating students about binge drinking rates, which tend to be lower than students estimate. Supporting this strategy are results from an experiment that randomly assigned incoming university students to participate in a peer-oriented discussion (which focused on norms) or an individual-oriented discussion (which focused on decision-making; Schroeder & Prentice, 1998). Months after the discussion, students reported significantly lower levels of alcohol consumption in the peer condition than in the individual condition. In contrast, other evidence has suggested that these norm strategies are counterproductive. For example, another norm-based intervention study found that providing information about drinking rates significantly lowered drinking levels among some students while raising drinking rates among other students (Werch et al., 2000). More recent evidence has suggested that self-affirmation—a strategy known to reduce defensiveness—may increase receptivity to persuasive messages regarding negative effects of alcohol only when not combined with information about drinking norms (Voisin et al., 2016). Thus, the available evidence suggests that, although norming interventions hold some promise, their benefits emerge inconsistently. In fact, a recent meta-analysis revealed that even large changes in norms may result in only small changes in alcohol consumption (Prestwich et al., 2016). An alternative strategy to reduce binge drinking without activating defensiveness involves inducing anticipated regret.

**Anticipated Regret**

Anticipated regret is a “cognitive emotion” that involves both thinking about the future and imagining potential feelings. As the term suggests, anticipated regret involves imagining wishing that one had acted differently (Zeelenberg & Pieters, 2006). Much research on anticipated regret places it in the context of an extended version of the Theory of Planned Behavior (Icek Ajzen: Homepage, n.d.). Accordingly, anticipated regret should exert its effects through strengthening behavioral intention. Applying the original theory would predict that the most proximal predictor of binge drinking is intention to binge drink. Three factors, in turn, predict intention: attitude (how one feels about binge drinking), subjective norm (how one perceives important others’ support for binge drinking), and perceived behavioral control (how much power one believes that one has over binge drinking). Research in various cultural contexts has supported the utility of the Theory of Planned Behavior to understand drinking intentions and behavior (e.g., Hamilton et al., 2020; Watakakosol et al., 2021).

Research has supported anticipated regret as another predictor of intention. A recent review illustrated that anticipated regret significantly—and often uniquely—predicted intentions to engage in various health-promoting behaviors (e.g., vaccination) and avoid various health-harming behaviors (e.g., unprotected sex; Koch, 2014; Sandberg & Conner, 2008; Sandberg et al, 2016). Perhaps surprisingly, the review revealed sparse research investigating the potential role of anticipated regret in binge drinking. In a notable exception, results of one study revealed that anticipated regret significantly predicted binge drinking intention, which, in turn, predicted binge drinking behavior one week later (Cooke et al., 2007). In another study, manipulating whether a sample of risky drinkers imagined how they felt before or after an episode of binge drinking created significant differences in negative affect, but changes in affect did not translate to changes in behavior (Murgraff et al., 1999). Finally, a more recent study found that anticipated regret did not significantly predict intention to not binge drink (Gagnon et al., 2012); however, a dichotomized outcome measure might have reduced the statistical power of detecting an effect.

An especially stringent test of the statistical effect of anticipated regret on intention to avoid binge drinking involves controlling other extended Theory of Planned Behavior variables. The study that measured binge drinking intention and self-reported behavior one week later also measured descriptive norms (i.e., perceptions of what most other people do; what norming interventions target) and past behavior (Cooke et al., 2007). Results suggested that anticipated regret uniquely predicted binge drinking intentions, even when analyses statistically controlled for original Theory of Planned Behavior variables, descriptive norm, and past behavior. The present research followed this practice of providing a conservative test of the power of anticipated regret by including these two additional variables.

Researchers have employed a variety of manipulations to induce anticipated regret. As mentioned previously, one simple manipulation involves asking participants about their predicted feelings after a potentially regret-evoking situation (compared with their feelings about or before the situation; Murgraff et al., 1999). Perhaps the simplest—yet
often effective—induction of anticipated regret involves mere measurement. Multiple studies have demonstrated that simply having participants complete items that assess anticipated regret may effectively increase anticipated regret and/or intention. These studies have examined various domains, including cervical screening attendance (Sandberg & Conner, 2009), posthumous organ donation (O’Carroll, Foster, et al., 2011), and regular physical exercise (Abraham & Sheeran, 2004). Thus, the present research attempted to manipulate anticipated regret via mere measurement.

The Present Research
Research on anticipated regret in binge drinking is promising but incomplete. The present investigation advances prior research in several ways. First, most of the limited prior studies examining anticipated regret regarding binge drinking took place in Europe; research in other contexts (such as North America) is needed. As the “replication crisis” in psychology has shown, replications allow researchers to assess the credibility of findings (Maxwell et al., 2015); some journals have responded by explicitly welcoming replication studies because of their value (e.g., Edlund, 2016). Social norms and the legal drinking age vary both between and within North America and Europe (Howard, 2018), further highlighting the need to assess the generalizability of prior findings. Second, since the publication of the previous studies, research has found that modifications to measures may more accurately capture participants’ binge drinking levels. Specifically, research has demonstrated that providing detailed labels of what constitutes “one drink” increases accuracy of self-reported alcohol consumption levels (Osiowy et al., 2015). Thus, the present research applied this practice. Third, given the mixed success of Murgraff et al.’s (1999) anticipated regret manipulation (involving imagining feelings before or after binge drinking), the present research tested a different manipulation, which prior research supported in other health domains. Fourth, the present research extended the time between measures of intention and behavior from one or two weeks to one month. Previous research found that longer time frames decrease the effects of context on drinking intentions (Cooke & French, 2011); thus, a longer time frame may provide a cleaner test of intention’s predictive value. Furthermore, finding a significant relationship between intention and behavior over a longer time frame would have promising intervention implications, suggesting that an intervention that alters intentions may have lasting effects on behavior.

The present three studies tested two hypotheses:
1. Anticipated regret was expected to uniquely predict intention to avoid binge drinking, which, in turn, would negatively predict binge drinking behavior.
2. Responding to items assessing anticipated regret was expected to increase intention to avoid binge drinking, which, in turn, would predict avoidance of binge drinking one month later.

Study 1: Pilot
The primary purpose of Study 1 was to develop a measure to assess extended Theory of Planned Behavior variables appropriate for binge drinking in a North American context. The process of piloting the measure follows Ajzen’s recommendations for creating a Theory of Planned Behavior measure (Icek Ajzen: Homepage, n.d.). The hypothesis was that anticipated regret would uniquely predict intention to avoid binge drinking.

Method
Participants
One hundred nine undergraduate students (84 women, 24 men, and 1 other) participated in an online study in exchange for extra credit in their Introductory Psychology course. Most (94.5%) reported that they consume alcohol.

Materials and Procedure
This study and the two subsequent studies received ethics clearance from St. Francis Xavier’s University Research Ethics Board (REB; Study 1: ROMEO #23024; Studies 2 and 3: ROMEO #23249) prior to being conducted. All materials and data for all studies are publicly available on the Open Science Framework (https://osf.io/qjv8f/). All participants provided electronic consent before proceeding with each study. Participants signed up online via Sona Systems for a study titled “Alcohol Survey: Pilot Study” and then completed the study at their convenience. The first page of the study’s website contained an item assessing whether participants consumed alcohol (“yes” or “no”) and another item assessing participants’ gender. The subsequent items, where relevant, followed Ajzen’s recommendations for constructing a Theory of Planned Behavior measure, including a preface that some “…questions appear to be similar, but they do address somewhat different issues” (Icek Ajzen:
Wording also closely followed that of a previous study of binge drinking in undergraduates (Cooke et al., 2007). Participants then responded to an open-ended item in which they explained how they would define the term “binge drinking,” followed by a webpage that contained two fill-in-the-blank questions that began with the stem: “Some people define binge drinking by counting the number of drinks consumed over a short period of time. How would you define binge drinking? ___ drinks for men” and “___ drinks for women.” These items were included for exploratory purposes.

Following recent meta-analytic findings suggesting that anticipated regret for inaction (e.g., not binge drinking) may more strongly predict behavioral intention than does anticipated regret for action (e.g., binge drinking; Brewer et al., 2016), most of the present extended Theory of Planned Behavior items referred to avoiding—rather than partaking in—binge drinking. This wording selection also arose out of concerns that positively worded items might actually increase the frequency of maladaptive behaviors (Cooke et al., 2007; Wood et al., 2016), such as binge drinking. In addition, recent research suggested that an intention to drink heavily may be less important than a willingness to drink heavily (Stevens et al., 2022). Unless otherwise stated, each item had a 7-point response format; in all multi-item measures, responses were averaged to create scale scores. The first five items assessed attitudes toward avoiding binge drinking over the next month (e.g., “For me to drink fewer than 4 (females)/5 (males) drinks over the course of about two hours in the next month would be…” ranging from unpleasant [1] to pleasant [7]; α = .81). The next four items assessed subjective norms (e.g., “Most people who are important to me think that I ___ drink fewer than 4 (females)/5 (males) drinks over the course of about two hours in the next month,” ranging from should to should not; α = .72). For these items only, higher scores indicate a lower value—in this case, weaker perceptions of a subjective norm supporting avoidance of binge drinking. Three items assessed perceived behavioral control (e.g., “If I wanted to, I could drink fewer than 4 (females)/5 (males) drinks over the course of about two hours in the next month,” ranging from definitely false to definitely true, α = .68).

The next page of the measure contained additional items assessing both original and extended Theory of Planned Behavior variables. Two open-ended items assessed descriptive norms, split by gender (e.g., “How many women do you know who avoid binge drinking?”). A single open-ended item assessed past behavior (“How many days in the previous month did you drink 4 (females)/5 (males) or more drinks over the course of about two hours?”). Two items assessed the crucial variable of anticipated regret (e.g., “In the next month, I would feel regret if I drank more than 4 (females)/5 (males) drinks over the course of about two hours”; α = .89). Some research suggests that placing anticipated regret items immediately before intention items strengthens intentions (Abraham & Sheeran, 2003); therefore, four intention items followed (e.g., “I plan to drink fewer than 4 (females)/5 (males) drinks over the course of about two hours in the next month”; α = .88). A final, open-ended item solicited feedback to help improve the measure.

Results and Discussion

Results that follow are based on participants (N = 98) who reported that they consume alcohol and who passed two embedded attention checks. A post hoc power analysis revealed that this sample size provided adequate power (.87) to detect a medium effect in a four-predictor regression model. Gender was not a significant covariate and so is not discussed further. Results of analyses of exploratory items appear on the OSF page (https://osf.io/qjv8f/).

Analyses began with an inspection of the open-ended data (assessing descriptive norms and past behavior), which revealed wide variation in both content and format, as Sona Systems does not permit restricting open-ended data to a numeric form. Thus, many participants provided responses that did not lend themselves to quantitative analyses (e.g., “a lot,” “On Fridays and Saturdays”). Therefore, due to the variable nature of the descriptive norm and past behavior responses, these items were not analyzed. Remaining items revealed no evidence of nonnormality (all skewness and kurtosis values < |1.0|), and no outliers (i.e., values > |3| SDs from the mean). Other descriptive statistics appear in Table 1. Furthermore, inspection of the data revealed no concerns about multicollinearity, as all correlations were < |.70|, all tolerance values > |.20|, and all VIF values were below 2.0.

Table 1 also reveals that variables correlated in expected ways. Specifically, anticipated regret, attitude, perceived behavioral control, and subjective norms all significantly correlated with intention to avoid binge drinking. The strongest correlation
was between intention and anticipated regret \( (r = .67) \), which was significantly higher than the other correlations, \( Z = 3.11, p < .01 \). A follow-up multiple regression analysis tested whether anticipated regret uniquely predicted intention to avoid binge drinking. The full model explained 57% of the variance in intention. As Table 2 indicates, only anticipated regret and perceived behavioral control explained unique variance in intention. As with the zero-order correlations, anticipated regret was the strongest predictor of intention.

In sum, Study 1 provided strong evidence for the power of anticipated regret in predicting intention to avoid binge drinking. Study 2 addressed several shortcomings of Study 1. First, open-ended items assessing descriptive norms and past behavior were restricted to numeric responses. Second, although most Study 1 participants did not provide feedback, several described the question wording as “confusing” \( (e.g., \text{“the wording of your questions with ‘over the course of 2 hours in the next month’ is very confusing’} \) ). In addition, Study 1 participants tended to overestimate the number of drinks that define binge drinking. Thus, to simplify the wording and to provide a standard definition of binge drinking, Study 2 included an explicit definition of binge drinking combined with a graphic defining “one standard drink.” Third, Study 1 did not assess subsequent behavior; thus, Study 2 involved contacting participants one month after their initial responses to obtain self-report data on drinking behavior.

**Study 2**

**Method**

**Participants**
Undergraduate students received extra credit in their Introductory Psychology course for participating. At Time 1, 176 responses were received; however, inspection of participants’ self-reported identification numbers suggested that some participants completed the study more than once or provided incorrect identification information. Thus, data from these participants were discarded. All participants passed two embedded attention checks. One hundred forty-six participants (42 men, 104 women) provided unique, valid identifiers and reported that they consumed alcohol. A post hoc power analysis revealed that this sample size had high power \( (.95) \) to detect a medium effect in a six-predictor multiple regression analysis.

**Method and Procedure**
At Time 1, participants signed up online for a study called “Alcohol Survey” via Sona Systems; however, to permit restrictions on the response type in open-ended items, participants completed the study through Qualtrics. The study was accessible to participants for two days. Study materials were similar to those of Study 1. The primary difference was that the top of each page of the survey included an explicit definition of binge drinking (from the NIAAA) and a graphic illustrating “one standard drink.” These additions permitted simplification of the wording of items used in Study 1. For example, the revised stem for the attitude items was, “For me to avoid binge drinking in the next month would be…” The revised measure assessed the same variables as in Study 1: attitude, subjective norm, perceived behavioral control, descriptive norm, past behavior, anticipated regret, and intention, along with two embedded attention checks. Responses to the open-ended past behavior and descriptive norm items were restricted to numeric format.

---

**TABLE 1**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>( B )</th>
<th>95% CI</th>
<th>( \beta )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude</td>
<td>0.13</td>
<td>[–0.08, 0.34]</td>
<td>0.10</td>
<td>.21</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>–0.13</td>
<td>[–0.32, 0.06]</td>
<td>–0.10</td>
<td>.18</td>
</tr>
<tr>
<td>Perceived behavioral control</td>
<td>0.32</td>
<td>[0.11, 0.52]</td>
<td>0.23</td>
<td>.004</td>
</tr>
<tr>
<td>Anticipated regret</td>
<td>0.58</td>
<td>[0.45, 0.71]</td>
<td>0.64</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note. Subjective norm was scaled such that higher scores indicate lower perceived support for avoiding binge drinking.
All participants who provided data at Time 1 were contacted via email and invited to a follow-up study approximately one month later (i.e., at Time 2). Eighty-three participants provided responses to two items: “At any time in the past month, did you binge drink?” (with response options of “yes” and “no”) and “In the past month, how may days did you binge drink?” (with an open-ended response format). Seventy of these participants reported that they consume alcohol; one of these participants had an outlier at Time 1 (as described below), leaving usable data from 69 participants at Time 2. A series of independent-samples t tests revealed no systematic differences in Time 1 variables between participants who did versus did not provide Time 2 data, all ts < 1.20, ps > .20. All Time 2 participants were entered in a lottery for gift cards.

Results and Discussion

Time 1

Table 3 presents descriptive statistics; as the table indicates, all multi-item measures demonstrated adequate internal reliability. (One subjective norm item demonstrated an unacceptable item-total correlation, r = .12, and removal of this item substantially increased internal reliability; thus, results are based on a three-item measure, with the problematic item removed.) Inspection of the data revealed that, with the exception of descriptive norm and perceived behavioral control, no nonnormality or outliers were present. The two descriptive norm items (assessing how many men and women participants knew who avoid binge drinking) were highly correlated (r = .91). High levels of skewness and kurtosis necessitated a data transformation; thus, the descriptive norm variable was square-root transformed. Two outliers remained even after this transformation and therefore were omitted, and four outliers on perceived behavioral control were removed, leaving data from 140 participants for further analysis. Inspection of the correlation matrix in Table 3 revealed no concerns about multicollinearity. Table 3 also indicates that, as in Study 1, all predictor variables significantly correlated with intention to avoid binge drinking.

Table 4 depicts the results of a simultaneous linear regression analysis that tested whether anticipated regret uniquely predicted intention to avoid binge drinking. This model explained 66% of the variance in intention. Attitude, perceived behavioral control, past behavior, and, crucially, anticipated regret uniquely predicted intention to avoid binge drinking. Unlike in Study 1, attitudes more strongly predicted intention than anticipated regret did, at least descriptively. Thus, results replicated those of Study 1, even with two additional predictors.

Time 2

Did intention to avoid binge drinking at Time 1 significantly predict binge drinking behavior at Time 2? Intention, attitude, subjective norm, perceived behavioral control, descriptive norm, and anticipated regret were predictors in the first

### Table 3

| Study 2 Correlation Matrix and Descriptive Statistics at Time 1 |
|-----------------|--------|--------|--------|--------|--------|--------|--------|
| M               | 4.83   | 3.75   | 5.93   | 5.44   | 2.06   | 3.07   | 3.47   |
| SD              | 1.23   | 1.42   | 1.07   | 4.13   | 1.35   | 1.90   | 1.85   |
| N               | 140    | 140    | 140    | 140    | 139    | 140    | 140    |
| α               | .83    | .74    | .63    | .93    | .88    | .92    |
| Range           | 1.6–7  | 1–7    | 3–7    | 0–15   | 0–6.78 | 1–7    | 1–7    |
| SF              | 4.83   | 3.75   | 5.93   | 5.44   | 2.06   | 3.07   | 3.47   |

Note. PBC = perceived behavioral control. N varies due to missing data. * = square-root transformed **p < .01. *p < .05.

### Table 4

| Study 2 Simultaneous Linear Regression Results Predicting Intention to Avoid Binge Drinking at Time 1 |
|-----------------|--------|---------|--------|--------|
| Predictor       | β      | 95% CI  | p      |
| Attitude        | .45    | [.04, .86] | .30    | <.001  |
| Subjective norm | -.11   | [-.27, .05] | -.09   | .18    |
| Perceived behavioral control | .22 | [.00, .44] | .23    | .05    |
| Descriptive norm | .09    | [-.06, .25] | .07    | .23    |
| Past behavior   | -.13   | [-.19, -.07] | -.30   | <.001  |
| Anticipated regret | .24 | [.01, .34] | .24    | <.001  |

Note. Subjective norm was scaled such that higher scores indicate lower perceived support for avoiding binge drinking.
step in a hierarchical regression analysis predicting the number of self-reported days in which participants binge drank. Past behavior was entered in the second (final) step (Chorlton et al., 2012), as unlike anticipated regret and the other predictor variables, past behavior cannot be modified in an intervention and therefore warranted its own step. As Table 5 indicates, intention significantly and uniquely predicted binge-drinking behavior; no other variables emerged as significant predictors in the first step. However, in the second step, only past behavior uniquely predicted binge-drinking behavior. The final model explained 41% of the variance in binge-drinking days. Thus, consistent with previous research (Cooke et al., 2007), past behavior emerged as the only unique predictor of binge drinking when all predictors were included in the regression model.

Most participants ($n = 51, 76\%$) reported binge drinking at some point during the previous month. A logistic regression analysis predicting the dichotomous outcome of binge drinking followed the same procedure as the multiple regression analysis described above, with past behavior entered on the second step. As Table 6 reveals, in the first step, intention (and subjective norm) emerged as a significant predictor of whether participants binge drank; however, when past behavior was entered on the second step, the effect of intention dropped to just below statistical significance, and, unexpectedly, subjective norm remained a significant predictor. In sum, supporting Hypothesis 1, intention emerged as a significant, unique predictor of binge drinking (at least when past behavior was not included).

**Study 3**

Study 1 provided evidence that anticipated regret uniquely predicts intention to avoid binge drinking. Study 2 replicated this finding and extended it by demonstrating that intention, in turn, predicts self-reported binge-drinking behavior one month later. These findings suggest anticipated regret as a promising intervention target to reduce binge drinking. Thus, Study 3 experimentally manipulated exposure to anticipated regret items to test the hypothesis that merely responding to anticipated regret items reduces binge drinking. In addition, Study 3 sought to broaden the generalizability of the research by recruiting a student sample outside of the psychology pool.

**Method**

**Participants**

An email to the student listserv at a primarily undergraduate university in Atlantic Canada invited students to participate in a study on alcohol-related attitudes and behavior. Two hundred forty-one (193 women, 46 men, 2 other) responded and were entered in a lottery for credits to be applied toward the university’s meal plan. Most ($n = 222$) reported consuming alcohol.

**Procedure**

After reading an electronic informed consent form, participants reported their gender, whether they consume alcohol, and a self-generated code number (last four digits of phone number + two-digit number of birth month) to facilitate linking data across two time points. The remaining items were identical to those of Study 2, with one critical exception: participants were randomly assigned to respond to one of two versions of the measure. One
contained the two anticipated regret items (experimental condition; \( n = 122 \)) and the other did not (control condition; \( n = 119 \)). Participants had the option of providing their email address if they chose to participate in the prize lottery. Approximately one month later, a second email invitation was sent to the student listserv. Students had access to the materials at each time point (Time 1 and Time 2) for two days. (Because providing an email address was optional, Time 1 email addresses could not be used to recruit participants at Time 2.) The email contained a link to the Time 2 measure, which was identical to that of Study 2. Time 2 participants were entered in a lottery for gift cards.

**Results and Discussion**

**Time 1**

Descriptive statistics and zero-order correlations appear in Table 7. Inspection of the data revealed no concerns about multicollinearity (all \( |r| < .80 \), all VIF values < 4.0); however, both past behavior and descriptive norms showed signs of nonnormality (i.e., skewness and kurtosis > 1). A square-root transformation acceptably reduced the nonnormality of the descriptive norm distribution, and removal of four outliers on past behavior improved normality of its distribution. Three additional participants reported attitudes or perceived behavioral control values that were outliers; thus, their data were discarded. The remaining analyses also omit data from the 19 participants who reported at Time 1 that they do not consume alcohol and two participants who did not pass one of two attention checks. Thus, the analyses that follow are based on data from 213 participants. A post hoc power analysis revealed that this sample was highly powered (.95) to detect a medium effect using a two-tailed independent-samples \( t \)-test.

Contrary to predictions, on average, participants who responded to anticipated regret items reported significantly weaker intention to avoid binge drinking (\( M = 3.70, SD = 1.81 \)) than did participants who did not respond to the anticipated regret items (\( M = 4.26, SD = 1.97 \)), \( t(211) = −2.14 \), Hedge’s \( g = −0.29 \), 95% CI (−0.56, −0.02), \( p = .03 \). Thus, results demonstrate that exposure to anticipated regret items, unexpectedly, lowered intention to avoid binge drinking.

**Time 2**

Because the Time 1 manipulation turned out to be ineffective, detailed Time 2 results are presented only on the OSF page (https://osf.io/qjv8f/). Fifty participants provided usable data at Time 2. In sum, no significant differences emerged between conditions for either the continuous or dichotomous measure of self-reported binge drinking one month later.

**General Discussion**

The present research demonstrated that self-reported anticipated regret uniquely predicts intention to avoid binge drinking. The predictive power of anticipated regret remained even when statistically controlling attitude, subjective and descriptive norms, perceived behavioral control, and past behavior. Furthermore, intention to avoid binge drinking negatively predicted self-reported binge drinking behavior. These results suggest anticipated regret as a promising intervention target. Past behavior also emerged as a unique predictor, but unlike anticipated regret, past behavior is not amenable to change.

The present research also suggests caution in designing interventions to evoke anticipated regret. Although prior research suggested mere measurement as an effective anticipated regret manipulation (e.g., Abraham & Sheeran, 2004; O’Carroll, Dryden et al., 2011; Sandberg & Conner, 2009), the present research did not replicate this effect. This unsuccessful attempt to manipulate anticipated regret items has emerged in some prior research. One recent study found that, although anticipated regret significantly correlated with health-promoting behaviors, it did not significantly correlate with health-risk behaviors, including binge drinking (Stevens et al., 2019). In other domains, although previous research suggested

## TABLE 7

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Subjective norm</td>
<td>–.57**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. PBC</td>
<td>.47**</td>
<td>–.40**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Past behavior</td>
<td>–.50**</td>
<td>.42**</td>
<td>–.60**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Descriptive norm</td>
<td>.11</td>
<td>–.23**</td>
<td>.18**</td>
<td>–.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Intention</td>
<td>.70**</td>
<td>–.54**</td>
<td>.51**</td>
<td>–.55**</td>
<td>–.22**</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>( N )</th>
<th>213</th>
<th>213</th>
<th>213</th>
<th>213</th>
<th>213</th>
<th>213</th>
</tr>
</thead>
<tbody>
<tr>
<td>( a )</td>
<td>.84</td>
<td>.78</td>
<td>.71</td>
<td>–</td>
<td>.90</td>
<td>.94</td>
</tr>
<tr>
<td>Range</td>
<td>1.60–7</td>
<td>1–7</td>
<td>2.33–7</td>
<td>0–15</td>
<td>0–6.71</td>
<td>1–7</td>
</tr>
<tr>
<td>( M )</td>
<td>5.18</td>
<td>3.77</td>
<td>5.93</td>
<td>3.54</td>
<td>1.79</td>
<td>3.97</td>
</tr>
<tr>
<td>SD</td>
<td>1.23</td>
<td>1.42</td>
<td>1.14</td>
<td>3.22</td>
<td>1.17</td>
<td>1.91</td>
</tr>
</tbody>
</table>

Note: PBC = perceived behavioral control.

\( p < .01 \), \( p < .05 \).
Anticipated Regret and Binge Drinking | Koch

the utility of exposure to anticipated regret items in increasing posthumous organ donation registration (O’Carroll, Dryden et al., 2011), a recent study failed to replicate this effect (O’Carroll et al., 2016). Similarly, a previous study failed to find that measuring anticipated regret for not donating blood ultimately increased blood donation behavior (Godin et al., 2010). The study’s authors speculated that anticipated regret may need to be particularly high to change intention, and perhaps it is generally not high for not donating blood. When giving blood, a donor is highly unlikely to know who—if anyone—will benefit. In contrast, in previous studies that successfully manipulated anticipated regret via mere measurement, the benefit of the behavior in question might be more obvious (e.g., cervical screening: Abraham & Sheeran, 2004; physical exercise: Sandberg & Conner, 2009). Thus, perhaps a different manipulation of anticipated regret that does not rely on mere measurement will be more effective.

Limitations and Future Directions
Although the present research has strengths, it also has limitations that future research may address. Although prior research guided the design of the anticipated regret manipulation in Study 3, the manipulation proved ineffective. Future research may use different manipulations. For example, early research on anticipated regret in a health domain used the time perspective manipulation (i.e., having participants report their feelings before/about or after a situation) with vivid, plausible scenarios (e.g., a casual sex encounter on a vacation; Richard et al., 1996). Similarly vivid, emotionally involving (e.g., embarrassing; Davies et al., 2017) scenarios involving binge drinking may be easy to generate, given the myriad of problems that binge drinking may cause. One such vivid event to which many people can relate is reflected in the present article’s title: a hangover. Future research may employ scenarios involving unpleasant hangovers to make the situations particularly relatable.

On a related note, the mean levels of anticipated regret in Studies 1 and 2 (in which all participants responded to anticipated regret items) were relatively low, near the theoretical midpoint. Mean levels of anticipated regret in experimental conditions may need to be relatively high to increase intention to avoid binge drinking.

The lack of information about participants’ racial/ethnic background precludes strong conclusions about the generalizability of the present results. Although the different recruitment methods (through campus email and via an Introductory Psychology sign-up system) might have ensured a broad cross-section of students, the lack of demographic data means that potential moderation by race/ethnicity cannot be examined. Future research examining potential links between anticipated regret and binge drinking would benefit from recruiting ethnically diverse samples and recording demographic information more thoroughly.

Theoretical and Practical Implications
As noted above, the present research suggests that, although anticipated regret may be a useful intervention target, researchers should exercise caution in designing an intervention strategy. A mere measurement manipulation that places anticipated regret items immediately before intention items may be too blatant (Godin et al., 2010; Wood et al., 2016), creating reactance. In addition, the pleasurable effects of drinking alcohol may outweigh negative feelings; thus, an effective anticipated regret manipulation may need to be vivid and emotionally involving.

The present research also contributes to the theoretical discussion of the utility of the original Theory of Planned Behavior. Although multiple studies have found that adding predictors (e.g., anticipated regret) increases the proportion of explained variance in intention, a recent study challenged the notion that such findings result from adding affect to the original theory. In this experiment, participants were randomly assigned to respond to items assessing either consuming or avoiding alcohol, or consuming or avoiding fast food (Ajzen & Sheikh, 2013). Results revealed that, as predicted, anticipated affect (including regret) explained additional variance in intention only when affect and other variables were measured “incompatibly.” Specifically, measuring anticipated affect for consuming alcohol contributed unique variance in intention only when all other variables assessed avoiding alcohol. When all variables were measured compatibly, anticipated affect no longer emerged as a unique predictor of intention. These results suggest that the apparent effects of anticipated regret are merely a methodological artefact. The present research (Studies 2 and 3) challenges this assumption by measuring anticipated regret and intention compatibly, with items referring to avoiding binge drinking.

1Similarly, a recent criticism points to the studies’ relatively small sample sizes and correspondingly large confidence intervals around the correlation coefficients (Sandberg et al., 2016).

1I thank an anonymous reviewer for this suggestion.
Conclusion
The present research suggests that anticipated regret for failing to avoid binge drinking uniquely predicts avoidance intention, which, in turn, predicts behavior. The results further suggest careful attention to interventions involving anticipated regret to reduce binge drinking, as placing face-valid anticipated regret items immediately before intention items unexpectedly lowered intention to avoid binge drinking. Future research may reveal more effective methods to induce anticipated regret, thereby increasing avoidance intention. Inducing students to imagine the hangover may ultimately turn out be a simple, cost-effective way to reduce problematic levels of binge drinking.

References


**Author Note.** Erika J. Koch
https://orcid.org/0000-0001-9063-8611

Selected portions of this research were presented at the 2019 meeting of the International Society for Research on Emotions (ISRE) in Amsterdam and at the 2021 meeting of the Society for Personality and Social Psychology (SPSP) online. A grant from St. Francis Xavier’s University Council for Research supported this work. All materials and data for all studies are publicly available on the Open Science Framework (https://osf.io/qjv8f/)

I thank James Shepperd for his comments on a previous version of this manuscript.

The author declares no conflict of interest.

Correspondence concerning this article should be addressed to Erika J. Koch, ekoch@stfx.ca or PO Box 5000, Antigonish, NS B2G 2W5, Canada.
The 2021–22 Psi Chi president’s theme by Dr. Ngoc Bui focused on promoting networking and mentorship experiences within Psi Chi, particularly for undergraduate students who may be the greatest beneficiaries of these experiences. One way to foster these mentorship experiences is through student mentored research, which typically involves a faculty researcher overseeing and/or including undergraduate student involvement in the research process, whether that be faculty- or student-led. Moreover, these student mentored research experiences can be incredibly useful for those who are seeking graduate school (Koch, 2008).

Although it is well-known that graduate schools are generally looking for student applicants with research experience as an undergraduate, it can be rather challenging for students to obtain such experience (Hughes et al., 2019). For instance, a willing faculty member may be overloaded with other work demands or not have the resources wherein to involve undergraduate students in research. Similarly, an undergraduate student may not realize how important research experience is or may simply not know how to get involved. Compounding things further, student mentored research may seem incredibly daunting to both faculty and students as both struggle to meet demands placed on them from other sources (e.g., teaching, coursework, graduate students). Rob is at a university that is almost exclusively teaching-focused, Jenny’s faculty position involves both teaching and research, and Kimberli’s university is a Tier-1 research institution with graduate student demands. As such, we have written this editorial in the hopes to aid faculty in undergraduate student mentored research by sharing some insights that each of us have discovered in our own unique faculty positions.

Robert Wright: Research Mentoring at a Teaching-Focused University
Situated near Grand Teton and Yellowstone National Parks, Brigham Young University-Idaho (BYU-Idaho) is a large private undergraduate student-focused institution that exclusively develops and practices innovative teaching with no graduate or research programs. The Psychology Department boasts a vibrant ~1,700 psychology majors with three separate emphasis areas: general psychology, health psychology, and I/O psychology. In 2015, I established the health psychology emphasis and currently supervise the ~500 declared student majors. I also recently received the Early Career Award from Rocky Mountain Psychological Association for student mentored research with these students who have often received awards of their own. Although most of our graduates do not pursue graduate school education, a substantial subgroup (~30%) is at a disadvantage with little to no research experience. Despite our creation of a required Experiencing Research course where groups of students conduct a research study, our semester time constraints (14 weeks) and sheer volume of students make it difficult for majors to experience the research process that most graduate schools find attractive. In this context, establishing my small research lab devoted to the field of health psychology has been a process requiring time, effort, and collaboration. However, I have a deep appreciation for mentored student research ever since I was an undergraduate student myself at Utah State University where I conducted my own senior honors thesis study that received a grant and was later published in the *Psi Chi Journal of Psychological Research* (Wright et al., 2007), which had a large impact on my success in graduate school. As such, despite the difficulties, I felt it was immensely worth it because I have benefited from and inherently enjoy the mentorship relationship and process. Below, I describe three elements that I think were critical to the success of my small research lab in providing student mentored research experiences at an exclusive teaching-oriented institution.

First, I established the need for a small research
Student Research Mentoring | Wright, Treadwell, and Hughes

lab by collaborating and being assertive with the department and university administration. This took time and patience. Naturally, as a newcomer to BYU-Idaho without tenure, I was hesitant to ask for things that I felt I needed. However, with the guidance of good colleague mentors, I developed a rationale for lab space, equipment (e.g., blood pressure machine, bioelectric impedance scale), and personnel (e.g., paid student research assistant). Although I was nervous about asking for these resources, I was amazed to receive many of them. I am convinced that two primary factors worked in my favor: my arguments were justified by statistics I had gathered (e.g., student interest) and the timing was appropriate (e.g., resources were available). After that initial granting of requested resources, my research lab has been an active source of student research mentoring of around 20 undergraduate students each academic year, with most of those going on to graduate school.

Second, I developed eligibility criteria for interested students. No matter how you do it, student mentored research is challenging, time-consuming and limited by space. Thus, I focused on inviting those students who meet my stipulations including: (a) asking me about opportunities (good indicator of future success), (b) completion of Research Methods (necessary for basic research skill development), and, most importantly, (c) exemplary performance in my Health Psychology course (good indicator of matching interests). These criteria are helpful in protecting the research team from being “infected” by a student who is not motivated, helpful, or positive, which can greatly detract the research team (this has happened before). Timing is important too, as I have found that I need to consider who I will invite to join my lab the next semester as early as the middle of the semester prior (Week 7), before registration opens. Otherwise, my student availability is restricted to those who may not be as conscientious or committed, two critical student characteristics in a research setting. Moreover, without graduate student human resources, it is incredibly important to have a lead research assistant (such as the paid position I requested) who is motivated, punctual, hard working and excited about conducting research. As a faculty member with limited time, it is essential to have a student leader who fits these characteristics, as I will often ask this student to organize the group, remind me of upcoming deadlines, and participate in advanced research procedures (e.g., data analysis).

Third, determining the tasks and focus of my research lab has been of upmost importance. Early on, I allowed students to bring their own ideas for potential exploration. Although that approach has merit, challenges emerged due to the time restrictions of a single semester. As such, I now provide my team with some scaffolding, such as a health psychology-related study that is ongoing, where we collect, analyze, and publish on data across multiple semesters. This model allows students to join the team at different stages of ongoing research efforts. Generally, this has worked well, though several students have expressed interest in remaining on the research team for multiple semesters and that can work too. As I make adjustments to our lab projects, I have found it important to be forward-thinking so that I am considering changes the semester before I intend to implement them. Importantly, I try to have some type of a goal or deliverable each semester for the team to work toward from the outset of the semester. These have ranged from oral/poster presentations at local (BYU-Idaho), regional (Rocky Mountain Psychological Association), and national (American Psychological Society) venues to academic publications in journals (Psi Chi Journal of Psychological Research) and even presentations given to my current courses I teach (this is especially useful when no other option seems available).

Finally, publication of student mentored research can be rather daunting, particularly as a seasoned faculty researcher may become frustrated with the mentorship process of an inexperienced undergraduate student. However, I have found a wide-range of options that have made these feasible and rewarding for both myself and the student. One option involves a highly motivated student approaching the faculty with their own idea, then conducting the study under supervision of the faculty researcher and completing a majority of the manuscript preparation. One such student approached me and we conducted a study on a topic that was outside of my research lab but involved other student research assistants (Moon et al., 2017). On the other end of the spectrum, undergraduate students can join the faculty member under an existing research program spanning several semesters and publish with the lead researcher. One example comes from a three-part intervention study we conducted over multiple semesters to address perceived barriers to eating healthy foods (Wright et al., 2021). Of course, there are many variations between these two options that involve the student researcher more or less, which has been more common and feasible for me with
my limited resources. For instance, a few student researchers joined my team after learning of my current research examining technology use and student health, which we examined together in two recent studies (Wright et al., 2018; Wright et al., 2020). As one may note from these example publications, undergraduate-friendly journals like the Psi Chi Journal of Psychological Research are incredibly helpful, though a wide range of journals can be successfully solicited. Thus, from my experience, I would suggest undergraduate that student mentored research can be done at teaching-focused universities, especially as professors (a) establish the need for a small research lab, (b) develop and enforce criteria for students to join the research lab, and (c) provide a clear goal or research experience for the research team to accomplish, including the difficult, but attainable goal of publication.

Jenny Hughes: Research Mentoring at a Small Liberal Arts College

Agnes Scott College is a historically all-women’s college in metropolitan Atlanta. It is a private liberal arts college with just over 1,000 undergraduate students, and the College recently started several new master’s programs. For the past few decades, the most popular undergraduate major at the College has been psychology, and according to departmental records, 60% of the majors go on to graduate programs. Among national liberal arts colleges, the U.S. News and World Report (2022) designated Agnes Scott as #2 Best Undergraduate Teaching for the second year in a row. The College is unique in that faculty are expected to have robust research programs, in addition to being exceptional instructors. This can be challenging without having doctoral students, but there are things that can be done to have a successful lab with undergraduate students (Hughes, 2014). For example, since starting in 1998, I have worked with 245 students in my lab and about half of those students worked with me for more than one semester. Some even worked with me for three or four years. Besides my individual research, I have published 37 papers and two chapters with students as coauthors. In addition, my students and I have presented 311 papers at research conferences.

In 2014, I wrote a paper for the Psi Chi Journal about a research model I use to help undergraduate students present and publish their research because that is one of our goals in our psychology department (see https://www.usnews.com/best-colleges/agnes-scott-college-1542/overall-rankings). In this editorial, I would like to highlight three things, mentioned in the article, that I do, which have been especially helpful when mentoring undergraduate students in my research lab.

First, I break down the research process into manageable steps, and after students complete each step, they have the components to make a quality research paper. My students often comment that this helps them learn the research process and makes it less overwhelming. I also have alums who tell me that they continue to use this method while in graduate school. I know that asking undergraduate students to write a paper with little guidance often results in papers that are rushed and poor in quality. As I mentioned in my 2014 paper, I include the following tasks:

(a) hypotheses and proposed statistical tests to be used; (b) articles and book selection and a justification of why they chose those articles and books; (c) summaries of the articles and books they read; (d) a title for the paper; (e) an introductory paragraph; (f) an outline of their literature review; (g) a literature review; (h) a method section; (i) statistical analyses and their interpretation of their analyses; (j) a results section; (k) a discussion section including a summary of their findings, how their findings compare with other research literature, strengths of their study, weaknesses of their study, and future research ideas; (l) references; and (m) an abstract (p. 222).

For each of these tasks, I check my students’ work. This reinforces that I have high expectations for the research produced. This is especially important to me because I expect that my students will present their work at conferences and also that some students will publish their work. I often recommend submitting to the Psi Chi Journal of Psychological Research.

Second, I select research topics that are part of my research areas (i.e., couples, positive psychology, and commuting to and from work). I develop a project that I want to do individually during the school year, and then the students work on smaller projects related to my project for a semester. We collect data as a group. This means that I benefit from the project by doing my own individual research, and I also mentor students during the process. Having weekly meetings with students helps to keep me on track with my own research.
Third, I have students with varying knowledge and experiences and also alums work in my lab. I often ask Psi Chi members, students who are not yet eligible to join Psi Chi but who have excelled in one of my courses, and alums to join my lab. This results in having students who work in my lab for multiple years. I ask each student to commit to at least a semester and they complete a project during the semester that is ready to present at a conference. If they continue for another semester, they often work to publish that work. Then if they commit to work in the lab again, they start a new project. When students return to work with me, I have them share their prior research experiences and help to mentor the other students, especially the students who are learning about research for the first time. Students are inspired by seeing that other students and alums have successfully presented and published their research from my past labs.

Kimberli Treadwell: Research Mentoring at a Tier-1 Research University

The University of Connecticut, the third public land-grant university established in 1881 and a Top 25 Public Research University as ranked in U.S. News and World Report (2022), actively engages undergraduates in research. Undergraduates seek resources at the Office of Undergraduate Research to connect with research mentors; the office awards funding of $500–$4,000 to over 200 students each year, totaling over $600,000 across 10 different funding programs for research support, research supplies, and conference travel. UConn students presented over 300 research posters at the two annual Frontiers in Undergraduate Research Exhibition this past year. An annual Undergraduate Research Mentoring Award (for which I have been nominated twice since tenure) highlights professors’ contributions in developing undergraduate research endeavors. My department, the largest major in the College of Liberal Arts and Sciences with 1,000+ majors, is consistently ranked in the top 15 psychology departments for total research and development spending by the National Science Foundation. A Department Participant Pool assists in recruitment, which I coordinate. I observe undergraduates from multiple majors serving a variety of roles across vastly diverse research topics in core areas including behavioral health, neuroscience, cognitive science, and social relationships to enhance their undergraduate experience. Specific goals outlined at the beginning of a semester, in the context of ethical treatment of humans (for me) or animals (for other colleagues) is the basis for a variety of skills, which vary based on the focus of the lab. Within this context I approach undergraduate research mentoring in a scaffolded semester-based approach.

January 19, 2022. I sit in the first research team meeting for spring 2022 with my undergraduate and graduate students as I overlook a snowy quad busy with students passing by. Each of the nine undergraduates sitting here for this graded independent study course referred to as “research team” first completed an online lab application, met with a graduate student in my lab to discuss lab projects, interest, skills, and overall fit for the lab, then met with me to define specific research goals and course credits at the end of Fall 2021. I am pleased to see them and we chat about winter break and open the semester with a team building exercise. The five seniors have been in my lab 2–7 semesters; one will complete her honors research project, one will complete their senior capstone research thesis, one is a project coordinator, and two are expanding their research skills to include data analysis and writing. Three have a conference poster presentation under their belt as coauthor in previous semesters, four have accepted conference presentations this spring, and two will convert their projects into manuscripts to submit in May. I review the syllabus with the team, describe the main focus of the research lab (cognitive learning approach to anxiety in adolescents), outline how each student will be exposed to all steps of the scientific method this spring (just not all within the same project), arrange for tours of the lab rooms and key distribution, and give updates on a grant submission. Each project coordinator (graduate or undergraduate student) reviews the status of the five research projects at varying stages of completion and each student’s role in their chosen project(s). All students sign up for a journal club presentation for ensuing meetings. The new undergraduate is assigned CITI ethics training, and the remainder start coordinating schedules for the upcoming week to review experimental procedures and data coding to ensure reliability that coefficients have not dipped over winter break. Requested lab hours are due on Monday to the lead graduate student who will create a master online team lab schedule. Any questions? Off we go.

What do these undergraduates hope to gain from research? What do I expect of undergraduates at this Tier 1 Research University (designated to only 2.5% of higher education) that evaluates
faculty on a merit scale of 50% research, 25% teaching, and 25% service? Do they only conduct literature searches and enter data? I would argue that undergraduates gain valuable experience about research and science in this scaffolded model of research team, as well as communication, interpersonal, advising, and writing skills for their career—whether working immediately following their baccalaureate or while pursuing graduate study. And in an academic environment for which research output is an expectation for faculty tenure and promotion, undergraduates are valuable contributors to the research enterprise.

I aim for students to employ skills and evaluate research in psychological sciences. Undergraduates in the first and second semesters of research team conduct literature searches, assist in developing IRB protocols (including how to create a meaningful hypothesis based on the literature, choose assessment measures, and design procedures), consent participants, collect data, enter data, code reliable observational data, and analyze demographic data. They develop communication and interpersonal skills by working with participants, team members, graduate students, and members of the faculty. Students demonstrating strong organization and communication skills continue for additional semesters as a project coordinator to train research assistants in experimental procedures, schedule participants, organize data collection and entry, and manage many aspects of the project under the watchful guidance of the lead graduate student and myself. Other continuing undergraduates expand their role by analyzing more complicated data, writing, and supervising smaller pieces of a project. Students with two or more semesters of research may carve out a student-focused project from an existing lab project or initiate separate data collection under the auspices of my lab as a senior capstone project or honors thesis; these students are typically successful in applying for university undergraduate research grants and creating output of research in the form of posters or manuscripts. Students at any level may elect to contribute to posters that are submitted to conferences each semester; experienced students are first authors and commit to presenting the poster, successfully applying for undergraduate grant funding to pay for travel expenses. Students at all levels participate in discussions of research progress and development for ongoing lab projects, undergraduate projects, and graduate students’ masters and dissertation projects, thus providing a scaffolding model for growth in independence as a researcher.

My graduate students serve as project coordinators and assist in supervising the undergraduates, with one taking the lead as lab manager. I am present at weekly meetings and also directly supervise research projects, with weekly individual meetings for undergraduates pursuing student-initiated research projects.

May 8, 2022. Our first-author undergraduate manuscript was rejected by the first journal and has been resubmitted to a second; we continue to write the second senior’s first-author paper targeting submission in fall. A graduate student’s first-author paper was accepted. Four senior undergraduates presented first-author research posters at international and regional conferences. Graduating seniors are heading to medical school, graduate programs in social work and clinical psychology, and jobs in education and counseling settings. Three rising seniors are returning to lab in the fall; two plan to collect data for their honors theses (one carved from a lab project and the other a separate IRB) and another is returning as a project coordinator. Both seniors and I will submit the IRB applications over the summer. A rising junior will return for her fourth semester as a project coordinator. Four new faces will join us in the fall to assist in the new grant-supported project. I will return for the joy of working with my students.

Conclusion
Throughout our collective experience, student mentored research has offered numerous benefits and advantages to us and our students that have made the effort worth it and enjoyable. We have encountered obstacles (e.g., limited resources, time constraints) in our unique respective efforts to engage in student mentored research but maintain that it has been a rewarding process for us and our students. As other faculty and students seek to engage in experiential research learning models, we hope our suggestions here can be helpful in making the process more gratifying for all involved. Because, when asked the reason behind why we continue to engage in undergraduate student mentored research, we simply respond, “because we enjoy it.”

References


Author Note. Robert R. Wright https://orcid.org/0000-0002-4101-7840
Kimberli R. H. Treadwell https://orcid.org/0000-0002-4595-4193
Jennifer L. Hughes https://orcid.org/0000-0002-7978-5650

Special thanks to Steven Rouse and Bradley Cannon for insightful comments during the writing process. Correspondence concerning this article should be addressed to Robert R. Wright, Department of Psychology, Brigham Young University – Idaho, 525 South Center St. Rexburg, ID 83440-2140. Telephone: 208-496-4085.

Email: wrightro@byui.edu

Student Research Mentoring | Wright, Treadwell, and Hughes
Turn Your Compassion Into a Career in Mental Health

Our online degree programs feature relationship-focused curriculum, innovative faculty, and lead to licensure.

alliant.edu/psychology
**Publish Your Research in *Psi Chi Journal***
Undergraduate, graduate, and faculty submissions are welcome year round. Only one author (either first author or coauthor) is required to be a Psi Chi member. All submissions are free. Reasons to submit include

- a unique, doctoral-level, peer-review process
- indexing in PsycINFO, EBSCO, and Crossref databases
- free access of all articles at psichi.org
- our efficient online submissions portal

View Submission Guidelines and submit your research at [www.psichi.org/?page=JN_Submissions](http://www.psichi.org/?page=JN_Submissions)

---

**Become a Journal Reviewer**
Doctoral-level faculty in psychology and related fields who are passionate about educating others on conducting and reporting quality empirical research are invited become reviewers for *Psi Chi Journal*. Our editorial team is uniquely dedicated to mentorship and promoting professional development of our authors—Please join us!

To become a reviewer, visit [www.psichi.org/page/JN_BecomeAReviewer](http://www.psichi.org/page/JN_BecomeAReviewer)

---

**Resources for Student Research**
Looking for solid examples of student manuscripts and educational editorials about conducting psychological research? Download as many free articles to share in your classrooms as you would like.

Search past issues, or articles by subject area or author at [www.psichi.org/journal_past](http://www.psichi.org/journal_past)

---

**Learn About Psi Chi**
Psi Chi is the International Honor Society in Psychology. Membership is primarily open to undergraduates, graduate students, transfer students, full-time and part-time faculty members, and alumni.

See membership benefits and a link to apply at [www.psichi.org/page/member_benefits](http://www.psichi.org/page/member_benefits)