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Effect of the Establishment of a 2-week Brief Mindfulness Practice on Positive Nutritional Choices and Perceived Stress in College Undergraduates

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Abstract

College students often experience weight gain, which appears to be associated with elevated levels of stress. This stress can be due to exposure to a new environment, increased responsibility, and newfound independence that comes with living away from home. As such, identification of interventions that increase healthy eating behaviors and reduce perceived stress may promote good physical and mental health for college students. Mindfulness meditation, which is associated with lowered blood pressure, heart rate, and subjective anxiety, may be one such strategy. However, no research has examined the effect of the establishment of a mindfulness meditation practice on nutritional choices. The current study aimed to identify changes in college undergraduates' positive nutritional choices that follow 2 weeks of mindfulness meditation paired with daily food diaries relative to participation in a nutrition-information video plus daily food diaries comparison condition. Results indicated no significant changes in mindfulness, perceived stress, or eating behaviors between groups over time, though analyses were likely hampered by low participant enrollment. Despite unexpected findings, examination of effect sizes (small to large) suggested several potentially fruitful avenues of future research.

Keywords: mindfulness; stress; college undergraduates; daily diary; nutritional habits

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College is a time of new experiences, increased responsibilities, and immersion in new surroundings with new people. During this time, it is common for students to exhibit a wide variety of positive and negative emotions and other behavioral responses, though stress is often cited as one of the most commonly occurring reactions (Karatekin, 2018). High stress is associated with several negative mental and physical outcomes. For example, research indicates elevated stress is associated with depressive symptoms and substance use relapse in individuals with substance use disorders (SUDs; Hirsch et al., 2019; Carroll & Lustyk, 2018). Moreover, stress appears associated with weight gain, an effect that is especially prominent in first year college populations (often referred to as the 'freshman 15'; Smith-Jackson & Reel, 2012). Such sudden accumulation of body fat is, in turn, detrimental to overall health and quality of life (i.e., "a state of complete physical, mental, and social well-being, not merely the absence of disease"; World Health Organization, 2014, p.1). Some side effects of sudden weight gain include high risk for future obesity, development of Type 2 Diabetes, heart disease, sleep apnea, and high blood pressure (Erickson, 2019). Accordingly, identification and implementation of effective weight control and stress reduction strategies in college populations may have a significant impact on public health broadly.

One commonly cited cause of weight gain is poor nutritional habits (Larson et al., 2014). As such, increasing healthy eating habits may be one method of addressing unwanted weight gain. Several methods of increasing healthy nutritional habits have been identified, such as food delivery programs, calorie counting, using specific cookbooks, and social media support groups (Reynolds et al., 2018; Tsai & Wadden 2005). Generally, good short-term outcomes follow

implementation of these strategies, including a decrease in caloric intake and an increase in daily nutrient levels (Nguyen et al., 2015; Tsai & Wadden, 2005). Despite these favorable outcomes, many individuals fail to realize the benefit from such techniques and the effects of these strategies appear short-lived. For example, unhealthy eating behaviors often reemerge upon the discontinuation of journaling (Zepeda & Deal, 2008), which suggests a need to identify additional treatment strategies that positively impact healthy eating behavior.

As previously noted, weight gain also appears related to increased levels of stress (Rhee, 2013). Stress and poor nutrition habits may interact to compound weight problems. For example, one study that examined teenagers over a 5-year span found the rate of adiposity, or the state of being overweight, was higher in individuals that reported high, relative to low, perceived stress (Van Jaarsveld et al., 2009). Additionally, extant research indicates high perceived stress is associated with weight gain (Block et al., 2009; Harding et al., 2014; Torres & Nowson, 2007). Indeed, research also suggests poor nutritional habits and subsequent weight gain are associated with high levels of perceived stress (Ball et al., 2017), including in college student populations (Wichianson et al., 2009). As such, identification of methods that may provide additional coping strategies for general distress and support more consistent healthy eating behaviors seems warranted. Common methods of stress reduction include working out and beginning a new hobby. More recently, researchers have explored the effects of establishing a regular mindfulness practice on behavioral health outcomes broadly (Adler et al., 2017).

Mindfulness, largely originating in Eastern philosophies, has been applied to the treatment of several medical and psychiatric disorders, as well as stress reduction, through a variety of behavioral interventions. Kabat-Zinn (1994), a leader in bringing mindfulness to Western medicine, defines mindfulness as: “paying attention in a particular way: on purpose, in

the present moment, and non-judgmentally" (p. 12). Typical mindfulness meditation exercises, which are one method of promoting the development of mindfulness, involve finding a comfortable sitting position and following a guided session or practicing freely without guidance. The practice commonly involves: focusing attention on the natural breath in the present moment; bringing awareness back to the breath when the mind drifts away to thoughts, emotions, or other physical sensations; and noticing judgmental thoughts related to oneself, the practice itself, or any other stimuli (Davidson & Kaszniak, 2015). Mindfulness appears to lead to several beneficial outcomes when practiced as part of large behavioral intervention packages (Shonin, Van Gordon, & Griffiths, 2013), such as Mindfulness-Based Cognitive Therapy (MBCT; Sengal et al., 2001), Acceptance and Commitment Therapy (ACT; Hayes et al., 1999), or Dialectical Behavioral Therapy (DBT; Linehan 1993), as well as when implemented as brief, consistently practiced exercises (Feliu et al., 2014; Fissler et al., 2016; Valenstein-Mah et al., 2019).

Indeed, participation in Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1996) programs, which intensely train participants in mindfulness meditation, is associated with decreased emotional eating, even when the content of the intervention is not tailored specifically to weight loss or eating (Corsica et al., 2014; Levoy et al., 2017). Despite these successful implementations of MBSR interventions for poor eating habits, several factors may limit the applicability of large mindfulness-based treatment packages for college students. For example, such programs typically include weekly in-person group meetings, ask participants to devote at least 45-min daily to practicing mindfulness exercises, and require participation in a day-long mindfulness retreat (Kabat-Zinn, 1996). The demands of college life, including studying, completing homework, and participation in extracurricular activities, may limit students' ability

to participate in additional time-demanding programs, indicating a need to evaluate the effectiveness of brief mindfulness exercises in student populations.

Research conducted to date suggests several benefits of integrating brief mindfulness exercises (i.e., 5- or 10-min) into life for college students. Students have evidenced momentary cardiovascular benefits, increased attention and memory, and decreased concern with self-image following mindfulness meditation (Campillo et al., 2018; Chen & Jordan, 2018; Johnson et al., 2019). The establishment of a mindfulness practice leads to increased self-awareness and non-judgment towards oneself (Kerin et al., 2017; Stella, 2016), as well as reductions in perceived stress over time (Berghoff et al., 2017; Miller et al., 2017; Shearer et al., 2016). Mindfulness also appears beneficial in supporting conscious choice and thwarting reactivity, while also reducing stress and increasing well-being (Bahl et al, 2013). Research indicates the pairing of mindfulness and problem-focused coping appears to lead to decreased stress (Finkelstein-Fox, 2018), and concurrent training in positive reappraisal and mindfulness appears to promote well-being in college undergraduate students (Pogrebtsova, 2018). The aforementioned research encouraged college students to incorporate mindfulness into their lives and provides support for the effectiveness of such practices as one method of decreasing stress. In addition, relative to low mindfulness, high self-reported trait level mindfulness is related to greater overeating regulation and lower dysregulation of discomfort and leisure overeating (Kerin et al., 2017). Taken together, these studies indicate mindfulness is an effective therapeutic strategy for reducing perceived stress in college undergraduate populations and may promote the alleviation of ineffective stress-related behaviors in college students, such as poor eating habits.

In summary, college undergraduates are at high risk for stress, which appears related to subsequent poor eating habits. Research suggests low mindfulness is related to several unhealthy

eating behavior related constructs. Moreover, the provision of intensive, as well as brief mindfulness-based interventions to individuals effectively reduces stress. Yet, researchers have not identified the effect of the establishment of a brief mindfulness meditation practice on eating behaviors in college populations. The present study aimed to evaluate the effect of establishing a 2-week daily mindfulness practice on healthy eating behaviors in a sample of college undergraduate students. We hypothesized participants randomly assigned to the mindfulness meditation intervention would report higher mindfulness and lower perceived stress at the follow-up assessment occasion than participants randomly assigned to a nutrition-information comparison condition. We also hypothesized participants randomly assigned to the mindfulness meditation intervention would report higher average positive nutritional choices during the two weeks relative to participants in the nutrition-information comparison condition. Findings may inform the development of interventions that effectively increase healthy eating behaviors and reduce perceived stress in college student populations.

Method

Participants

Students attending the University of South Dakota were recruited through SONA systems, flyers posted on the university campus, and the laboratory website. Eligibility criteria included: being 18 years or older; having a meal plan with the university; self-reported desire to improve eating habits; and experiencing stress in daily life. There were no additional exclusion criteria for the current study.

Participants who participated in the initial research day (see Procedure, below) were 10 college students ranging in age from 18 to 20 (M_{age} = 19, SD_{age} = 0.63). Participants were primarily female (90%) and self-reported ethnicity was as follows: White = 80%, American

Indian = 10%, and Other = 10%. All participants were single and never married and 50% of participants had at least one job. When asked, 30% of participants indicated that they had previously practiced regular mindfulness such as meditation or yoga. The majority of the sample (80%) disclosed regular exercise for at least an hour at a time and most (80%) reported either walking or biking to classes. Of the 10 participants, 60% indicated they eat at home most nights and 80% indicated they drink at least 8 glasses of water a day. 70% of participants reported getting seven or more hours of sleep a night regularly. One participant reported regular nicotine or tobacco use.

Five participants completed the research protocol. These participants were all female ranging in age from 18 to 20 (M_{age} = 19.2, SD_{age} = 0.75) and reported the following racial/ethnic background: White = 80% and Other = 20%. All participants had at least one job and reported being single/never married. When asked, 40% of participants indicated they previously practiced regular mindfulness such as meditation or yoga. Eighty percent of the sample reported regular exercise for at least an hour at a time and 60% of the sample reported either walking or biking to classes. Additionally, 80% indicated they eat at home most nights and 80% indicated they drink at least 8 glasses of water a day. Most participants (60%) reported seven or more hours of sleep a night.

Measures

Eligibility Survey

This brief survey, developed for the present study, was used to assess eligibility requirements as described above, using 4 dichotomous Yes-No scaled items (No = 0; Yes =1; see Appendix A).

Demographics Questionnaire

The demographics questionnaire, standardized for use in the research laboratory, was used to assess sex, gender identity, age, ethnic background, self-identity, education level completed, student status, employment status, and other related questions (see Appendix B).

Perceived Stress Scale (PSS; Cohen et al., 1983)

The PSS is a 10-item self-report measure of an individual's perceived stress (see Appendix C). Example items include: "In the last month, how often have you been upset because of something that happened unexpectedly?" and "In the last month, how often have you been able to control irritations in your life?". Participants report past-month stress using a 5-point Likert-type response scale (0 = *Never* to 4 = *Very Often*). Total stress (Range = 0-40) is calculated by reverse-coding positively worded items and summing all items. High PSS scores indicate high perceived stress (Andreou et al., 2011; Cohen et al., 1983; Kechter et al., 2019). A meta-analysis examining the internal consistency and test-retest reliability indicated the PSS has acceptable reliability (α = >.70; Lee, 2012). Furthermore, the PSS correlates in theoretically consistent ways with other measures of stress, suggesting adequate validity (Lee & Jeong, 2019). The internal consistency of pre- (α_{pre} = .85) and post-PSS scores (α_{post} = .76) for the current sample was acceptable.

Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006)

The FFMQ is a 39-item self-report measure of five aspects of mindfulness: observing; describing; acting with awareness; nonjudging; and nonreactivity (see Appendix D). Example items include: "When I'm walking, I deliberately notice the sensations of my body moving"; "I am easily distracted"; and "I pay attention to how my emotions affect my thoughts and behavior." Participants respond to items using a 5-point Likert-type response scale (1 = *Never or*

very rarely to 5 = *Very often or always true*). Facet scores (Range = 1-5) are calculated by reverse-coding responses to negatively worded items and averaging all items, with high scores indicating high mindfulness. The reliability of the FFMQ is adequate (αs = 0.86-0.93), the measure correlates as expected with measures of similar constructs (Christopher et al., 2012), and the FFMQ has good construct validity (Baer et al., 2006; Baer et al., 2008). The internal consistency of pre- (α = .88) and post-FFMQ scores (α = .84) for the current sample was acceptable.

Daily Diary Questionnaire

A daily questionnaire developed for the present study was used to assess mindfulness practice adherence and eating behavior (see Appendix E). Mindfulness adherence was assessed with the item "Did you complete the 10-minute mindfulness meditation today?" (No = 0; Yes = 1). Participants reported their daily food intake by responding to the following item: "How many servings of each of the following food categories have you eaten today?", as described in Nutritional Journaling, below. Healthy nutritional choices were calculated as the average daily fruit, vegetable, and protein servings across all daily diary surveys.

Interventions

Mindfulness Meditation Practice

A 10-minute, recorded audio exercise previously validated with college students (Berghoff et al., 2017) was used in the current study. This guided mindfulness meditation is representative of Mindfulness-Based Stress Reduction interventions (Kabat-Zinn, 1990) and begins with asking the listener to find a comfortable, but attentive seated position and closing their eyes. The recording then instructs listeners to direct attention to their breath, non-judgmentally notice when their mind wanders from the breath, and gently return attention to the

breath when this happens. Generally, the exercise guides listeners to be attentive to the present moment with specific emphasis on compassion and acceptance towards oneself. The exercise ends with a reminder to maintain mindfulness throughout the day.

Comparison Exercise

The comparison exercise consisted of a nutritional-information video acquired from https://www.youtube.com/watch?v=MYIAdd2Z9Mc. This video, created by the U.S. Food and Drug Administration, discusses the importance of reading food labels and identifies strategies for effectively interpreting food label information. The video presents information regarding portion sizing, the nutritional value of food, and how to adhere to portion sizes (U.S. Food and Drug Administration, 2011). The original video (28-min and 47-sec) was edited to 12-min and 17-sec to better match the duration of the mindfulness meditation audio.

Nutritional Journaling

The nutritional diary was completed as part of the daily diary assessment, as described above (also, see Appendix E). Participants provided numerical responses to the following food categories: fruit; vegetables; meat; sugar; carbohydrates; and dairy. Participants were provided serving size examples for each category.

Procedure

All procedures were approved by the local Institutional Review Board. Interested individuals were directed to the experimental website (www.MyMindfulDays.com), where they provided informed consent and responded to the eligibility questionnaire. Ineligible participants were presented a webpage that informed them of their status, thanked them for their time, and instructed them to close their browser window to help protect privacy. Eligible participants were

provided the opportunity to schedule an in-person experimental session using the experimental website.

Experimental sessions were held in a group format, with a maximum capacity for each being 15. First, participants created a password protected secure personal account on the experimental website, during which time they were randomly assigned (automatically performed by the experimental website using a previously generated random number table) to the experimental (mindfulness meditation + journaling) versus comparison (nutritional information + journaling) group. Second, participants again provided informed consent. Third, participants received instructions regarding the functionality of the website (e.g., personal information maintenance; how to access daily surveys). Fourth, participants completed a pre-intervention assessment battery that included self-report questionnaires of mindfulness and stress, in addition to several measures not related to the present research project. Fifth, participants learned the procedure for daily recording of nutritional information used throughout the research study.

Sixth, following survey completion by all attendees, participants were separated by assigned condition, with one group (randomly assigned each session) moving to a separate room for participation in the experimental exercise. The experimental group received a brief rationale and instructions regarding the mindfulness exercise, learned the mindfulness exercise, and were asked to practice the exercise daily for the next two weeks. The comparison group viewed the nutritional-information video. All participants were asked to complete the nutritional record and daily diary for two weeks. Participants received an email and text message (if opted in) at 5 PM daily, which provided a unique link to the daily diary and nutritional tracking survey. Each daily survey needed to be completed by 2 AM, after which time access to the day's survey was removed.

Following the two-week period, participants were asked to complete a follow-up assessment battery identical to that completed pre-intervention. This survey could be completed in the laboratory or at home using a unique hyperlink delivered to participants' email addresses. Completion of the post-intervention survey marked the end of participation.

Participants were compensated by way of prorated SONA research credit and entries to win one of three $200 gift cards. Eight SONA credits were awarded for the completion of the initial 1-hour experimental session. Participants were granted three SONA credits for the completion of the follow-up survey, which was estimated to require 30-min to complete. One SONA credit was awarded for every daily diary completed, for fourteen possible credits. A total of twenty-five SONA credits were possible for the completion of every part of the study. Moreover, participants were awarded three drawing entries for completing each of the pre and follow-up surveys, one entry for every daily diary completed, and a bonus three entries for completing all study surveys.

Results

Data Cleaning and Preparation

Initial data screening was completed using SPSS. Distributions were determined to be normal based upon visual inspection of frequency distributions. In addition, no outliers were identified (i.e., ±3.29 *SD* from the mean; Tabachnick & Fidell, 2013).

Descriptive statistics are presented in Table 1. FFMQ and PSS scores indicated average levels of mindfulness and perceived stress relative to scores reported by similar samples (Frick et al., 2011; Lemay et al., 2018; Pang & Ruch, 2018 Sampath et al., 2019). The two participants assigned to the mindfulness condition reported moderate practice of the exercise (8 and 10 out of 14 days, respectively). Average daily consumption of fruit, vegetables, and protein for the

current sample was low. Per USDA recommendations, adults should consume at least 1 ½ to 2 servings per day of fruit, 2 to 3 servings per day of vegetables, and 5 to 6 servings of protein per day (U.S. Department of Agriculture, 2019). The current sample reported on average 1.82 servings of all three combined per day. Of note, participants reported low average daily servings of all other food categories as well, $M = 2.48$, $SD = 0.86$.

Primary Analyses

Independent samples t-tests were conducted to determine if baseline mindfulness and perceived stress scores differed across experimental groups. Baseline mindfulness scores were not significantly different across groups, $t(8) = 1.15$, $p = 0.29$ Baseline perceived stress scores were also not significantly different across groups, $t(8) = -1.23$, $p > .0.25$.

To examine differences in mindfulness and perceived stress across time and between groups, two independent 2 (pre-intervention vs. follow-up) x 2 (experimental vs. comparison condition) repeated measures analyses of covariances were used. There was no significant difference in mindfulness across time, $F(1, 3) = 0.25$, $p = .65$, though the effect size was moderate, $\eta_p^2 = . 08$. There was no overall significant difference in mindfulness between groups across time $F(1, 3) = 0.40$, $p = .57$ and the effect size was moderate, $\eta_p^2 = .12$. There was a significant difference in perceived stress across time, $F(1, 3) = 12.63$, $p = 0.04$, and the effect size was large, $\eta_p^2 = .81$. However, there was no overall significant difference in perceived stress between groups across time, $F(1, 3) = 0.13$, $p = .75$, and the effect size was small, $\eta_p^2 = 0.04$. Finally, results of an independent samples t-test indicated a large but non-significant difference in average healthy eating behavior across groups, $t(8) = 1.388$, $p = 0.20$ $d = 0.88$.

Table 1

Descriptive statistics

	Condition	*M*	*SD*	*N*
FFMQ Pre Scores	Mindfulness	3.31	0.32	5
	Video	2.95	0.61	5
	Total	3.13	0.50	10
FFMQ Post Scores	Mindfulness	3.34	0.60	2
	Video	2.96	0.47	3
	Total	3.11	0.50	5
PSS Pre Scores	Mindfulness	18.60	5.86	5
	Video	23.40	6.43	5
	Total	21.00	6.32	10
PSS Post Scores	Mindfulness	19.50	9.19	2
	Video	23.33	3.21	3
	Total	21.80	5.54	5
Average Eating	Mindfulness	2.08	0.73	5
Behaviors	Video	1.56	0.40	5
	Total	1.82	0.62	10

Note. FFMQ = Five Facet Mindfulness Questionnaire; PSS = Perceived Stress Scale.

Discussion

Extant research indicates college students experience new and frequent stressors, such as new surroundings and increased responsibilities (Karatekin, 2018), which contribute to increased risk for high perceived stress. Such high stress can lead to the adoption of coping behaviors such as poor nutritional habits (e.g., emotional eating) that, in turn, can lead to negative long-term consequences (e.g., weight gain; Bennett et al., 2013; Smith-Jackson & Reel, 2012). Mindfulness meditation has been shown to have beneficial physiological and psychological effects for individuals who establish regular practices, including reduced stress, reductions in unhelpful coping behaviors, and improved overall eating habits (Corsica et al., 2014; Levoy et al., 2017; Nelson, 2017; Van der Zwan et al., 2015). Yet, minimal research has examined such relations in college students. The current study aimed to fill this gap by identifying the effect of the establishment of a two-week daily mindfulness practice on perceived stress and positive nutritional habits relative to a nutrition-information comparison condition in an undergraduate sample. Despite evidence of several moderate to large effect sizes, hypotheses were generally not supported in the present study. Of note, statistical analyses were likely negatively impacted by low recruitment and study completion by just 5 participants.

Our first hypothesis, that participants randomly assigned to the mindfulness meditation intervention would provide higher follow-up mindfulness scores relative to comparison condition participants, was not supported. As such, it appears practicing mindfulness meditation for two weeks did not result in higher levels of mindfulness relative to that of the nutrition-information comparison condition. Although findings from the current study were insignificant, we observed moderate effect sizes for changes in mindfulness over time and between groups. Notably, past research indicates engagement in mindfulness meditation practices, as part of large treatment

packages or the establishment of a brief personal mediation practice, likely leads to increased self-reported mindfulness (Shapiro et al., 1998; Collard et al., 2008). As such, the present study may not provide an accurate statistical analysis of the effect of meditation on self-reported mindfulness. Though this may be due to our small sample size, the present study also does not rule out the possibility that additional treatment components may be needed to engender changes in mindfulness. Another reason for this could be that participants did not spend enough time practicing the mindfulness meditation exercise. Of all the participants, only two reported a moderately consistent practice. Because of this lack of practice, participants may not have benefited from the practice as intended. Future research could explore the possible effects of mindfulness through the implementation of mindfulness meditation practices as a portion of a treatment rather than a standalone intervention.

The hypothesis that participants randomly assigned to the mindfulness meditation intervention would report lower follow-up perceived stress relative to participants in the nutrition-information comparison condition was also not supported. Hence, practicing mindfulness meditation for two weeks did not result in changes in perceived stress relative to that of the nutrition-information comparison condition. Although findings of this study appear inconclusive due to sample size and other limitations, a large effect of time on perceived stress, regardless of practice, was detected. Previous studies indicate that mindfulness meditation led to reports of decreased perceived stress over time for those who engaged in the practice (Berghoff et al., 2017; Van der Zwan et al., 2015; Zollars et al., 2019). Unlike the current study, these studies provided participants with further psychoeducation and examined additional variables such as adherence to mindfulness practice and time spent practicing. Providing psychoeducation may have strengthened the present effects. Assessment and control of potential confounding

variables may clarify if participants adequately engage in their practice. Future studies should consider the implementation of these additional variables to best understand the relation between mindfulness and perceived stress.

However, results indicated perceived stress declined from pre- to post-assessment in the sample overall. Although not as hypothesized, this decrease may be attributed to factors within the study that both conditions experienced. For example, participants were asked about their stress daily. Bringing attention to this may have allowed them to reach some level of acceptance of their stress. This unexpected result may also be due to factors external to the current study. The majority of participants began the study during semester midterms and concluded the study on spring break. Because of this, many participants may have been experiencing higher levels of stress at the beginning of the study due to midterm tests, projects, and assignments. Conversely, stress levels may have been lower at the final assessment point due to alleviation of school-related stressors during the spring break period. These factors may have resulted in undue influences on reported scores. Future studies that obtain data from more participants gathered across different timepoints in the school semester may clarify the contribution of these factors to reports of decreased stress over time.

The hypothesis that participants randomly assigned to the mindfulness meditation intervention would report more overall positive nutritional choices relative to participants in the nutrition-information comparison condition was not supported. As such, practicing mindfulness for two weeks did not result in changes in eating behaviors compared to the nutrition-information comparison group. Upon review of reported food consumption, it was observed that participants underreported across all categories. This may be due to participants incorrectly completing the food journaling task or influence from extraneous variables, such as dieting. The majority of

participants began the study two weeks prior to spring break, which may be a common time for dieting and may explain the low reported nutritional intake. For example, extant studies have found that when asking women their reasons for dieting, vacation was commonly listed (Ogle & Damhorst, 2000). Thus, students may have changed their eating behavior in response to the coming break. Additional studies should collect data from participants throughout the school year and at times when student diets are typically more regular.

Yet, it is important to note that a large effect size was associated with the effect of group assignment on eating behaviors, suggesting mindfulness interventions may result in increased positive nutritional choices. However, more research is needed to substantiate this conclusion due to the lack of significance in eating behavior change across groups observed in the present study. For example, prior research that explored the effect of mindfulness meditation on emotional eating used an objective eating behavior task and indicated mindfulness practice was associated with decreased eating in the absence of hunger, increased non-snack food consumption, and decreased consumption of foods with poor nutritional value (Pivarunas et al. 2015). In the current study, these additional variables were not examined, which may have hindered our ability to fully understand the mindfulness-eating relation. Therefore, inclusion of objective behavioral tasks in future research may support better identification of the effects of brief mindfulness meditation practices on eating behavior.

There were several limitations of the current study. First, as noted above, the sample size was quite small. Initial power analyses indicated 120 participants were required to achieve adequate statistical power, yet only 10 participants enrolled in the current study and just five completed both the pre and post survey batteries, which negatively impacted our ability to detect statistically significant effects. Notably, extenuating circumstances related to the COVID-19

pandemic prevented sufficient participant recruitment. As such, the proposed number of participants was not reached prior to termination, leading to lack of necessary power. Second, participants were required to have a campus meal plan, which likely contributed to the sample including participants all 20 years of age or younger. Thus, findings may not generalize to upperclassmen or nontraditional students. The current study also recruited from a general population, potentially not including students who were struggling with stress, experiencing physical health issues, exhibiting negative eating behaviors, or seeking treatment. Future studies should target diverse students at all points in their college career, while recruiting samples large enough to provide sufficient power to detect significant effect, to determine if meditation practices are applicable to students of different backgrounds and experiences.

Conclusions are also limited by characteristics of the experimental conditions. For example, our nutrition-information comparison condition has not been validated in prior research. Accordingly, we are unable to determine if the implemented comparison task affected participants such that effects of mindfulness meditation were masked. Use of a validated comparison condition in future research may clarify such comparisons. In addition, the mindfulness meditation exercise was a general practice exercise. Though extant research indicates general mindfulness practices appear to have positive effects on eating behavior (Tapper, 2017; Arch et al., 2016), provision of an eating-focused meditation exercise to participants may lead to clarity regarding the effect of brief mediation exercises on such behaviors. It should also be noted that the meditation group learned one general meditation practice and were asked to practice this for 14 days. Though the exercise provided to participants was previously validated in similar research designs and samples used presently, and appears to lead to reduced stress (Berghoff et al., 2017), participants may have become bored with or

desensitized to the exercise. If so, this may have reduced participant compliance with the study protocol or limited the effect of the meditation practice. Future studies may benefit from making more than one audio mindfulness exercise available. Likewise, future studies may benefit from comparing the effect of alternative methods of mindfulness practices (e.g., journaling, yoga), which appear to have positive effects on eating behaviors (Ayobi et al., 2018; Medina et al., 2015).

Measurement characteristics also represent a limitation of the current study. Only self-report measures were used to assess mindfulness, perceived stress, and eating habits. Data may have been affected by self-report bias, such that participants may have inaccurately reported their food intake, stress, or mindful habits. Furthermore, results could be impacted by common-method variance, such that relations may be inflated. Use of other methods of measurement, such as behavioral observation or laboratory tasks, may provide more objective measurements of stress, mindfulness, and eating habits. For example, stress could be measured with saliva cortisol or breath counting tasks (Levinson et al., 2014). Finally, our assessment of daily nutrition, which was developed for the current study, may have been too complex and has yet to be validated. Though potentially problematic, hypotheses for the current study required measurements of self-reported servings of specific food types (e.g. protein, vegetables, fruits), leading to the decision to create a measure that would allow for a numerical report of healthy food consumption by participants. As noted above, participants reported unusually low food servings, suggesting they may not have understood the measure or that additional training regarding tracking eating behaviors may be needed. Other scales, such as the Three Factor Easting Questionnaire (TFEQ; Stunkard & Messick, 1985), measure eating behaviors through general attitudes towards food and eating habits, which may provide for a streamlined measurement method of eating related

constructs. Future directions could include the examination of the effect of mindfulness practice on these other factors or the validation of the measure developed for this study.

The present study is the first to evaluate the effect of the establishment of a 2-week personal meditation practice on healthy eating behavior in college students. Though hypotheses were not supported, inspection of effect sizes revealed potential avenues for future research. By examining the effect sizes, we were able to note that changes in mindfulness across time and between groups did indeed show moderate effect sizes and perceived stress across time showed large effect sizes, however we were not able to determine significance. We also noted that changes in eating behaviors over time had a large effect size but, again, we cannot determine significance. More adequately powered research may lead to stronger conclusions regarding the effect of meditation on self-reported mindfulness and stress, as well as healthy eating behavior. Future clarification of these relations could inform the development of mindfulness-oriented exercises or training programs that lead to increased mindfulness, reduced stress, and improved eating behavior for college students.

References

Adler, E., Dhruva, A., Moran, P. J., Daubenmier, J., Acree, M., Epel, E. S., Bacchetti, P., Prather, A. A., Mason, A., & Hecht, F. M. (2017). Impact of a mindfulness-based weight-loss intervention on sleep quality among adults with obesity: Data from the SHINE randomized controlled trial. *The Journal of Alternative and Complementary Medicine*, *23*(3), 188–195. https://doi.org/10.1089/acm.2016.0141

Andreou, E., Alexopoulos, E. C., Lionis, C., Varvogli, L., Gnardellis, C., & Chrousos, G. P., & Darviri, C. (2011). Perceived stress scale: Reliability and validity study in Greece. *International Journal of Environmental Research and Public Health, 8*(8), 3287–3298. https://doi.org/10.3390/ijerph8083287

Arch, J. J., Brown, K. W., Goodman, R. J., Della Porta, M. D., Kiken, L. G., & Tillman, S. (2016). Enjoying food without caloric cost: The impact of brief mindfulness on laboratory eating outcomes. *Behaviour Research and Therapy*, *79*, 23–34. https://doi.org/10.1016/j.brat.2016.02.002

Ayobi, A., Sonne, T., Marshall, P., & Cox, A. L. (2018). Flexible and mindful self-tracking. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems - CHI '18*. https://doi.org/10.1145/3173574.3173602

Baer, R. A., Carmody, J., & Hunsinger, M. (2012). Weekly Change in Mindfulness and Perceived Stress in a Mindfulness-Based Stress Reduction Program. *Journal of Clinical Psychology*, *68*(7), 755–765. https://doi.org/10.1002/jclp.21865

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

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., Walsh, E., Duggan, D., & Williams, J. M. G. (2008). Construct validity of the Five Facet Mindfulness Questionnaire in meditating and nonmeditating samples. *Assessment, 15*(3), 329–342. https://doi.org/10.1177/1073191107313003

Bahl, S., Milne, G. R., Ross, S. M., & Chan, K. (2013). Mindfulness: A long-term solution for mindless eating by college students. *Journal of Public Policy & Marketing, 32*(2), 173–184. https://doi.org/10.1509/jppm.11.008

Ball, K., Schoenaker, D. A. J. M., & Mishra, G. D. (2017). Does psychosocial stress explain socioeconomic inequities in 9-year weight gain among young women?. *Obesity, 25*(6), 1109–1114. https://doi.org/10.1002/oby.21830

Bennett, J., Greene, G., & Schwartz-Barcott, D. (2013). Perceptions of emotional eating behavior. A qualitative study of college students. *Appetite, 60*, 187–192. https://doi.org/10.1016/j.appet.2012.09.023

Berghoff, C. R., Wheeless, L. E., Ritzert, T. R., Wooley, C. M., & Forsyth, J. P. (2017). Mindfulness meditation adherence in a college sample: Comparison of a 10-min versus 20-min 2-week daily practice. *Mindfulness, 8*, 1513-1521. https://doi.org/10.1007/s12671-017-0717-y

Block, J. P., He, Y., Zaslavsky, A. M., Ding, L., & Ayanian, J. Z. (2009). Psychosocial stress and change in weight among US adults. *American Journal of Epidemiology*, *170*(2), 181–192. https://doi.org/10.1093/aje/kwp104

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*(4), 822–848. https://doi.org/10.1037/0022-3514.84.4.822

Campillo, E., Ricarte, J. J., Ros, L., Nieto, M., & Latorre, J. M. (2018). Effects of the visual and auditory components of a brief mindfulness intervention on mood state and on visual and auditory attention and memory task performance. *Current Psychology: A Journal for Diverse Perspectives on Diverse Psychological Issues, 37*(1), 357–365. https://doi.org/10.1007/s12144-016-9519-y

Carroll, H., & Lustyk, M. K. B. (2018). Mindfulness-based relapse prevention for substance use disorders: Effects on cardiac vagal control and craving under stress. *Mindfulness, 9*(2), 488–499. https://doi.org/10.1007/s12671-017-0791-1

Chen, S., & Jordan, C. H. (2018). Incorporating ethics into brief mindfulness practice: Effects on well-being and prosocial behavior. *Mindfulness*. https://doi.org/10.1007/s12671-018-0915-2

Christopher, M. S., Neuser, N. J., Michael, P. G., & Baitmangalkar, A. (2012). Exploring the psychometric properties of the Five Facet Mindfulness Questionnaire. *Mindfulness, 3*, 124-131. https://doi.org/10.1007/s12671-011-0086-x

Clevenger, K. A., Pfeiffer, K. A., Yee, K. E., Triplett, A. N., Florida, J., & Selby, S. (2018). Mindfulness and children's physical activity, diet, quality of life, and weight status. *Mindfulness, 9*(1), 221–229. https://doi.org/10.1007/s12671-017-0765-3

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

Collard, P., Avny, N., & Boniwell, I. (2008). Teaching Mindfulness Based Cognitive Therapy (MBCT) to students: The effects of MBCT on the levels of mindfulness and subjective well-being. *Counselling Psychology Quarterly, 21*(4), 323–336. https://doi.org/10.1080/09515070802602112

Consedine, N. S., & Butler, H. F. (2013). Mindfulness, health symptoms and healthcare utilization: Active facets and possible affective mediators. *Psychology, Health & Medicine, 19*(4), 392–401. https://doi.org/10.1080/13548506.2013.824596

Corsica, J., Hood, M. M., Katterman, S., Kleinman, B., & Ivan, I. (2014). Development of a novel mindfulness and cognitive behavioral intervention for stress-eating: A comparative pilot study. *Eating Behaviors, 15*(4), 694–699. https://doi.org/10.1016/j.eatbeh.2014.08.002

Davidson, R. J., & Kaszniak, A. W. (2015). Conceptual and methodological issues in research on mindfulness and meditation. *American Psychologist, 70*, 581–592. https://doi.org/10.1037/a0039512

Ditto, B., Eclache, M., & Goldman, N. (2006). Short-term autonomic and cardiovascular effects of mindfulness body scan meditation. *Annals of Behavioral Medicine, 32*(3), 227–234. https://doi.org/10.1207/s15324796abm3203_9

Ebrecht, M., Hextall, J., Kirtley, L.-G., Taylor, A., Dyson, M., & Weinman, J. (2004). Perceived stress and cortisol levels predict speed of wound healing in healthy male adults. *Psychoneuroendocrinology, 29*(6), 798–809. https://doi.org/10.1016/s0306-4530(03)00144-6

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149-1160.

Feliu, S. A., Pascual, J. C., Borràs, X., Portella, M. J., Martín, B. A., Armario, A., Alvarez, E., Pérez, V., & Soler, J. (2014). Effects of dialectical behaviour therapy-mindfulness training on emotional reactivity in borderline personality disorder: Preliminary

results. *Clinical Psychology & Psychotherapy*, *21*(4), 363–370. https://doi.org/10.1002/cpp.1837

Finkelstein-Fox, L., Park, C. L., & Riley, K. E. (2018). Mindfulness' effects on stress, coping, and mood: A daily diary goodness-of-fit study. *Emotion*. https://doi.org/10.1037/emo0000495

Fissler, M., Winnebeck, E., Schroeter, T., Gummersbach, M., Huntenburg, J. M., Gaertner, M., & Barnhofer, T. (2016). An investigation of the effects of brief mindfulness training on self-reported interoceptive awareness, the ability to decenter, and their role in the reduction of depressive symptoms. *Mindfulness, 7*(5), 1170–1181. https://doi.org/10.1007/s12671-016-0559-z

Frick, L. J., Frick, J. L., Coffman, R. E., & Dey, S. (2011). Student stress in a three-year doctor of pharmacy program using a mastery learning educational model. *American Journal of Pharmaceutical Education, 75*(4), 64. https://doi.org/10.5688/ajpe75464

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of meditation studies. *Clinical Psychology Review, 37*, 1-12. https://doi.org/10.1016/j.cpr.2015.01.006

Harding, J. L., Backholer, K., Williams, E. D., Peeters, A., Cameron, A. J., Hare, M. J., Shaw, J. E., & Magliano, D. J. (2014). Psychosocial stress is positively associated with body mass index gain over 5 years: Evidence from the longitudinal AusDiab study. *Obesity*, *22*(1), 277–286. https://doi.org/10.1002/oby.20423

Hayes, S. C., Strosahl, K., & Wilson, K. G. (1999). *Acceptance and Commitment Therapy: An experiential approach to behavior change.* Guilford Press.

Heslop, P., Smith, G. D., Carroll, D., Macleod, J., Hyland, F., & Hart, C. (2001). Perceived stress and coronary heart disease risk factors: The contribution of socio-economic position. *British Journal of Health Psychology, 6*(2), 167–178. https://doi.org/10.1348/135910701169133

Hirsch, J. K., Rabon, J. K., Reynolds, E. E., Barton, A. L., & Chang, E. C. (2019). Perceived stress and suicidal behaviors in college students: Conditional indirect effects of depressive symptoms and mental health stigma. *Stigma and Health, 4*(1), 98–106. https://doi.org/10.1037/sah0000125

Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on Psychological Science, 6*(6), 537–559. https://doi.org/10.1177/1745691611419671

Hudson, J. I., Hiripi, E., Pope, H. G., & Kessler, R. C. (2007). The prevalence and correlates of eating disorders in the national comorbidity survey replication. *Biological Psychiatry, 61*, 348–358. https://doi.org/10.1016/j.biopsych.2006.03.04

IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.

Johnson, K. T., Merritt, M. M., Zawadzki, M. J., Di Paolo, M. R., & Ayazi, M. (2019). Cardiovascular and affective responses to speech and anger: Proactive benefits of a single brief session of mindfulness meditation. *Journal of Applied Biobehavioral Research*. https://doi.org/10.1111/jabr.12167

Karatekin, C. (2018). Adverse childhood experiences (ACEs), stress and mental health in college students. *Stress and Health: Journal of the International Society for the Investigation of Stress, 34,* 36–45. https://doi.org/10.1002/smi.2761

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness*. Dell.

Kabat-Zinn, J. (1994). *Wherever you go, there you are*. Hyperion.

Kabat-Zinn, J. (1996). Mindfulness meditation: What it is, what it isn't, and its role in health care and medicine. In Y. Haruki, Y. Ishii, & M. Suzuki (Eds.), *Comparative and psychological study on meditation* (pp. 161-169). Eubron.

Kechter, A., Black, D. S., Riggs, N. R., Warren, C. M., Ritt-Olson, A., Chou, C. P., & Pentz, M. A. (2019). Factors in the perceived stress scale differentially associate with mindfulness disposition and executive function among early adolescents. *Journal of Child and Family Studies 28*, 814–821. https://doi.org/10.1007/s10826-018-01313-4

Kerin, J. L., Webb, H. J., & Zimmer-Gembeck, M. J. (2017). Resisting the temptation of food: Regulating overeating and associations with emotion regulation, mindfulness, and eating pathology. *Australian Journal of Psychology, 70*(2), 167–178. https://doi.org/10.1111/ajpy.12169

Larson, N., Hannan, P. J., Fulkerson, J. A., Laska, M. N., Eisenberg, M. E., & Neumark-Sztainer, D. (2014). Secular trends in fast-food restaurant use among adolescents and maternal caregivers from 1999 to 2010. *American Journal of Public Health, 104*(5), e62–e69. https://doi.org/10.2105/AJPH.2013.301805

Lee, B. & Jeong, H. (2019). Construct validity of the Perceived Stress Scale (PSS-10) in a sample of early childhood teacher candidates. *Psychiatry and Clinical Psychopharmacology, 29*(1), 76-82. https://doi.org/10.1080/24750573.2019.1565693

Lee, E. H. (2012). Review of the psychometric evidence of the perceived stress scale. *Asian Nursing Research*, *6*(4), 121-127.

Lemay, V., Hoolahan, J., & Buchanan, A. (2018). SAMYAMA: Stress, Anxiety, and Mindfulness; A Yoga and Meditation Assessment. *American Journal of Pharmaceutical Education*. https://doi.org/10.5688/ajpe7001

Levinson, D. B., Stoll, E. L., Kindy, S. D., Merry, H. L., & Davidson, R. J. (2014). A mind you can count on: Validating breath counting as a behavioral measure of mindfulness. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.01202

Levoy, E., Lazaridou, A., Brewer, J., & Fulwiler, C. (2017). An exploratory study of Mindfulness Based Stress Reduction for emotional eating. *Appetite, 109*, 124–130. https://doi.org/10.1016/j.appet.2016.11.029

Linehan MM. *Cognitive-Behavioral Treatment of Borderline Personality Disorder*. New York, NY: Guilford Press; 1993.

Medina, J., Hopkins, L., Powers, M., Baird, S. O., & Smits, J. (2015). The effects of a Hatha yoga intervention on facets of distress tolerance. *Cognitive Behaviour Therapy, 44*(4), 288–300. https://doi.org/10.1080/16506073.2015.1028433

Malinowski, P., Moore, A. W., Mead, B. R., & Gruber, T. (2017). Mindful aging: The effects of regular brief mindfulness practice on electrophysiological markers of cognitive and affective processing in older adults. *Mindfulness, 8*(1), 78–94. https://doi.org/10.1007/s12671-015-0482-8

Miller, C. J., Elder, K., & Scavone, A. (2017). The feasibility of bringing brief mindfulness-based training to the university classroom. *Mindfulness, 8*(4), 1047–1054. https://doi.org/10.1007/s12671-017-0680-7

Nelson J. B. (2017). Mindful eating: The art of presence while you eat. *Diabetes Spectrum, 30*(3), 171–174. https://doi.org/10.2337/ds17-0015

Nguyen, B. T., Shuval, K., Bertmann, F., & Yaroch, A. L. (2015). The supplemental nutrition assistance program, food insecurity, dietary quality, and obesity among US adults. *American Journal of Public Health, 105*(7), 1453–1459. https://doi.org/10.2105/AJPH.2015.302580

Naumann, E., Svaldi, J., Wyschka, T., Heinrichs, M., & von Dawans, B. (2018). Stress-induced body dissatisfaction in women with binge eating disorder. *Journal of Abnormal Psychology, 127*(6), 548–558. https://doi.org/10.1037/abn0000371

Ogle, J. P., & Damhorst, M. L. (2000). Dieting among adolescent girls and their mothers: An interpretive study. *Family and Consumer Sciences Research Journal, 28(4), 428–462.* doi:10.1177/1077727x00284002

Pang, D., & Ruch, W. (2018). Scrutinizing the components of mindfulness: Insights from current, past, and non-meditators. *Mindfulness, 10*(3), 492–505. https://doi.org/10.1007/s12671-018-0990-4

Pivarunas, B., Kelly, N. R., Pickworth, C. K., Cassidy, O., Radin, R. M., Shank, L. M., Vannucci, A., Courville, A. B., Chen, K. Y., Tanofsky-Kraff, M., Yanovski, J. A., & Shomaker, L. B. (2015). Mindfulness and eating behavior in adolescent girls at risk for type 2 diabetes. *International Journal of Eating Disorders, 48*(6), 563–569. https://doi.org/10.1002/eat.22435

Pogrebtsova, E., Craig, J., Chris, A., O'Shea, D., & González, M. M. G. (2018). Exploring daily affective changes in university students with a mindful positive reappraisal intervention: A daily diary randomized controlled trial. *Stress and Health, 34*(1), 46–58. https://doi.org/10.1002/smi.2759

Reynolds, M., Driver, S., & Bennett, M. (2018). The social network—Using social media to support individuals with traumatic brain injury participating in a pilot study weight-loss program. *Brain Injury, 32*(12), 1450–1454. https://doi.org/10.1080/02699052.2018.1496480

Rhee, K. E., Pan, T. Y., Norman, G. J., Crow, S., & Boutelle, K. (2013). Relationship between maternal parenting and eating self-efficacy in overweight children when stressed. *Eating and Weight Disorders, 18,* 283–288. https://doi.org/10.1007/s40519-013-0043-x

Sampath, H., Biswas, A. G., Soohinda, G., & Dutta, S. (2019). Mindfulness and its role in psychological well-being among medical college students. *Open Journal of Psychiatry & Allied Sciences, 10*(1), 52. https://doi.org/10.5958/2394-2061.2019.00013.

Sengal, Z. V., Williams, M. G., Tesdale, J. D. (2001). *Mindfulness-based cognitive therapy for depression: A new approach to preventing relapse.* Guilford Press.

Shapiro, S. L., Schwartz, G. E., & Bonner, G. (1998). Effects of Mindfulness-Based Stress Reduction on medical and premedical students. *Journal of Behavioral Medicine, 21*(6), 581–599. https://doi.org/10.1023/a:1018700829825

Shonin, E., Van Gordon, W., & Griffiths, M. D. (2013). Mindfulness-based interventions: Towards mindful clinical integration. *Frontiers in Psychology,* 4. https://doi.org/10.3389/fpsyg.2013.00194

Sigfusdottir, I. D., Kristjansson, A. L., Thorlindsson, T., & Allegrante, J. P. (2017). Stress and adolescent well-being: The need for an interdisciplinary framework. *Health Promotion International*, *32*, 1081–1090. https://doi.org/10.1093/heapro/daw038

Smith-Jackson, T., & Reel, J. J. (2012). Freshmen women and the "freshman 15": Perspectives on prevalence and causes of college weight gain. *Journal of American College Health*, *60*(1), 14–20. https://doi.org/10.1080/07448481.2011.555931

Stella, M. (2016). Befriending death: A mindfulness-based approach to cultivating self-awareness in counselling students. *Death Studies, 40*(1), 32–39. https://doi.org/10.1080/07481187.2015.1056566

Stunkard, A. J., & Messick, S. (1985). The three-factor eating questionnaire to measure dietary restraint, disinhibition and hunger. *Journal of Psychosomatic Research, 29*(1), 71–83. https://doi.org/10.1016/0022-3999(85)90010-8

Tapper, K. (2017). Can mindfulness influence weight management related eating behaviors? If so, how? *Clinical Psychology Review*, *53*, 122–134. https://doi.org/10.1016/j.cpr.2017.03.003

Torres, S. J., & Nowson, C. A. (2007). Relationship between stress, eating behavior, and obesity. *Nutrition*, *23*(11-12), 887–894. https://doi.org/10.1016/j.nut.2007.08.008

Tsai, A. G. & Wadden T. A. (2005). Systematic review: An evaluation of major commercial weight loss programs in the united states. *Yearbook of Endocrinology, 2006*, 153–157. https://doi.org/10.1016/s0084-3741(08)70338-x

USD Student Information System. *Enrollment Dashboard*. (2019). Retrieved from https://www.usd.edu/institutional-research/enrollment-dashboard

U.S. Department of Agriculture. (2019). *Choose My Plate.* https://www.choosemyplate.gov/eathealthy/start-simple-myplate

U.S. Food and Drug Administration. (2011, February). *The food label and you* [Video File]. Retrieved from https://www.youtube.com/watch?v=MYIAdd2Z9Mc

Valenstein-Mah, H., Simpson, T. L., Bowen, S., Enkema, M. C., Bird, E. R., In Cho, H., & Larimer, M. E. (2019). Feasibility pilot of a brief mindfulness intervention for college students with posttraumatic stress symptoms and problem drinking. *Mindfulness*. https://doi.org/10.1007/s12671-018-1077-y

Van der Gucht, K., Takano, K., Labarque, V., Vandenabeele, K., Nolf, N., Kuylen, S., Cosyns, V., Van Broeck, N., Kuppens, P., & Raes, F. (2017). A mindfulness-based intervention for adolescents and young adults after cancer treatment: Effects on quality of life, emotional distress, and cognitive vulnerability. *Journal of Adolescent and Young Adult Oncology, 6*(2), 307–317. https://doi.org/10.1089/jayao.2016.0070

Van der Zwan, J. E., de Vente, W., Huizink, A. C., Bögels, S. M., & de Bruin, E. I. (2015). Physical activity, mindfulness meditation, or heart rate variability biofeedback for stress reduction: A randomized controlled trial. *Applied Psychophysiology and Biofeedback, 40*(4), *257–268.* https://doi.org/10.1007/s10484-015-9293-x

Van Jaarsveld, C. H. M., Fidler, J. A., Steptoe, A., Boniface, D., & Wardle, J. (2009). Perceived stress and weight gain in adolescence: A longitudinal analysis. *Obesity, 17*(12), 2155–2161. https://doi.org/10.1038/oby.2009.183

Von Schell, A., Ohrt, T. K., Bruening, A. B., & Perez, M. (2018). Rates of disordered eating behaviors across sexual minority undergraduate men and women. *Psychology of Sexual Orientation and Gender Diversity, 5*(3), 352–359. https://doi.org/10.1037/sgd0000278

Wichianson, J. R., Bughi, S. A., Unger, J. B., Spruijt-Metz, D., & Nguyen-Rodriguez, S. T. (2009). Perceived stress, coping and night-eating in college students. *Stress and Health, 25*(3), 235–240. https://doi.org/10.1002/smi.1242

World Health Organization. (2014). *WHOQOL: Measuring quality of life.* https://www.who.int/healthinfo/survey/whoqol-qualityoflife/en/

Zepeda, L., & Deal, D. (2008). Think before you eat: Photographic food diaries as intervention tools to change dietary decision making and attitudes. *International Journal of Consumer Studies, 32*(6), 692–698. https://doi.org/10.1111/j.1470-6431.2008.00725.x

Zollars, I., Poirier, T. I., & Pailden, J. (2019). Effects of mindfulness meditation on mindfulness, mental well-being, and perceived stress. *Currents in Pharmacy Teaching and Learning.* https://doi.org/10.1016/j.cptl.2019.06.005

Appendix A

Eligibility Survey

Eligibility Survey

1. Are you 18 years or older?
   - ☐ Yes
   - ☐ No
2. Do you have a meal plan with the university?
   - ☐ Yes
   - ☐ No
3. Do you wish to better your eating habits?
   - ☐ Yes
   - ☐ No
4. Do you experience stress in your daily life?
   - ☐ Yes
   - ☐ No

Appendix B

Demographics Questionnaire

Demographics Questionnaire

1. What was your sex at birth?
    - Male
    - Female
    - Other (Please Specify): _____
2. Which of the following best describes your gender identity?
    - Female/Woman
    - Male/Man
    - Transgender
    - Other Genders (Please Specify): _____
3. What is your date of birth? _____
4. What is your age (in years)? _____
5. What is your ethnic background?
    - White
    - Native American/American Indian
    - Black/African-American
    - Chinese or Chinese-American
    - Japanese or Japanese-American
    - Korean or Korean-American
    - Other Asian or Asian-American
    - Mexican, Mexican American, or Chicano
    - Puerto Rican
    - Other Hispanic/Latino

- East Indian
- Middle Eastern/Arab
- Other (Please Specify): _____

6. How do you self-identify?
   - Gay
   - Lesbian
   - Bisexual
   - Queer
   - Questioning
   - Heterosexual/Straight
   - Asexual
   - Other (Please Specify): _____
7. What is your current relationship status?
   - Single, never married
   - Widowed
   - Married
   - Separated
   - Divorced
   - Living with partner (but not legally married)
   - Long-term committed relationship
8. What is the highest grade or degree you have completed?
   - Eighth grade of less
   - Some high school

- GED
- High school graduate
- Business or technical training beyond high school
- Some college
- College graduate
- Some graduate or professional school beyond college
- Masters degree
- Doctoral degree

9. Are you a student?
   - Not a student
   - Part-time student
   - Full-time student
10. What is your employment status?
    - Unemployed
    - Employed part-time (working 1-30 hours a week)
    - Employed full-time (working more than 30 hours a week)
    - Home-maker
    - Retired
11. What is your occupation?_____
12. What is your total household/family income?
    - Less than $9,999
    - $10,000-$19,999
    - $20,000-$29,999

- $30,000-$39,999
- $40,000-$49,999
- $50,000-$59,000
- $60,000-$69,999
- $70,000-$79,999
- $80,000-$89,999
- $90,000-$99,999
- $100,000 or more

Appendix C

Perceived Stress Scale (PSS)

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Never or very rarely true — Almost always or always true

_____ 1. In the last month, how often have you been upset because of something that happened unexpectedly?

_____ 2. In the last month, how often have you felt that you were unable to control the important things in your life?

_____ 3. In the last month, how often have you felt nervous and "stressed"?

_____ 4. In the last month, how often have you felt confident about your ability to handle your personal problems?

_____ 5. In the last month, how often have you felt that things were going your way?

_____ 6. In the last month, how often have you found that you could not cope with all the things that you had to do?

_____ 7. In the last month, how often have you been able to control irritations in your life?

_____ 8. In the last month, how often have you felt that you were on top of things?

_____ 9. In the last month, how often you have been angered because of things that were outside of your control?

_____ 10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Appendix D

Five Facet Mindfulness Questionnaire (FFMQ)

FFMQ

Rate each item based upon the extent to which it is true of your experience. Please use the following scale:

1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Never or very rarely true — Almost always or always true

_____ 1. I perceive my feelings and emotions without having to react to them.
_____ 2. When I'm walking, I deliberately notice the sensations of my body moving.
_____ 3. I find it difficult to stay focused on what's happening in the present.
_____ 4. I'm good at finding the words to describe my feelings.
_____ 5. I criticize myself for having irrational or inappropriate emotions.
_____ 6. I watch my feelings without getting lost in them.
_____ 7. When I take a shower or bath, I stay alert to the sensations of water on my body.
_____ 8. It seems I am "running on automatic" without much awareness of what I'm doing.
_____ 9. I can easily put my beliefs, opinions, and expectations into words.
_____ 10. I tell myself that I shouldn't be feeling the way I'm feeling.
_____ 11. In difficult situations, I can pause without immediately reacting.
_____ 12. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
_____ 13. I rush through activities without being really attentive to them.
_____ 14. It's hard for me to find the words to describe what I'm thinking.
_____ 15. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
_____ 16. Usually when I have distressing thoughts or images I am able just to notice them without reacting.
_____ 17. I pay attention to sensations, such as the wind in my hair or sun on my face.

_____ 18. I do jobs or tasks automatically, without being aware of what I'm doing.

_____ 19. I have trouble thinking of the right words to express how I feel about things.

_____ 20. I make judgments about whether my thoughts are good or bad.

_____ 21. Usually when I have distressing thoughts or images I feel calm soon after.

_____ 22. I pay attention to sounds, such as clocks ticking, birds chirping, and cars passing.

_____ 23. I find myself doing things without paying attention.

_____ 24. I tell myself I shouldn't be thinking the way I'm thinking.

_____ 25. When I have a sensation in my body, it's hard for me to describe it because I can't find the right words.

_____ 26. Usually when I have distressing thoughts or images I "step back" and am aware of the thought or image without getting taken over by it.

_____ 27. I notice the smells and aromas of things.

_____ 28. When I do things, my mind wanders off and I'm easily distracted.

_____ 29. Even when I'm feeling terribly upset, I can find a way to put it into words.

_____ 30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.

_____ 31. Usually when I have distressing thoughts or images I just notice them and let them go.

_____ 32. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.

_____ 33. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.

_____ 34. My natural tendency is to put my experiences into words.

_____ 35. I disapprove of myself when I have irrational ideas.

_____ 36. I pay attention to how my emotions affect my thoughts and behavior.

_____ 37. I am easily distracted.

_____ 38. I can usually describe how I feel at the moment in considerable detail.

_____ 39. Usually when I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.

Appendix E

Daily Diary Questionnaire

Daily Diary Questionnaire

Please respond to the following items considering the shorter of the following timeframes: either (a) the past 24 hours or (b) since you last completed a daily survey.

1. Did you practice mindfulness meditation today?

   - ☐ Yes
   - ☐ No

   If Yes

   2. How long did you practice mindfulness meditation today? _____
   3. Did you use the provided audio recording to practice mindfulness meditation today?

      - ☐ Yes
      - ☐ No

4. How many servings of each of the following categories have you eaten today?

   _____ Fruit (1 serving = 1 apple, 1 banana, 1 cup of 100% fruit juice, 8 strawberries, 1 cup grapes, 1 cup watermelon, etc.)

   _____ Vegetables (1 serving = 1 cup leafy greens, 1 cup cooked or canned vegetables, 1 medium tomato, ½ cup beans, etc.)

   _____ Carbohydrates (1 serving = 1 slice bread, ½ cup dry cereal, ½ cup cooked pasta or rice, 1 granola bar, etc.)

   _____ Sugar (1 serving = 1 teaspoon sugar, 1 can soda pop, ½ chocolate bar, etc.)

   _____ Dairy (1 serving = 1 cup milk, 1 cup yogurt, 2 ounces cheese, etc.)

   _____ Protein (1 serving = 1 ounce meat, poultry, or fish, 1 egg, etc.)