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The mental health of LGBTQ+ graduate students: Examining the role of lifestyle factors

Lindsey Ostermiller

THE MENTAL HEALTH OF LGBTQ+ GRADUATE STUDENTS: EXAMINING THE ROLE OF LIFESTYLE FACTORS

by

Lindsey Ostermiller

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Committee:

Dr. Austen Anderson, Committee Chair
Dr. Craig Warlick
Dr. Eric Dahlen

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ABSTRACT

The are many well-documented disparities among LGBTQ+ individuals and a rising concern about mental health in higher education, as LGBTQ+ graduate students may face unique and specific vulnerabilities in relation to their overall health compared to their peers. Part of what might be driving the mental health crisis among LGBTQ+ graduate students are poorer lifestyle factors. There is limited research that examines the impact of health-related lifestyle factors on mental health among LGBTQ+ graduate students, exacerbating our lack of insight into specific problems that may affect LGBTQ+ individuals' mental health. As such, the present study examined mental health in LGBTQ+ graduate students, if there are disparities in rates of engagement and participation in select lifestyle factors, and whether certain lifestyle factors may be especially harmful/ hurtful for this population. This project utilized pre-collected data collected from the Fall of 2019 as part of the American College Health Association's National Health Assessment (NCHA) totaling 7,702 graduate students M_{age}= 28.4) who self-reported engagement in various health related lifestyle factors. As expected, LGBTQ+ graduate students reported greater psychological distress (*d = .49, 95% CI [.42, .56])* and generally worse lifestyle factor profiles compared to sexual and gender majority graduate students. Further, sleep distress was the strongest predictor of psychological distress in LGBTQ+ graduate students (β = -.39, 95% CI [-.45, -.32]); however, LGBTQ+ identity did not moderate the relationship between select lifestyle factors and psychological distress. These findings have important implications for policies and interventions to improve mental health and decrease suffering in LGBTQ+ graduate students.

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DEDICATION

I would like to dedicate this work to the people who have shown me what bravery looks like and who have taught me the importance of living true to who you are. To the vibrant and unique souls that demonstrate strength, courage, and love. To those who have been discriminated against and are forced to fight every day for justice. To those in my life who have shown me what it means to love unapologetically, courageously, and passionately. Thank you for your vulnerability, your existence, and for teaching me to be a critic of harmful culture instead of a blind consumer of it. I will forever be a fierce advocate. This work would not have been possible without you, thank you for being you.

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CHAPTER I – INTRODUCTION

In the last few decades, there has been an increased awareness of and attention to the experiences and health of lesbian, gay, bisexual, transgender, and questioning (LGBTQ+) individuals, in part because the U.S. Supreme court legalized same sex marriage in 2015 (Nadal, 2019). However, significant problems persist in the ways in which this new knowledge and awareness is applied (Duran et al., 2022; Russel & Fish, 2016). Many disparities still exist in this population, particularly in that they bear a higher burden of mental health issues compared to the general population (Neptune, 2020; Przedworski et al., 2015; Su et al., 2016). This includes higher rates of depression, anxiety, self-harm, and suicidal ideation (Meyer, 2003; Miranda-Mendizabal et al., 2017). Of note, there is also evidence that young lesbian, gay, bisexual, transgender and questioning (LGBTQ+) individuals may be at a higher risk for poor mental health and low well-being compared to the general LGBTQ+ adult population (Baams, 2018; Fish, 2020). Little research has been conducted on the mental health of LGBTQ+ graduate students, which may be a group at particularly high risk, as the disparities of the LGBTQ+ population are combined with the generally low mental health of U.S. graduate students (Posselt, 2021), which showcases the need for more research in this area. Part of what might be driving the mental health crisis among young LGBTQ+ individuals are poorer lifestyle factors. For example, some evidence highlights important differences in alcohol consumption (Winberg et al., 2018), diet (Diemer et al., 2015) and sleep (Hershner et al., 2021) between LGBTQ+ and non-LGBTQ+ groups. As such this study examined mental health in the LGBTQ+ graduate student population and how mental health within this group might be associated with relevant lifestyle factors.

Mental Health in LGBTQ+ Students

A recent meta-analysis examining rates of depression and anxiety in graduate students found that only 1 of the 16 studies specifically addressed LGBTQ+ graduate student mental health (Satinsky et al., 2021). Transitioning into higher education constitutes substantial change for incoming students and can be especially difficult for LGBTQ+ individuals (Neptune, 2020; Ray et al., 2021). LGBTQ+ undergraduate and graduate students face tremendous challenges during their college years, including reporting greater rates of being victimized and threatened, and experiencing prejudice, discrimination, and violence (Boyle et al., 2021; Fish, 2020; Meyer 2008; Ray et al., 2021). Specifically, sexual minority students are at risk for experiencing higher rates of sexual assault and related depressive symptoms and suicidal thoughts (Backhaus et al., 2020; Boyle et al., 2021). It is believed that these and other difficulties lead to this population being three times more likely to screen positive for depression and anxiety (Neptune, 2020; Posselt, 2021; Su et al., 2016).

There is a rising concern about mental health in higher education, including a recognition of the need for more research regarding graduate students' mental health and well-being (Posselt, 2021; Woolston, 2019). Findings indicate a prevalence rate of 24% for depression and 17% for anxiety among PhD students, compared to around a 4% prevalence rate of depression and 10% prevalence rate of anxiety in the general North American population and a 13 – 15% prevalence rate of depression and a 4% prevalence rate of anxiety for young adults ages 18 to 29 (Satinsky et al., 2021).While graduate students often have many traits that could contribute to positive mental health including resilience, goal setting, self-regulation, and problem-solving (Hoppmann & Gerstorf,

2016), they also may have unique and specific vulnerabilities in relation to overall mental and physical health (Posselt, 2021) that are often overlooked (Woolston, 2019). Graduate students are often financially stressed, and face distinct work-life pressure (Levecque et al., 2017; Rummell, 2015). Graduate student debt has increased over the last 10 years while undergraduate tuition has stayed consistent which may lead to the academic system reinforcing racial, socioeconomic, and differences in privilege among graduate students ("Data Snapshot"). Graduate students face long work hours with 26% of students feeling unsure if the long hours they spend during graduate study will prepare them for a fulfilling career (Evans et al., 2018) and often face stiff competition for tenure-track positions following graduation (Satinsky et al., 2021). Additionally, graduate students have to navigate advisor-student relationships which may cause additional stress faced by graduate students (Satinsky et al., 2021), with advisor relationship quality being a predictor of anxiety and depression (Evans et al., 2018). Further, the nature of graduate student work can be particularly isolating (Lovitts, 2002), and the ability to succeed in graduate school with expectations related to research and publication is a challenge on its own (Evans et al., 2018; Ogunsanya et al 2018). Mental health among graduate students may be impacted because of the stigma that exists in the academic community surrounding mental illness and the pressure to succeed in graduate programs (Woolston, 2019). In sum, graduate students seem to be suffering in terms of their mental health, which may be especially concerning for students from marginalized groups.

LGBTQ+ graduate students face specific vulnerabilities in addition to the stressors and hardships that their non-LGBTQ+ peers face, as they are at risk for both institutionalized and everyday discrimination during their graduate training (Bhopal et al.,

2020). Research has shown that graduate students who endure discrimination and identify with groups whose belonging is questioned are more likely to experience depression and anxiety (Posselt, 2021). Additionally, graduate students who endure forms of discrimination may question their worth (Gildersleeve et al., 2011) which may also impact mental health. Despite some recent studies on the topic, LGBTQ+ graduate student's mental health and overall well-being is understudied (Chen et al., 2021). Because of the high rates of anxiety and depression in graduate students (Satinsky et al., 2021), there is a need for more research to understand what factors contribute to the overall mental health in LGBTQ+ graduate students.

Lifestyle Factors and Mental Health

Lifestyle factors are being increasingly recognized as contributors to mental health and well-being (Anderson et al., 2022; Walsh, 2011). Lifestyle factors may be especially important to young adults because this developmental period may be particularly important for forming healthy habits (Jao et al, 2019). Research has also shown that students are likely to continue to engage in harmful health related habits after college, (El Ansari et al., 2011; Jao et al., 2019), making it critical to adopt healthy lifestyle behaviors in college. Adopting healthy lifestyle behaviors as a young adult is also important because lifestyle factors tend to cluster together which can cause multiplicative effects (El Ansari et al., 2011). As with other areas of research, there have been fewer examinations of the associations of lifestyle factors with mental health in the LGTBQ+ population, especially in the LGBTQ+ graduate student population. Questions remain about the degree to which these factors predict mental health in this population, and whether there are disparities in rates of engagement in these lifestyle factors.

There are multiple potential paths by which LGBTQ+ status may impact engagement in lifestyle factors. For example, LGBTQ+ individuals face discrimination in the domains of education, employment, healthcare, housing, as well as in public accommodations (Reisner et al., 2017), which may lead LGBTQ+ individuals to engage in unhealthy lifestyle behaviors leading to poor mental health and physical health (Thoma et al., 2021). More specifically, gender identity and sexual orientation have been linked with income, employment and poverty (Badgett et al., 2021; Leppel, 2016), which are in l turn associated with various lifestyle behaviors such as diet and physical activity (Darmon & Drewnowski, 2008; Kari et al., 2015). Higher quality diets are associated with greater affluence, whereas energy dense diets are often lacking in nutrients are more often consumed by individuals with less economic means (Kari et al., 2015). Income levels have also been shown to be associated with physical activity levels with results indicating that individuals with higher income are more likely to report engagement in physical activity (Kari et al., 2015), potentially via increased leisure time or access to facilities that promote physical activity. As such, financial disparities may drive lifestyle engagement disparities.

Stemming from stigma and prejudice, LGBTQ+ individuals may have less social support, which is related to engagement in health-related behaviors such as substance use, risky sexual behaviors, diet, and physical activity (McDonald, 2018; Strine et al., 2007). A lack of social support can lead to lower life quality which contains aspects of social, environmental and physical health (Alsubaie et al., 2019), and may be especially important in minority groups because of the discrimination and increased stress that underrepresented groups face (Hass & Lannutti, 2021). Along with a lack of social

support, barriers to appropriate healthcare may impact this group's understanding of and motivation to engage in relevant lifestyle factors (Institute of Medicine, 2011).

The potential for bidirectional relationships between poor mental health and lifestyle factors must also be accounted for, such that mental health symptoms may impact engagement in lifestyle factors (Anderson et al., 2021; Firth et al., 2020). The increased rates of depression and trauma experiences in the LGBTQ+ community (Baams, 2018; Chen et al., 2020; Su et al., 2016), may lead to functional impairment and reduced engagement in relevant lifestyle factors (Katon & Russo, 2009; Khalid et al., 2016). Depression for example, has been associated with poor diet, and physical inactivity, potentially perpetuating poor overall health (Zhijie et al., 2014). Considering all the potential causes of differences in lifestyle engagement, recent research also promotes the idea that health related factors tend to cluster together (Anderson, 2022), indicating that certain poor lifestyle behaviors may impact engagement in other unhealthy behaviors. Overall, the challenging experiences faced by this population likely impact their engagement in health lifestyle factors, which may in turn negatively impact mental health. Some of the lifestyle factors that are related to mental health are reviewed below, along with further information about disparities for the LGBTQ+ population.

Physical Activity

Physical activity is important to our overall mental health (Memon et al., 2022; White et al., 2017). Nonetheless, according to a pooled analysis of 358 population-based surveys with 1.9 million participants the global prevalence of insufficient physical activity was 27.5% (Guthold et al., 2018). Further, the latest global estimates show that 1.4 billion adults do not meet the recommend level of physical activity that has been

connected to good health (World Health Organization, 2022). College students' physical activity levels in general are of concern because university students have reported lower levels of physical activity compared to the general adult population in the United States with more than 70% not meeting the recommended step count of 10,000 steps per day (Memon et al., 2021). LGBTQ+ undergraduate students have been shown to participate in even less physical activity compared to their peers (Greenspan et al., 2019). Research has identified different determinants of college student's physical activity including personal, social, cognitive, and environmental factors (Keating et al., 2005). LGBTQ+ graduate students might be lacking in physical activity participation because of the homophobia and transphobia that might still exist around sports and participation in physical activity (Herrick & Duncan, 2018). Physical activity could also be negatively impacted due to a lack of social support among minority college students (Frederick et al., 2020).

Diet

Almost a quarter of adults in the United States have a poor-quality diet when measured as eating vegetables less than once a day (Centers for Disease Control, 2019). Poor diet has been linked to poor mental health including the onset of mood disorders, especially depression (Firth et al., 2019). Further, the results from meta-analyses strongly suggest that diet can play a role in reducing depressive symptoms and improving well-being across the population (Firth et al., 2020). Transgender students report less healthy food intake including skipping meals, more frequent intake of fast food and soft drinks, and less frequent intake of fruit and milk (Bishop, 2020). It has also been noted that sexual minorities may have a higher prevalence of weight dissatisfaction, which can lead

to the development of poor dietary behaviors such as binge eating and eating to cope with stress, as well as eating disorders (Neptune, 2020). Furthermore, in a sample of more than 33,000 college students in Minnesota it was found that sexual minority men had on average higher BMI's, were more likely to engage in unhealthy eating habits, and experience more body dissatisfaction (Murphy & Morrell, 2021).

Sleep

Sleep has been shown to be an important contributor for overall mental health, and physical health (Ogunbajo et al., 2020) and is vital for human functioning (Otte et al, 2015), but problems with sleep are common (Gardani et al., 2021). A meta-analysis of 21 longitudinal studies showed that individuals with insomnia (defined as persistent difficulties falling asleep and/or staying asleep) had twice the risk for developing subsequent depression compared to individuals who do not have trouble sleeping. Daytime naps are also an important aspect of sleep, being one of the few predictors of subsequent depression in a methodologically rigorous Mendelian randomization study (Choi et al., 2020). A focus on sleep is important for everyone, but it may be especially important for undergraduate and graduate college students (Allen et al., 2021; Gardani et al., 2022). Recent evidence has shown that approximately 30% of students meet the criteria of insomnia (Gardani et al., 2022) and recent research has documented sleep disparities among sexual minority individuals, including shorter sleep duration and lower sleep quality (Patterson & Potter, 2019). There are many mechanisms that may be affecting sleep quality and quantity in minority students; greater exposure to stigmatization, stress, and unsafe living environments all potentially effecting sleep outcomes (Levenson et al., 2020). Further, recent research suggests that family support is

associated with sleep problems in LGBTQ+ individuals and may be an important contributing factor (Chum et al., 2021).

Substance Use (Alcohol, Tobacco, Cannabis)

Substance use has been shown to have a variety of implications for mental health including being associated with higher rates of depression and anxiety (Khan et al., 2020; Strine et al., 2008). For example, individuals from a nationally representative sample of adults who smoke and drink excessively were more susceptible to experience forms of depression in their lifetime (Cabell et al, 2017). Substance use, specifically cannabis, stimulant, and illicit drugs have been on the rise in the college student population (Welsh et al., 2019) which may be associated with college students overall mental health (Lanier et al., 2009). Research shows that substance use is higher in lesbians, gay men (Hughes & Eliason, 2002), bisexual individuals (Marshal et al., 2009), and transgender individuals (Day et al., 2017). Additionally, prevalence of substance use has been shown to be higher in LGBTQ+ college students when compared to their peers (Kerr et al., 2014). Underrepresented students face discrimination, and a lack of support which may increase the rates of substance use in LGBTQ+ students (McCabe et al., 2010).

Social Interaction with Family and Friends

A wealth of research demonstrates that social isolation and loneliness have been shown to lead to worse overall mental health outcomes (Leigh-Hunt et al., 2017). Some have argued that depressive disorders are essentially at root, a social problem (Cruwys et al., 2014). In support of that, previous research demonstrated that social contact with friends is associated with greater life satisfaction and decreased depressive symptoms (Przedworski et al., 2015). Additionally, meaningful social interaction has been shown to

be an especially important variable when considering the mental health of college students, especially in LGBTQ+ young adults (Snapp et al., 2015). Specifically, social interaction with family is seen as a critical component to improving mental health in LGBTQ+ individuals because of the lack in support shown by teachers, peers, and other significant figures in LGBTQ+ individuals lives (Roe, 2017). Research shows that receiving explicit support from parental figures is helpful when navigating the challenging process of identity development; and support from family helped LGBTQ+ individuals feel safe and supported in the world (Roe, 2017). Social connection and interaction among the LGBTQ+ graduate population may be especially important because of the prejudice and discrimination LGBTQ+ graduate students face compared to their peers (Reisner et al., 2015).

Religious and Spiritual Practice

Various studies have demonstrated that mental health can be influenced by religion and spirituality (Garssen et al., 2021). Religion and spiritualty may provide a framework for meaning making which can support coping with adverse life events (Park, 2005). Research also shows that college students generally are less likely to be religious (Hartley, 2004) but religious participation has shown to be related to lower rates of depression in graduate students (Scorsolini-Comin et al., 2021). Even though religious/spiritual practice may have benefits for the general population it is important to consider how religious views may impact LGBTQ+ individuals because many sexual minorities experience religious conflict (Lefevor et al., 2021). Evidence suggests that LGBTQ+ individuals are less religious compared to the general population (Barnes & Meyer, 2012) because many religions have a non-LGBTQ+ affirming stance (Wood &

Conley, 2014). Conflict between identity and religion can negatively impact the mental health of LGBTQ+ individuals, but may depend on many factors including: religious affiliation, attachment to religious theology, and levels of spiritual engagement (Beagan & Hattie, 2015). A 2021 review speaks to a mix of positive and negative implications connected to religion and spirituality for sexual minority individuals (Wilkinson & Johnson, 2021). More research is needed to determine if participation and engagement in religious/ spiritual activity differs among LGBTQ+ graduate students when compared to non-LGBTQ+ graduate students.

Mindfulness and Meditation

A meta-analysis found that mindfulness-based stress reduction is effective in reducing stress, and depression and increasing quality of life in the general population (Khoury et al., 2015). Meditation has also been shown to have various positive effects such as improving anxiety levels, and decreasing depression (Goyal et al., 2014), including in college students (Bamber & Morpeth, 2018). Additionally, mindfulness and mediation practices have been shown to reduce negative mental health symptoms in the LGBTQ+ community (Iacono, 2019). Because mindfulness/meditation has been shown to have positive benefits for both non-LGBTQ+ individuals and LGBTQ+ individuals, it may be important to see if there is a difference in participation and engagement among LGBTQ+ graduate students because mindfulness and meditation have previously shown positive results among at-risk populations (Pequignot, 2022). As the mental health disparities seen in LGBTQ+ graduate students are in part caused by a lack of support, peer victimization, and societal rejection (Iacono, 2019), mindfulness and meditation

practices, which often emphasize acceptance, and utilizes a non-judgmental attitude may be especially helpful for this population.

Volunteering

Volunteering is an activity engaged in by choice for the benefit of a wider community (Bambra, 2008) and it has been connected to various physical and mental health outcomes (Wilson, Justice et al., 2005), including improved self-rated health, a decrease in depressive symptoms (Yeung & Kim., 2017), and an increase in overall life satisfaction (Thoitis & Hweitt, 2001). Furthermore, volunteering is associated with psychological well-being (Yuen et al., 2014) and has been defended as part of a healthy lifestyle (Yeung et al., 2018). Volunteering may be especially important for college students to promote overall health because of its perceived impacts on student development (Williamson et al., 2018). Volunteering may be especially important for the LGBTQ+ graduate student community because of the potential impact volunteering may have on social cohesion and social identity, which may in turn impact mental health (Gates & Dentato., 2020).

TV Watching

TV watching has recently gained more attention as a modifiable lifestyle factor and unhealthy behavior because it has shown to be associated with poor mental and physical health (Jiang et al., 2015; Werneck et al., 2021). A Mendelain randomization study demonstrated that TV watching is an important risk factor for depression (Choi et al., 2020). TV watching is not only associated with high rates of depression but has also been thought to be linked to poor sleep quality, and less meaningful social interaction (Werneck et al., 2021). Prolonged periods of sedentary time and TV watching may also

increase the risk of major chronic disease, obesity and even mortality (Jiang et al., 2015). This is of particular importance because television is one of the most popular leisure activities especially among young individuals (Asare, 2015), and may be especially relevant to LGBTQ+ graduate students because of the high rates of depression in this population (Posselt, 2021). Although LGBTQ+ media visibility is increasing, there is still unequal representation of LGBTQ+ central characters, storylines, and experiences, (Gillig et al., 2018). As such, hours spent watching TV may have a differential impact on LGBTQ+ graduate students than heterosexual and cisgender graduate students.

The Present Study

As part of the Healthy People 2030 initiative, The Office of Disease Prevention and Health Promotion (n.d.) argued that more research is needed to identify the health dipartites that exist in the LGBTQ+ community. LGBTQ+ individuals experience worse mental health when compared to their peers (Salerno et al., 2020), and graduate students seem to have significantly impaired mental health relative to the wider population (Satinsky et al., 2021), but little is known about the mental health of LGBTQ+ graduate students specifically (Renn, 2010). Further, although there is growing support surrounding specific lifestyle factors, the field would benefit from additional work examining the rates of engagement in lifestyle factors for LGBTQ+ graduate students and how that engagement predicts mental health (Frederick et al., 2020; Neptune, 2020). Research that can clarify these disparities and identify predictors of the disparities can support the development and implementation of policies and programs that benefit LGBTQ+ graduate students and inform the development of targeted lifestyle screening and treatment. As such, the current study examined mental health and lifestyle behavior

disparities among LGBTQ+ students. This study also examined which lifestyle factors predict mental health in the LGBTQ+ population and whether certain lifestyle factors are especially helpful/harmful for this population relative to the general LGBTQ+ population via moderation analyses.

Question 1: Are LGBTQ+ U.S. graduate students reporting worse mental health than the sexual majority graduate student population?

Hypothesis 1: LGBTQ+ graduate students will report more psychological distress than sexual majority graduate students.

Question 2: Do U.S. LGBTQ+ graduate students' have worse lifestyle behavior profiles than sexual and gender majority graduate students?

Hypotheses 2a – 2j: Relative to sexual majority graduate students, LGBTQ+ graduate students will report lower physical activity (a), weight training (b), consumption of fruits and vegetables (c), sleep quality (d), sleep quantity (e), social interaction with friends (f), social interaction with family (g), religious/spiritual activity (h), mindfulness/meditation (i), and volunteering (j).

Hypotheses 2k – 2p: Relative to sexual majority graduate students, LGBTQ+ graduate students will report greater frequency of daytime naps (k), tobacco use (l), cannabis use (m), alcohol use (n) and alcohol binge drinking (o), and TV watching (p).

Question 3: Which lifestyle factors are associated with psychological distress among LGBTQ+ identifying graduate students?

Hypotheses 3a – 3j: LGBTQ+ graduate students' psychological distress will be negatively associated with physical activity (a), weight training (b), consumption

of fruits and vegetables (c), sleep quality (d), sleep quantity (e), social interaction with friends (f), social interaction with family (g), religious/spiritual activity (h), mindfulness/meditation (i), and volunteering (j).

Hypotheses 3k – 3p: LGBTQ+ graduate students' psychological distress will be positively associated with day time naps (k) tobacco use (l), cannabis use (m), alcohol use (n) and alcohol binge drinking (o) and TV watching (p).

Question 4: Which lifestyle factors are the strongest predictors of psychological distress within a non-representative national sample of LGBTQ+ graduate students?

Hypothesis 4a – 4e: Physical activity (a), sleep quality (b), diet (c), social interaction with friends (d) and social interaction with family (e) will most strongly predict psychological distress in LGBTQ+ graduate students.

Question 5: Are the associations between select lifestyle factors and mental health moderated by LGBTQ+ identity?

Hypothesis 5a-e: LGBTQ+ identity will moderate the association between social interaction with friends and (a), social interaction with family (b), mindfulness/meditation (c), volunteering (d), TV watching (e), and mental health.

CHAPTER II – METHOD

Participants

The participants for this study were recruited as part of the American College Health Association's National Health Assessment (NCHA) in the Fall of 2019. This study explored a wide range of students' health habits, behaviors, and perceptions. The initial sample consisted of 7,766 graduate students (M_{age} = 28.4) who self-reported engagement in various health related lifestyle factors, and were enrolled in one of 57 two-year and four-year public and private institutions from various regions in the United States. After removing those who did not report gender identity, sex, or sexual orientation (n = 64), the total effective sample size was 7,702, with a subsample of 1,055 LGBTQ+ participants. Those who identified as non cis-gender and non-heterosexual comprised the LGBTQ+ group. Although individuals who identity as non cis-gender and non-heterosexual have some different experiences and different representation in the literature (Suen et al., 2020), there are overarching patterns of discrimination for these individuals that merit examination in this study (Sutter & Perin, 2016). Participant characteristics are available in Table 1.

Table 1

Participant Characteristics

	n =	Graduates
Gender		
Female	4,573	58.9%
Male	3,051	39.3%
Non-binary	40	.5%
Agender	11	.001%
Genderfluid	17	.002%
Genderqueer	20	.003%
Intersex	1	.000%
Trans Man	7	.000%
Trans Woman	6	.000%
Identity not listed above	18	.003%
Race		
American Indian or Native Alaskan	81	1.0%
Asian or Asian American	1,680	21.6%
Black or African American	514	6.6%
Hispanic or Latino/a/x	792	10.2%
Middle Eastern	138	1.8%
Native Hawaiian or Other Pacific Islander Native	13	.2%
White	4,129	53.2%
Biracial or Multiracial	229	2.9%
Identity not listed above	132	1.7%
Sexual Orientation		
Straight/Heterosexual	6,542	84.2%
Asexual	47	.6%
Bisexual	511	6.6%
Gay	193	2.5%
Lesbian	81	1.0%
Pansexual	87	1.1%
Queer	136	1.8%
Questioning	82	1.1%
Identity not listed above	34	.4%
Age		
Age	28.36 years	*SD*(7.30)

Measures

Demographics

Participants were asked to report their sex as either male, female, or intersex, whether they identified as transgender, and which term they use to describe their gender identity: woman or female, man or male, trans woman, trans man, genderqueer, agender, genderfluid, intersex, non-binary, or "my identity is not listed above." Participants were also asked to report their sexual orientation as either straight/heterosexual, bisexual, gay, lesbian, pansexual, queer, questioning, or my identity is not listed above. Participants provided their age, height, weight, year in school, and current enrollment status.

Kessler Psychological Distress Scale (K6)

Psychological distress was measured by using the Kessler Psychological Distress Scale (K6; Kessler et al., 2002) which is comprised of 6 items covering non-specific psychological distress. Participants were asked to report how often in the past 30 days they experienced various symptoms. Item responses range from 0 (None of the time) to 4 (All of the time), with the sum of the items ranging from 0-24. Cutoff scores have been identified with 13 or higher representing severe psychological distress and a value between 5 and 12 representing moderate psychological distress (Kessler et al., 2002; Prochaska et al., 2012). Scores on the K6 have been internally consistent in two initial samples ($\alpha = 0.89$) and ($\alpha = 0.92$; Kessler et al., 2002), and support for reliability and validity was provided in a subsequent validation study when used for screening for non-specific serious mental illness (Kawakami et al., 2020). The alpha coefficient for this sample was .87.

Physical Activity

Physical activity was measured using two variables which were comprised of items covering strength-focused exercise and overall metabolic expenditure. Participants were asked to report how often in the last 7 days they engaged in strength-focused exercise and they were asked how much total time they spent in moderate and vigorous physical activity with responses ranging from 0 hours to more than 30 hours. Moderate physical activity was described as when a person can typically talk during exercise and vigorous physical activity was described as when a person cannot say more than a few words without pausing for a breath during exercise. Based on a review of Ainsworth and colleagues (1993) compendium of physical activities, moderate physical activity will be multiplied by 4.5 and vigorous physical activity will be multiplied by 7, in order to weight the time spent in the activity by the expected metabolic expenditure (i.e. how many times more is the rate of energy expenditure relative to resting).

Diet

Diet was measured using two variables which were comprised of items covering fruit and vegetable intake. Participants were asked to report in separate questions how many servings of fruit and vegetables they consumed on average per day. Responses ranged from 0 servings per day, 1-2 servings per day, 3-4 servings per day, 5-6 servings per day, and more than 6 servings per day. Examples of one serving of fruit, and one serving of vegetables were provided in various forms including fresh and frozen. The fruit and vegetable questions were summed to create one fruit-vegetable intake variable.

Sleep

Sleep quantity was measured using 2 variables which were comprised of items covering weeknight and weekend sleep quality in hours. Weeknight quantity was subtracted from weekend quantity as a sleep quantity difference variable. Weeknight quantity was also multiplied by 5 and weekend quantity was multiplied by 2. These values were then summed and divided by 7 to get an average nightly sleep quantity variable. Sleep quality was assessed by self-reports of the frequency of how often in the last 7 days the participant woke up too early in the morning and couldn't get back to sleep, feeling tired or sleepy during the day, having an extremely hard time falling asleep, getting enough sleep so that you felt rested with responses ranging from 4 to 32. Those four items were summed (with getting enough sleep being reverse scored). Participants were also asked to report on how many days out of the last 7 days they took a daytime nap, and if so how long naps lasted with responses ranging from less than 30 minutes, between 30 and 59 minutes, between 60 and 119 minutes, or 2 or more hours.

Substance Use

Substance use was measured by using items from the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) which is designed to assess substance use and related health risks (Hides et al., 2009). Tobacco, alcohol, and marijuana use frequency were assessed with three variables from the ASSIST which asked about how often in the last three months have mentioned substances been used. Responses ranged from never (0), once or twice (1), monthly (1), weekly (13), daily or almost daily (90). Binge drinking frequency was also assessed with one item. Participants were asked to report how many times in the last two weeks had five or more drinks (males) or four or

more drinks (females) containing any kind of alcohol in one sitting been consumed based on the Centers for Disease Control's (2022) definition of binge drinking. Responses ranged from none, to 10 or more times.

Volunteering

Volunteering was measured by using one item where participants reported how much time was spent on community service or volunteer activities in a typical week. Responses ranged from 0 hours, 1-5 hours, 6-10 hours, 11-15 hours, 16-20 hours, 21-25 hours, 26-30 hours, and more than 30 hours.

Religious/ Spiritual Practice

Religious/ Spiritual practice was measured by using one item where participants reported how many hours per week are spent in spiritual or religious activities in a typical week. Responses ranged from 0 hours, 1-5 hours, 6-10 hours, 11-15 hours, 16-20 hours, 21-25 hours, 26-30 hours, and more than 30 hours.

Mindfulness/ Meditation

Mindfulness and Meditation was measured by using one item where participants reported how many hours per week are spent in meditation or meditative activities in a typical week. Responses ranged from 0 hours, 1-5 hours, 6-10 hours, 11-15 hours, 16-20 hours, 21-25 hours, 26-30 hours, and more than 30 hours.

Social Interaction with Family and Friends

Social interaction with family and friends was measured using two variables comprised of time spent with family and friends. Participants were asked to report in separate questions how many hours per week are spent socializing with friends, and spent

with family in a typical week. Responses ranged from 0 hours, 1-5 hours, 6-10 hours, 11-15 hours, 16-20 hours, 21-25 hours, 26-30 hours, and more than 30 hours.

TV Watching

TV watching was measured using one item where participants were asked to report how many hours in a typical week are spent watching TV, streaming movies/TV, or other media for entertainment in a typical week. Responses ranged from 0 hours, 1-5 hours, 6-10 hours, 11-15 hours, 16-20 hours, 21-25 hours, 26-30 hours, and more than 30 hours.

Procedures

This project represents a secondary analysis of the American College Health Association's (ACHA) National College Health Assessment (NCHA) conducted in the Fall of 2019. This wave of the study explored aspects of mental and physical health behaviors among a national sample of college students from 57 colleges and universities in the United States and was originally developed to offer participating institutions a way to benchmark student health outcomes, and gain an understanding of college students health. A review of the ACHA-NCHA III is given by Lederer and Hoban (2022), which is summarized briefly here. Starting in Fall of 2019, the NCHA survey implemented web-based only survey administration and was developed by a workgroup comprised of experts across multiple fields. During the development of ACHA-NCHA III, the workforce focused on breath rather than depth, implementing brief robust measures when possible to reduce survey fatigue. After receiving feedback from institutional coordinators, students, individual institutions, and methodological experts, a draft measure was developed. Piolet tests were run with 15 institutions using both ACHA-

NCHA II, and the newly developed ACHA-NCHA III. Reliability and validity of the new questions were considered and participants feedback was reviewed (Lederer & Hoban, 2022). The ACHA-NCHA III survey included new questions, more inclusive language, and use of valid scales rather than an assortment of individual items (Lederer & Hoban, 2022).

Participation in the NCHA survey was voluntary and only schools that randomly select students, or students surveyed in randomly selected classrooms, are part of the national database. The average response rate was 13 – 14% for each school. The ACHA-NCHA survey is accessible to colleges and institutions in the United States regardless of resources, size, or structure. The University of Southern Mississippi's Institutional Review board indicated that this study does not need IRB review as it is not considered human subjects research.

Analysis

All data processing and analyses were carried out using R (R Core Team, 2021) and RStudio (R Studio Team, 2020). Independent sample t-tests were used to compare group differences in mental health and lifestyle engagement. Multiple linear regression models were used to test lifestyle factors as predictors of LGBTQ+ mental health, as well as whether LGBTQ+ status moderates the relationship between lifestyle factors and mental health using R. The regression equality test from the *car* (Fox & Weisberg, 2019) package was used to test whether the selected lifestyle factors will have statistically significant larger associations with mental health than the other lifestyle factors. Assumptions of homoscedasticity (equality of variances) and normality of residuals were violated, so Welch's two-sample T-tests and robust regression models were used to test

the hypotheses from the *robustbase* package (Maechler et al., 2023). Due to extreme outliers, Winsorization was used on a set of variables such that values below the 0.5 percentile and above the 99.5 percentile, were changed to equal to those respective values. These variables included time spent volunteering, religious/ spiritual practice, time spent with friends, time spent engaging in mindfulness/ meditation, moderate and vigorous engagement in physical activity. As part of a sensitivity analysis, the analyses were run on both the Winsorized and non-Winsorized data.

For hypothesis 1a ("LGBTQ+ graduate students will report more psychological distress than sexual majority graduate students"), psychological distress was assessed using the K6. Those who identified as non cis-gender and non-heterosexual comprised the LGBTQ+ group. An independent sample t-test was used to compare group differences in psychological distress.

For hypotheses 2a – 2j ("Relative to sexual majority graduate students, LGBTQ+ graduate students will report lower physical activity (a), weight training (b), consumption of fruits and vegetables (c), sleep quality (d), sleep quantity (e), social interaction with friends (f), social interaction with family (g), religious/spiritual activity (h), mindfulness/meditation (i), and volunteering (j)") and hypotheses 2k – 2p ("Relative to sexual majority graduate students, LGBTQ+ graduate students will report greater frequency of daytime naps (k), tobacco use (l), cannabis use (m), alcohol use (n) and alcohol binge drinking (o), and TV watching (p)"), independent sample t-tests examined differences across sexual and gender identity in engagement in the relevant lifestyle factors. Those who identified as non cis-gender and non-heterosexual comprised the LGBTQ+ group.

For hypotheses 3a – 3j ("LGBTQ+ graduate students' psychological distress will be negatively associated with physical activity (a), weight training (b), consumption of fruits and vegetables (c), sleep quality (d), sleep quantity (e), social interaction with friends (f), social interaction with family (g), religious/spiritual activity (h), mindfulness/meditation (i), and volunteering (j)") and hypotheses 3k – 3p ("LGBTQ+ graduate students' psychological distress will be positively associated with day time naps (k) tobacco use (l), cannabis use (m), alcohol use (n) and alcohol binge drinking (o) and TV watching (p)"), a linear regression model was used to identify significant coefficients. Using only the LGBTQ+ sample, lifestyle factors were entered into a multiple linear regression model as predictors of psychological distress.

For hypotheses 4a – 4e ("Physical activity (a), sleep quality (b), sleep quantity (c), social interaction with friends (d) and social interaction with family (e) will most strongly predict psychological distress in LGBTQ+ graduate students"), a regression equality test was used to test whether the strongest predictors are significantly greater predictors than other lifestyle variables. Age and race were entered as control variables.

For hypothesis 5a-5e ("LGBTQ+ identity will moderate the association between social interaction with friends and (a), social interaction with family (b), mindfulness/meditation (c), volunteering (d), TV watching (e), and mental health"), a multiple linear regression model with interaction terms was used to test these associations.

There were no predicted effect size or minimum effects of interest for the effects tested in our statistical analyses. Age and race were entered as control variables. P-values of less than .05 were used to determine statistical significance for the various models'

hypotheses. Following Rubin (2017), we did not adjust for multiple comparisons, as we viewed each test as representing a separate hypothesis.

A power analysis using G*Power (Faul et al., 2009) indicated that 232 LGBTQ+ individuals and 1,294 non-LGBTQ+ individuals would be needed to detect small effects (0.20) with a power of .80 when conducting t-tests comparing differences in mental health and lifestyle engagement. The recommended sample size to assess the large number of lifestyle factors as predictors of LGBTQ+ mental health in multiple linear regression models was 929. It was estimated that the sample size from this study was large enough to obtain a power of .80 to detect small effects in the first three sets of hypotheses.

CHAPTER III – RESULTS

Data Screening and Preliminary Analyses

Little's MCAR test was used to examine the missing data pattern, and a non-significant result indicated that the data was missing completely at random ($X^2(7521) = 707$, $p = 1$). As such, pairwise deletion was utilized for the analyses. This resulted in varying effective sample sizes for the analyses, with the smallest being 996 for the multiple regression model examining lifestyle behaviors as predictors of psychological distress in the LGBTQ+ subsample. Descriptive statistics were calculated for the study variables and are available in Table 1.

Primary Analyses

The first hypothesis predicted LGBTQ+ graduate students would report more psychological distress than sexual and gender majority graduate students. A Welch's two sample t-test was used to determine that LGBTQ+ graduate students did in fact report greater psychological distress than non-LGBTQ+ graduate students with a statistically significant difference between the two groups with a medium effect size d = 0.49.See Table 2 for the results for hypothesis 1 and 2.

The second set of hypotheses were tested in R using Welch's independent sample t-tests after performing Levene's test and determining that the homogeneity of variance assumption was violated. Hypothesis 2 predicted relative to sexual majority graduate students, LGBTQ+ graduate students will report worse lifestyle behavior profiles than sexual and gender majority graduate students. The results are consistent with our hypothesis, as LGBTQ+ graduate students reported more sleep disturbance compared to non-LGBTQ+ graduate students, greater frequency of cannabis use, tobacco use, and

binge drinking, more hours spent watching TV, and greater frequency of daytime naps. Relative to sexual majority graduate students, LGBTQ+ graduate students reported less time spent in religious/ spiritual practice, less time spent with family, less time spent strength training, and less time spent engaging or participating in physical activity. Contrary to our fist hypothesis LGBTQ+ graduate students reported more time spent in meditation/ mindfulness. There were no significant differences for alcohol use frequency, fruit and vegetable intake, time spent with friends, and time spent volunteering. Overall, LGBTQ+ graduate students reported worse lifestyle factor profiles compared to sexual and gender majority graduate students, as evidenced by greater engagement in various unhealthy lifestyle factors and less engagement in healthy lifestyle factors.

Table 2

Independent Samples T-Test

	LGBTQ+	Non-LGBTQ+					
	M (SD)	*M (SD)*	*t*	*df*	*p*	*Cohen's D*	*95% CI*
Psychological Distress	8.82 (5.03)	6.47 (4.63)	14.21	1349.6	< 0.001	0.49	0.42, 0.56
Sleep Disturbance	16.40 (5.55)	14.67 (5.49)	9.33	1385.0	< 0.001	0.31	0.25, 0.38
Cannabis Use	5.78 (20.20)	2.19 (12.32)	5.57	1174.6	< 0.001	0.21	0.14, 0.29
Religious / Spiritual Practice	1.02 (2.53)	1.64 (2.83)	-7.27	1499.5	< 0.001	-0.23	-0.29, -0.17
Time with Family	4.37 (7.14)	5.72 (8.30)	-5.60	1547.2	< 0.001	-0.18	-0.24, -0.11
Tobacco Use	6.76 (22.84)	4.13 (18.03)	3.56	1267.4	< 0.001	0.13	0.06, 0.20
Strength Training	1.39 (1.73)	1.65 (1.84)	-4.55	1455.7	< 0.001	-0.15	-0.21, -0.08
TV Watching	7.29 (6.51)	6.48 (5.82)	3.79	1332.1	< 0.001	0.13	0.06, 0.20
Alcohol Binge Drinking	1.24 (1.40)	1.12 (1.39)	2.55	1359.7	0.01	0.09	0.02, 0.15
Daytime Nap Frequency	2.35 (1.71)	2.21 (1.58)	2.43	1350.3	0.02	0.08	0.02, 0.15
Physical Activity	1460.67 (1511.41)	1565.99 (1553.83)	-2.09	1423.2	0.04	-0.07	-0.13, 0.00
Meditation	1.24 (2.40)	1.08 (0.99)	2.01	1350.3	0.05	0.07	0.00, 0.14
Alcohol Use	11.96 (22.84)	10.95 (21.00)	1.44	1402.2	0.15	0.05	-0.02, 0.11
Diet	3.97 (2.06)	4.00 (2.11)	-0.40	1421.7	0.69	-0.01	-0.08, 0.05
Time with Friends	5.06 (4.50)	4.98 (4.41)	0.57	1389.7	0.57	0.02	-0.05, 0.08
Volunteering	1.68 (3.09)	1.73 (2.98)	-0.53	1380.3	0.59	-0.02	-0.08, 0.05

Hypothesis three predicted LGBTQ+ identifying graduate students' psychological distress would be negatively associated with healthy lifestyle factors and positively associated with unhealthy lifestyle factors. A robust regression model indicated some support for this set of hypotheses, as total physical activity was negatively associated with psychological distress. Further, select unhealthy lifestyle factors are positively associated with psychological distress including sleep distress, tobacco use, and hours spent watching TV. Older graduate students also reported less psychological distress. See Table 3 for the results for hypothesis 3.

Table 3

Psychological Distress Associated with Lifestyle Factors

				95% CI	
	β	Std. Err	*t*	Lower	Upper
Sleep Distress	-.39	.03	-11.68	-.45	-.32
Physical Activity	-.12	.03	-3.12	-.17	-.04
Tobacco Use	.06	.03	2.53	.01	.11
TV Watching	.06	.03	2.03	.00	.12
Strength Training	-.06	.04	-1.59	-.12	.01
Time with Family	-.06	.04	-1.46	-.13	.02
Time with Friends	-.05	.03	-1.64	-.12	.01
Daytime Nap Frequency	.05	.03	1.61	-.01	.10
Sleep Quantity	-.04	.03	-1.35	-.12	.02
Cannabis Use	.03	.02	1.28	-.01	.07
Meditation	.03	.04	.72	-.05	.10
Diet	-.02	.03	-.60	-.08	.04
Religious / Spiritual Activity	-.01	.04	-.16	-.09	.08
Alcohol Binge Drinking	-.00	.03	-.09	-.09	.04
Volunteering	.00	.03	.14	-.06	.07
Alcohol Use	-.00	.03	-.09	-.07	.06

The fourth set of hypotheses were tested in R using a test of coefficient equality. These hypotheses predicted that physical activity, sleep quality, diet, social interaction with friends, and social interaction with family would most strongly predict psychological distress in LGBTQ+ graduate students. The results indicate that relative to select lifestyle factors the strongest predictor of psychological distress in LGBTQ+ graduate students is sleep distress when compared to time spent with friends, time spent in physical activity, time spent in strength training, time spent in religious / spiritual practice, time spent volunteering, time spent with family, time spent in meditation / mindfulness, frequency of daytime naps, frequency of tobacco use, cannabis use, and alcohol use, time spent watching TV, alcohol binge drinking, sleep quantity, and fruit and vegetable consumption. Additionally, physical activity was a stronger predictor of psychological distress relative to time spent volunteering, frequency of alcohol use, and alcohol binge drinking. The results demonstrate the importance of sleep quality in LGBTQ+ graduate students' lives as it is the strongest predictor of psychological distress in our sample followed by physical activity. Time spent with family and friends, and diet were not stronger predictors of psychological distress when compared to other lifestyle factors in our sample. See Table 4 for the results for hypothesis 4.

Table 4

Coefficient Equality Test

	Chi-Square	*df*	*p*
Sleep Distress			
Time with Friends	47.39	1	< 0.001
Strength Training	44.27	1	< 0.001
Religious / Spiritual Activity	45.43	1	< 0.001
Volunteering	78.98	1	< 0.001
Physical Activity	33.17	1	< 0.001
Time with Family	42.03	1	< 0.001
Meditation	55.57	1	< 0.001
Daytime Nap Frequency	52.85	1	< 0.001
Tobacco Use	58.31	1	< 0.001
Cannabis Use	80.25	1	< 0.001
Alcohol Use	68.19	1	< 0.001
TV Watching	50.02	1	< 0.001
Alcohol Binge Drinking	73.64	1	< 0.001
Diet	61.10	1	< 0.001
Sleep Quantity	39.41	1	< 0.001
Diet			
Sleep Distress	61.10	1	< 0.001
Physical Activity	3.03	1	0.08
Tobacco Use	1.11	1	0.29
Alcohol Binge Drinking	0.90	1	0.34
TV Watching	0.80	1	0.37
Time with Friends	.56	1	0.45
Strength Training	0.53	1	0.47
Time with Family	0.48	1	0.49
Daytime Nap Frequency	0.40	1	0.53
Sleep Quantity	0.28	1	0.60
Volunteering	0.27	1	0.60
Alcohol Use	0.25	1	0.62
Religious / Spiritual Activity	0.05	1	0.82
Cannabis Use	0.04	1	0.84
Meditation	0.02	1	0.88
Time Spent with Friends			
Sleep Distress	47.39	1	< 0.001
Alcohol Binge Drinking	3.34	1	0.07
Volunteering	1.50	1	0.22
Alcohol Use	1.44	1	0.23
Physical Activity	1.14	1	0.29
Religious / Spiritual Activity	0.70	1	0.40
Diet	0.56	1	0.45

Table 4 Continued

	Chi-Square	*df*	*p*
Cannabis Use	0.49	1	0.48
Meditation	0.38	1	0.54
Sleep Quantity	0.05	1	0.82
Tobacco Use	0.04	1	0.84
Daytime Nap Frequency	0.03	1	0.86
TV Watching	0.01	1	0.91
Strength Training	< 0.001	1	0.98
Time with Family	< 0.001	1	0.99
Time Spent with Family			
Sleep Distress	42.03	1	< 0.001
Alcohol Binge Drinking	2.4	1	0.12
Volunteering	1.43	1	0.23
Alcohol Use	1.27	1	0.26
Physical Activity	1.02	1	0.31
Religious / Spiritual Activity	0.60	1	0.44
Diet	0.48	1	0.49
Cannabis Use	0.42	1	0.51
Meditation	0.31	1	0.58
Daytime Nap Frequency	0.03	1	0.86
Sleep Quantity	0.05	1	0.82
Tobacco Use	0.03	1	0.87
TV Watching	0.01	1	0.93
Strength Training	< 0.001	1	0.99
Time with Friends	< 0.001	1	0.99
Physical Activity			
Sleep Distress	33.17	1	< 0.001
Alcohol Binge Drinking	7.56	1	0.01
Alcohol Use	5.22	1	0.02
Volunteering	5.19	1	0.02
Cannabis Use	3.83	1	0.05
Religious / Spiritual Activity	3.31	1	0.07
Diet	3.03	1	0.08
Meditation	2.52	1	0.11
Sleep Quantity	1.83	1	0.18
Daytime Nap Frequency	1.73	1	0.19
Time with Friends	1.14	1	0.29
TV Watching	1.08	1	0.30
Tobacco Use	1.04	1	0.31
Time with Family	1.02	1	0.31
Strength Training	0.77	1	0.38

The fifth hypothesis predicted LGBTQ+ identity would moderate the association between a set of lifestyle behaviors (time spent with friends, time spent with family, time spent engaging in mindfulness/ meditation, time spent volunteering, time spent watching TV) and psychological distress. A multiple linear regression model with interaction terms indicated LGBTQ+ identity did not moderate the association between those lifestyle factors and psychological distress. In other words, the association of lifestyle factors with psychological distress did not differ for LGBTQ+ graduate students relative to sexual and gender majority graduate students. See Table 5 for the results for hypothesis 5.

Table 5

LGBTQ+ Identity Moderating Lifestyle Factors and Psychological Distress

				95% CI	
	Estimate	Std. Err	*t*	Lower	Upper
LGBTQ+ * Time with Friends	.01	.03	.29	-.05	.07
LGBTQ+ * Time with Family	.01	.03	.21	- 06	.07
LGBTQ+ * Meditation	.00	.03	.04	-.06	.06
LGBTQ+ * Volunteering	.00	.03	.03	-.06	.06
LGBTQ+ * TV Watching	-.01	.03	- .29	-.06	.05

CHAPTER IV – DISCUSSION

This study was designed to help establish a basic understanding of mental health in LGBTQ+ graduate students and to examine disparities in rates of self-reported lifestyle factors. This study also examined which lifestyle factors predict mental health among LGBTQ+ graduate students and whether certain lifestyle factors may be especially helpful/harmful for this population. Despite being a cross-sectional study, this project provided findings that may have important implications for policy and intervention to improve mental health and decrease suffering in LGBTQ+ graduate students.

Consistent with our first hypothesis, LGBTQ+ graduate students reported higher psychological distress when compared to sexual and gender majority graduate students. This is further evidenced by 72% of LGBTQ+ graduate students meeting the K6 cutoff score for moderate psychological distress and 18% for severe psychological distress compared to 51% of sexual and gender majority graduate students meeting the cutoff score for moderate psychological distress and 8% for severe psychological distress. These findings provide valuable baseline information on the mental health in LGBTQ+ graduate students, as most previous research has not specifically attended to LGBTQ+ students (McDermott et al., 2021; Williams et al., 2021) or has only examined LGBTQ+ undergraduate students (Diemer et al., 2015; Frederick et al., 2020; Hershner et al., 2021). While there are a variety of factors likely contributing to these high levels of distress which are reviewed in the introduction, another key factor may be the stigma that persists in academic communities surrounding seeking support for mental illness (Woolston, 2019). More broadly, LGBTQ+ individuals report experiencing structural discrimination through varied laws that target their rights, adversely impacting this

groups mental health (Coleman et al., 2023). For example, state legislatures, and administrative agencies across the country, are passing legislation which impacts access to gender-affirming care (Human Rights Campaign, 2023), transgender students' ability to fully participate in sports, and the process for obtaining identification documents with transgender individuals' gender (American Civil Liberties Union, 2022). Higher rates of discrimination may be impacted by the recent barrage of political attacks, in turn leading to worsened health disparities (Hoy-Ellis, 2023), higher rates of depression, anxiety, and increased stress among LGBTQ+ adults (Alibudbud, 2023). This population may not be able to access the support they need. Brief mental health interventions have shown to be useful in reducing mental health stigma among secondary students and may be one helpful tool for academic institutions as a way to combat mental health stigma and improve graduate student mental health generally (Szeto et al., 2021), and the LGBTQ+ students specifically.

Along with stigma, disparities in lifestyle factors may be driving the high levels of psychological distress in the LGBTQ+ graduate student population. Consistent with our second hypothesis, LGBTQ+ graduate students have worse lifestyle behavior profiles than sexual and gender majority graduate students shown by increased engagement in unhealthy lifestyle factors (e.g., alcohol consumption, tobacco use, cannabis use, TV watching, and a greater frequency of daytime naps), and less engagement in healthy lifestyle factors (e.g., physical activity, weight training, diet, sleep quality, social interaction with family and friends, religious/ spiritual activity and volunteering). The lifestyle medicine perspective of mental health would argue that the health behavior profile of LGBTQ+ graduate students may be significantly impairing their cognitive and

emotional functioning (Chan & Hazan, 2022; Sarris et al., 2014). Further, these differences may also impact long term health as poor lifestyle choices which can lead to chronic illness, including type 2 diabetes, and cardiovascular disease (Bodai et al., 2018). These health problems may in turn further impact mental health as physical and mental health are tightly linked (Prine et al., 2007). Engagement in health-related lifestyle factors may be especially important for LGBTQ+ graduate students because comorbidity of mental and physical health can impact help seeking, diagnosis, and treatment (Prine et al., 2007). Additionally, with the higher rates of distress in the LGBTQ+ sample, the potential for a bidirectional relationship between poor mental health and lifestyle factors must seriously be considered, as poor mental health may lead to less engagement in lifestyle factors potentially perpetuating poor overall health (e.g. Zhijie et al., 2014).

In partial support of our third set of hypotheses, LGBTQ+ graduate students' psychological distress was negatively associated with some healthy lifestyle factors and positively associated with other unhealthy lifestyle factors. These findings are consistent with the idea that engagement in healthy lifestyle factors may decrease psychological distress and engagement in unhealthy lifestyle factors increase psychological distress. Physical activity, tobacco use, time spent watching TV, and especially sleep quality were linked to PD among LGBTQ+ students. Interestingly, some lifestyle factors (e.g. time spent with family, time spent with friends) were predictive of psychological distress in sexual and gender majority graduate students and were not predictive of psychological distress in LGBTQ+ graduate students. This may be due to sexual and gender majority students' ability to consistently reap the benefits from lifestyle factors relative to LGBTQ+ graduate students. Wider standard errors in the regression model for the

LGBTQ+ students may represent more variation in the potential benefits of engagement in behaviors such as time spent with family, friends or in religious services. These social factors may benefit many LGBTQ+ graduate students, yet at the same time other LGBTQ+ individuals may face stigma and discrimination during social engagements, which could reduce their benefits or even create harm. As such, the associations between engagement in these social behaviors and PD may be more dependent on the quality of the interactions for LGBTQ+ graduate students.

One unexpected positive association was that of psychological distress and mindfulness/ meditation. Often seen as a beneficial activity, the association may be because some due to students using mindfulness/ mediation as a coping mechanism to reduce psychological distress (Goyal et al., 2014). Thus, individuals engaging in mindfulness/ meditation may be already high in psychological distress, explaining the positive association. Further, the LGBTQ+ sample was more engaged in mindfulness at a marginally significant level, potentially speaking to a greater openness to these exercises for this group and potentially an avenue of intervention.

This study also extends the literature by examining which lifestyle factors are the strongest predictors of psychological distress within a non-representative national sample of LGBTQ+ graduate students. Sleep quality was found to be the strongest predictor of psychological distress when compared to all other relevant lifestyle factors in our study. This may have important implications because sleep is being increasingly recognized as an important contributor to overall health (Grandner et al., 2016) and is vital to human functioning (Otte et al, 2015). Aspects of sleep are a byproduct of social stratification (Nagata et al., 2023) and other social/societal level factors (Grandner et al., 2013). For

LGBTQ+ individuals, sleep quality is likely affected by prejudice, stigma, poor environments, and stress (Patterson & Potter, 2019; Levenson et al., 2020), highlighting the importance of understanding the different pathways to sleep disturbance. At the individual level much research supports Cognitive Behavior Therapy for Insomnia (CBT-I) as an effective approach in treating insomnia by limiting time spent in bed, limiting activities in bed to just sleep and sex, and decreasing sleep related anxiety (Koffel et al., 2015). Because CBT-I may not be accessible for many individuals, some have developed alternative treatment methods including self-help interventions. Self-help interventions – psychological treatment that individuals can work through without oversight of a provider, have shown to be effective for improving sleep outcomes and may be especially helpful because of the increased accessibility (van Straten & Cuijpers, 2009). In an ideal world, self-help treatment interventions might be used to supplement traditional CBT-I for optimal outcomes. Moving forward, it may be important for clinicians, universities and other stakeholders to recognize social and societal level factors that may impact sleep, and to consider that LGBTQ+ graduate students' worse sleep may be driving their psychological distress.

Our hypothesis that LGBTQ+ identity would moderate the association between select lifestyle factors and psychological distress was not supported by our results. Specifically, LGBTQ+ identity did not moderate the association between time spent with family and friends, time spent engaging in mindfulness/ meditation, time spent volunteering, and time spent watching TV. As stated earlier, it might be important to investigate the quality of interactions for each of these factors, as time spent with a supportive family versus a prejudiced family could mean very different things for an

LGBTQ+ graduate student. And with the increasing representation of LGBTQ+ individuals in media (Nölke, 2017), it may be helpful to examine the content of the media that is being consumed.

Implications for Policy and Intervention

These findings may aid in the development and implementation of supportive and inclusive LGBTQ+ policy that aims to improve mental health and support healthy lifestyle factors in LGBTQ+ graduate students. The development of policy encouraging medical and mental health provider curricula addressing LGBTQ+ mental health disparities and specific health related issues may improve mental health in LGBTQ+ graduate students. This is especially relevant as LGBTQ+ individuals face the risk of low-quality care, and negative provider attitudes (United Nations, n.d.). A systematic review evaluating the effectiveness of educational curricula identified a need for integration of LGBTQ+ health into main curriculum (Sekoni et al., 2017). These efforts may increase the number of providers that are familiar with guidelines for providing quality care for LGBTQ+ individuals (Müller, 2013; Parameshwaran et al., 2017).

Universities may be well positioned to address the mental health disparities seen in LGBTQ+ graduate students in part because of the opportunity to identify, prevent, and treat mental health problems. Routine mental health screenings may help with early identification of students who are in need of support as research suggests that students are more likely to seek mental health services when available in schools (National Association of School Psychologists, 2021). It may also be helpful for universities to mandate something like a free yearly wellness screening that examines mental health, lifestyle behaviors, and promotes the importance of self-care. For mental health resources

to be utilized by those identified in screenings, it may be important for universities and institutions to decrease stigma attached to seeking mental health services as stigma affects graduate student's willingness to seek support for mental health (Szeto et al., 2021). Routine lifestyle screenings may be especially beneficial in decreasing both self-imposed and perceived stigma surrounding mental health that contributes to lack of treatment (Shim & Rust, 2013), potentially because the screenings would inquire about lifestyle factors including sleep instead of mental health which may be less stigmatized. Furthermore, lifestyle intervention screenings may contribute to awareness of the importance of engaging in healthy lifestyle behaviors for mental health.

Universities may benefit from the development of lifestyle intervention trainings and implementing them widely to ensure students, faculty, LGBTQ+ focused centers, and student groups on campus are exposed to critical material (Pregnall et al., 2021) while providing opportunity for follow up and support. Faculty may benefit from trainings about the mental health and lifestyle disparities faced by LGBTQ+ graduate students. These trainings may be especially beneficial if they emphasize the importance of sleep, and the relationship between sleep and psychological distress in LGBTQ+ graduate students. Further, these trainings and programs may seek to provide resources that would allow faculty members to guide LGBTQ+ graduate students toward mental health services. Additionally, LGBTQ+ focused centers and student support groups on campus, which can be found across sixty two percent of four-year universities nationwide (Coley & Das, 2020), may also benefit from trainings on LGBTQ+ mental health and lifestyle so that they can better support these students with related difficulties. The development of these programs would likely benefit from an inclusion of the thoughts, opinions, and

experiences of LGBTQ+ graduate students to ensure their specific needs are being described accurately.

The present findings demonstrate the importance of engagement in lifestyle factors and illustrate the potentially central role of sleep for LGBTQ+ graduate students mental health. Targeted lifestyle screening and intervention and may result in personalized lifestyle interventions that account for specific vulnerabilities LGBTQ+ graduate students face. Further, given the use of psychological sleep interventions used for college students generally (Saruhanjan et al., 2021), it would be worth evaluating these interventions for LGBTQ+ graduate students specifically. Studies indicate that cognitive behavior therapy for insomnia and other approaches including CBT-I are effective psychological interventions to improve sleep in college students (Friedrich & Schlarb, 2018; van Straten et al., 2018) and depression symptoms (Cunningham & Shapiro, 2018). Providers could also consider the ways in which health related lifestyle factors cluster together in complex ways (Anderson et al., 2022; Anderson & Ostermiller, n.d.) which may impact the success of lifestyle interventions.

Limitations and Future Directions

The present study has various limitations. First, the measurement of many of the lifestyle variables was limited, such that single items were often used as part of this survey. Surveys like NCHA often depend on broad assessment rather than depth, which allows for examination of a wide number of variables, but with less confidence in reliability and validity of measurement. However, single item measures can be reliable when used to measure homogenous concept's leading themselves to provide complete transparency about what is being measured (Postmes et al., 2013). The single item

measures used in this study provided valuable information on time spent engaging in various health behavior habits, especially with the straightforward nature of the concepts being measured. Certain self-report variables such as time spent in volunteering and physical activity often do lack reliability, raising questions about the error introduced in the study and potentially introducing outliers. The data are cross sectional, making the direction of associations and any casual inferences impossible. However, our sample includes 53.2% individuals who identify as White, followed by 21.6% Asian or Asian American, 10.2% Hispanic or Latino/a/x, and 6.6% as Black or African American. This relatively diverse sample may support a more accurate and realistic understanding of experiences in higher education potentially leading to a greater representation of the population of interest. Future research may prioritize recruitment of individuals with gender minority identities as only 1.8% of the LGBTQ+ subsample identified as gender minorities. Additionally, future longitudinal research may provide helpful insight into the directional relationship among these factors and should prioritize examining the relationship between mental health and sleep quality in LGBTQ+ graduate students. It may also be important for future research to consider how sleep interventions could be incorporated into routine mental health care for LGBTQ+ graduate students and an examination of relevant social factors that may be impacting sleep. With such high rates of distress for LGBTQ+ graduate students, it would be helpful to examine the effectiveness of CBT-I for sleep problems and psychological distress in that population. Future research may also benefit from including variables related to treatment seeking and past treatment experiences to better understand these student's awareness of and desire to use relevant services (e.g. Zay et al., 2021). Additionally, future research should

examine the complex, bidirectional relationships between mental health and engagement in health-related lifestyle factors in LGBTQ+ graduate students and examine mental health in LGBTQ+ graduate students as a result of targeted lifestyle and screening intervention.

Conclusion

This study provides much needed insight into the mental health of LGBTQ+ graduate students, as well as disparities in health-related lifestyle factors. Furthermore, our research sheds light on levels of engagement in health-related lifestyle factors and how change in lifestyle factors could potentially play a vital role in the prevention and treatment of psychological distress. The findings presented above, add to the growing body of literature supporting policy creation and implementation of lifestyle interventions in higher education. Further, research is required to address the existing barriers that prevent the implementation of LGBTQ+ supportive policy and lifestyle interventions. Finally, the relationship between mental health and engagement in health-related lifestyle factors is multifaceted, and likely bidirectional. Future research should continue to bring attention to the health and lifestyle disparities observed in LGBTQ+ graduate students in order to influence policy makers and clinicians towards adequately addressing the unique health and needs of this group.

APPENDIX A

Demographic Questions

This part of the survey will help us understand your personal characteristics. There may be limitations to the response options provided, and the response categories offered may not represent your full identity nor use the language you prefer. We care about all identities and experiences and ask that you indicate which choice best describes you.
What was your sex assigned at birth?

- Male
- Female
- Intersex
- Prefer not to say

Do you consider yourself to be transgender?

- Yes
- No
- I prefer not to say

Which term do **you** use to describe your gender identity?

- Woman or female
- Man or male
- Trans woman
- Trans man
- Genderqueer
- Agender
- Genderfluid
- Intersex
- Non-binary
- My identity is not listed above (please specify) _____
- I prefer not to say

Sexual orientation:

- Heterosexual or straight
- Homosexual
- Bisexual
- Other _____
- I prefer not to answer

How old are you?
_____Year

What is your height in feet (‘) and inches (“)?
_____feet
_____inches

What is your weight in pounds?

_____Pounds

What is your year in school?

- 1st year undergraduate
- 2nd year undergraduate
- 3rd year undergraduate
- 4th year undergraduate
- 5th year or more undergraduate
- Master’s (MA, MS, MFA, MBA, MPP, MPA, MPH, etc)
- Doctorate (PhD, EdD, MD, JD, etc)
- Not seeking a degree
- Other (please specify) _____

What is your enrollment status?

- Full-time
- Part-time
- Other (please specify) _____

How do you usually describe yourself? (Please select ALL that apply)

- American Indian or Native Alaskan
- Asian or Asian American
- Black of African American
- Hispanic or Latino/a/x
- Middle Eastern/ North African or Arab Origin
- Native Hawaiian or Other Pacific Islander Native
- White
- Biracial or Multiracial

My identity is not listed above (please specify)

APPENDIX B

K6; Kessler 6

Kessler Psychological Distress Scale – 6

The following questions are about how you have been feeling during the past 30 days.

1. About how often during the past 30 days did you feel nervous - would you say all of the time, most of the time, some of the time, a little of the time, or none of the time?

2. During the past 30 days, about how often did you feel hopeless - all of the time, most of the time, some of the time, a little of the time, or none of the time?

3. During the past 30 days, about how often did you feel restless or fidgety?

4. How often did you feel so depressed that nothing could cheer you up?

5. During the past 30 days, about how often did you feel that everything was an effort?

6. During the past 30 days, about how often did you feel worthless?

    - All of the time
    - Most of the time
    - Some of the time
    - A little of the time
    - None of the time

APPENDIX C

Physical Activity

In the last 7 days, on how many days did you do exercises to strengthen or tone your muscles? Examples: push ups, sit ups, or weightlifting/training.

- 0 days (0)
- 1 day (1)
- 2 days (2)
- 3 days (3)
- 4 days (4)
- 5 days (5)
- 6 days (6)
- 7 days (7)

For the next two questions, the levels of physical activity intensity can be characterized in terms of breathing difficulty. A person doing moderate physical activity can typically talk, but not sing while doing the activity. A person doing vigorous physical activity typically cannot say more than a few words without pausing for a breath while doing the activity.

_____In the last 7 days, how many (total) minutes did you spend doing moderate physical activity? Examples: brisk walking, dancing, or household chores. _____ minutes

_____In the last 7 days, how many (total) minutes did you spend doing vigorous physical activity? Examples: running, swimming laps, or hiking. _____ minutes

APPENDIX D

Diet

_____In the last 7 days, how many servings of fruit did you eat on average per day? One serving is a medium piece of fresh fruit; ½ cup of fresh, frozen, or canned fruit; ¼ cup of dried fruit; or ¾ cup of 100% fresh fruit juice.

- 0 servings per day (1)
- 1-2 servings per day (2)
- 3-4 servings per day (3)
- 5-6 servings per day (4)
- More than 6 servings per day (5)

_____In the last 7 days, how many servings of vegetables did you eat on average per day? One serving is ½ cup of fresh, frozen, or canned vegetables; ¾ cup 100% vegetable juice; or 1 cup salad greens.

- 0 servings per day (1)
- 1-2 servings per day (2)
- 3-4 servings per day (3)
- 5-6 servings per day (4)
- More than 6 servings per day (5)

APPENDIX E

Sleep

_____Over the last 2 weeks, what is the average amount of sleep you have gotten on a weeknight (excluding naps)? (Please select the response closest to your answer)

_____Over the last 2 weeks, what is the average amount of sleep you have gotten on a weekend night (excluding naps)? (Please select the response closest to your answer)

Scale:

- Less than 4 hours (1)
- 4 hours (2)
- 5 hours (3)
- 6 hours (4)
- 7 hours (5)
- 8 hours (6)
- 9 hours (7)
- 10 or more hours (8)

On how many of the last 7 days did you:

1. Wake up too early in the morning and couldn't get back to sleep?
2. Feel tired or sleepy during the day?
3. Have an extremely hard time falling asleep?
4. Get enough sleep so that you felt rested?
5. Take a nap?

Scale:

- 0 days (1)
- 1 day (2)
- 2 days (3)
- 3 days (4)
- 4 days (5)
- 5 days (6)
- 6 days (7)
- 7 days (8)

On average, how long are your naps?

- Less than 30 minutes (1)
- Between 30 and 59 minutes (2)
- Between 60 and 119 minutes (3)
- 2 hours or more (4)

APPENDIX F

Substance Use

Items from the ASSIST Scale

In your life, which of the following substances have you ever used? For prescription medications, please report nonmedical use only. "Nonmedical use" means taking prescription drugs just for the feeling or experience they cause or taking them more often or at higher doses than prescribed.

_____Tobacco or nicotine delivery products (cigarettes, e-cigarettes, or other vape products, water pipe or hookah, chewing tobacco, cigars, etc.)

_____Alcoholic beverages (beer, wine, liquor, etc.)

_____Cannabis (marijuana, weed, hash, edibles, vaped cannabis, etc.) [Please report nonmedical use only.]

Scale:

- No (0)
- Yes (3)

_____In the past 3 months, how often have you used the substance(s) you mentioned?

Scale:

- Never (0)
- Once or twice (2)
- Monthly (3)
- Weekly (4)
- Daily or almost daily (5)

_____Over the last two weeks, how many times have you had five or more drinks (males) or four or more drinks (females) containing any kind of alcohol at a sitting?

- None (1)
- 1 time (2)
- 2 times (3)
- 3 times (4)
- 4 times (5)
- 5 times (6)
- 6 times (7)
- 7 times (8)
- 8 times (9)
- 9 times (10)
- 10 or more times (11)

APPENDIX G

Additional Measures

Volunteering, Spiritual/ Religious Practice, Mindfulness/ Meditation, Social Interaction with family and friends, TV Watching

How many hours do you spend in a typical week (7 days) on the following activities?

_____Performing community service or volunteer activities

_____Participating in spiritual or religious activities

_____Participating in meditation or meditative activities

_____Socializing with friends

_____Spending time with family

_____Watching TV, streaming movies/TV or other media for entertainment

Scale:

- 0 hours (1)
- 1-5 hours (2)
- 6-10 hours (3)
- 11-15 hours (4)
- 16-20 hours (5)
- 21-25 hours (6)
- 26-3- hours (7)
- More than 30 hours (8)

APPENDIX H

IRB Approval Letter

ORI | Office of Research Integrity

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

118 COLLEGE DRIVE #5116 • HATTIESBURG, MS | 601.266.6756 | WWW.USM.EDU/ORI

Dec. 22, 2021

To Whom It May Concern,

Acting on behalf of The University of Southern Mississippi Institutional Review Board, in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University guidelines, I have reviewed the following project and have determined that review by USM's IRB is not necessary.

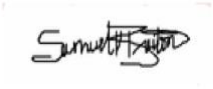
Principal Investigator: Austen R. Anderson

Doctoral Candidate Project: "College Students' Lifestyle Behaviors, Psychological Distress, and Well-Being: A Nationwide Study."

Date Submitted: Dec. 21, 2021

Formal IRB review is not required in this instance, as the project does not meet federal or institutional definitions of "human subjects research."

Sincerely,



Samuel V. Bruton

Director of the Office of Research Integrity

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