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# Examining the Relationship Between Physical Health Behaviors and Mental Health Outcomes in Female Hispanic College Students

Alexandra St. Laurent

University of Central Florida, al833361@ucf.edu



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EXAMINING THE RELATIONSHIP BETWEEN PHYSICAL HEALTH BEHAVIORS AND  
MENTAL HEALTH OUTCOMES IN FEMALE HISPANIC COLLEGE STUDENTS

by

ALEXANDRA ST. LAURENT

A thesis submitted in partial fulfillment of the requirements  
for the Honors Undergraduate Thesis program in Health Sciences  
in the College of Health Professions and Sciences  
and in the Burnett Honors College  
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Thesis Chair: Shanté Jeune, Ph.D.

## **ABSTRACT**

The current state of mental health in college students is a universal concern. Female college students are reporting more depression, anxiety, and stress symptoms than ever before. Physical activity and diet quality can positively influence mental health symptoms. Current research provides scarce evidence that examines the relationship of these health behaviors and outcomes in the Hispanic female population. The primary aim of this study is to examine the relationship between physical health behaviors and mental health outcomes in Hispanic female college students. This is a cross-sectional study using a self-report survey to collect data from approximately 109 Hispanic female college students through in-person recruitment and flyers placed on the university campus. Measures included the Dietary Quality Questionnaire, the International Physical Activity Questionnaire- Short Form, and the Depression, Anxiety, and Stress Scale. One-way analysis of variance tests and Pearson correlations were run to determine the relationship between mental health and physical activity and mental health and diet quality.

We hypothesized that diet quality and physical activity would be negatively associated with depressive, anxiety, and stress symptoms. We hypothesized that there would be significant group level differences between low, moderate, and high depression, anxiety, and stress on diet quality and that there would be significant group level differences between low, moderate, and high physical activity on depressive, anxiety, and stress scores. Pearson's correlations found diet quality was negatively associated with depressive, anxiety, and stress symptoms, but physical activity was not. We found that participants with better diet quality reported lower depressive, anxiety, and stress scores, but did not find physical activity group level differences with mental

health symptoms. These findings implicate future research to develop and test nutritional programs that target depression, anxiety, and stress of college students, specifically Hispanic female college students.

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# INTRODUCTION

## **Mental Health in College Students**

In 2019, there was an approximated 25% increase of people living with mental health disorders according to the World Health Organization (WHO) (World Health Organization [WHO], 2022c). For college students, though, there has been a 50% increase in mental health symptoms according to the National Education Association (Flannery, 2023).

College students, whose ages typically range from 18-23 years old, experience various challenges while pursuing their undergraduate degree. These challenges include financial, social, academic, and transitional stressors (Acharya et al., 2018). Many college students are living without the daily guidance of their parents for the first time, which introduces a multitude of unforeseen responsibilities that students must adapt to while simultaneously creating a new social network and maintaining good grades. The pressure for students to succeed in these different areas can take a toll on mental health at a particularly vulnerable age. Among college students, depression, anxiety, and stress-related disorders among the most frequently reported conditions (American College Health Association [ACHA], 2023).

Depression is defined as persistent sadness and a lack of interest or pleasure in previously rewarding or enjoyable activities, and often interrupts sleep (WHO, n.d.-a). Research has shown that there is a strong relationship between depression and physical health issues, such as cardiovascular disease (WHO, n.d.-a). Depression not only has other mental and physical comorbidities, but those who experience depression are at increased risk for suicide, which also happens to be the fourth leading cause of death in 15 to 29-year-olds (WHO, 2023b). Additionally, women are more likely to have depression than men (WHO, 2023b).



Approximately 25% of college students with depression also report anxiety (ACHA, 2023). Anxiety is a feeling of excessive fear and worry and behavioral disturbances (World Health Organization, 2022a). Anxiety symptoms include fatigue, sleep difficulty, body tension, inability to focus, and irritability (Munir & Takov, 2024). These chronic symptoms can lead to disturbances in social functioning, physical health, occupational performance, emotional regulation and other factors that impact quality of life (Wilmer et al., 2021).

Feelings of stress are also common in college students. Psychological stress is defined as mental strain that is caused by any difficult situation (WHO, 2023a). Stress impacts brain function, specifically memory and cognition (McManus et al., 2020). Additionally, stress disrupts gastrointestinal function by altering appetite, increasing inflammation, and contributing to motility disturbances (Yaribeygi et al., 2017). This serves as a call to action to examine contributing factors that are influencing this alarming increase in mental health symptoms among college students.

### **Physical Health Behaviors and Mental Health**

***Nutrition.*** Nutrition is a key component of overall health. There is a growing body of evidence that points to nutrition playing a significant role in mental health (Stevens et al., 2018). Recent research found that “junk food,” categorized as candies, snacks, and highly processed foods, was associated with depressive and anxiety symptoms (Rossa-Roccor et al., 2021). This applies to college students because “junk foods” like instant, easy, and snack-filled meals are preferred by college students due to their busy schedules (Sogari et al., 2018). Not only are quick meals preferred, but they are also the most accessible; public universities have food environments that are full of fast-food franchises, convenience stores and machines that sell

unhealthy and sugary foods and drinks (Cleveland, 2023). Ulhaq et al. (2022) found that higher stress levels led students to overeat or eat fast foods. Therefore, if stress encourages fast food and junk food consumption, which negatively affects mental health, then it could be hypothesized that a well-balanced diet may be associated with better mental health.

***Physical Activity.*** Another component of overall health is physical activity (PA). PA is any movement that requires energy (WHO, 2022b). PA is known to have a positive impact on physical health, but the benefits go beyond the physical body. Research suggests that physical activity is negatively associated with stress, anxiety, and depressive symptoms (Catling et al., 2022; Garrett et al., 2017; Herbert et al., 2020; Welle & Graf, 2011). According to the Centers for Disease Control and Prevention (CDC), 46% of adults do not meet national guidelines for physical activity, and women are less likely to meet PA guidelines than men (Elgaddal et al., 2022). Similar to CDC data, the National College Health Assessment (NCHA) reports less than half of college students meet PA guidelines. The repercussions of low PA include cardiovascular diseases, type 2 diabetes, increased risk of cancer, and depression (Park et al., 2020).

### **Increased Susceptibility of Hispanic Female College Students**

A crucial part of health promotion involves identifying those who need help and what their specific needs are. Different groups of people require different means to address their specific needs. There is a gender disparity in mental health; therefore, identifying tools that are helpful for males may not have the same impact when utilized by females. Another layer of health disparities is ethnicity. Research suggests that minority status is associated with higher risk of depression (Kalibatseva et al., 2022). One study found that 34% of Hispanic college students report depression compared to 21% of non-Hispanic college students (Worthen et al.,

2023). The present study seeks to examine both ethnic and gender gaps in mental health: Hispanic female mental health. Like mental health, there are gender and ethnic disparities in physical health behaviors like diet and PA. The CDC reports that Hispanic women are less likely to meet PA guidelines in comparison to non-Hispanic white women (Elgaddal et al., 2022). Compared to male counterparts, Hispanic female young adults consume less fruit and vegetables (Tam et al., 2017). Currently the literature is scarce on the impact of physical activity and diet quality on mental health outcomes in Hispanic female college students. This is cause for further research to better understand the impact that physical activity and diet quality have on the mental health outcomes of the Hispanic female college student population.

## **Summary**

Research suggests that physical health behaviors like diet and PA are associated with mental health, more specifically depression, stress, and anxiety. Gender and ethnic disparities are present when it comes to mental health outcomes. With the sharp increase in mental health disorders over the past decade, especially in college students, there is a real need to develop tools to best care and possibly prevent these debilitating disorders. Part of developing effective tools requires a comprehensive understanding of mental health status and associated behaviors. This begins with gathering data on prevalence of mental health disorders and physical health behaviors in different groups of people to inform the development of resources that address the specific areas of growth that differ for unique groups of people. Research has looked at female college students and their mental health compared to male college students, but there has yet to be a study that specifically looks at Hispanic female college students' physical behaviors and mental health outcomes. In order to best care for the Hispanic female college student population,

this study will gather prevalence data as well as test the relationship between physical health behaviors – specifically nutrition and PA – and mental health outcomes.

# **LITERATURE REVIEW**

## **Overview**

College students experience a critical transition period that includes both physical and psychological changes. At such a pivotal period in one's life, college students may face many new challenges that take time to acclimate as they embark on their education journey. College students are exposed to a fast-paced learning environment where balancing habits and responsibilities is crucial to maintaining overall health, and especially their diet, physical, and mental health. The following sections will examine the literature related to college students' diet quality and physical activity and highlight how these behaviors relate to mental health.

## **College Student Mental Health**

Psychological distress (i.e., depression, anxiety, and stress) among college students has increased in the last five years from 2018 to 2023 (ACHA, 2018, 2023). The Covid-19 pandemic presented additional stressors which resulted in a significant increase in psychological distress among college students (Lopes & Nihei, 2021). In 2023, 76% of college students reported moderate to serious psychological distress (ACHA, 2023). From 2013 to 2021, college students screened for depression and anxiety has doubled, an increase of 135% and 110% respectively (Lipson et al., 2022). This is cause for concern as higher depressive, anxiety, and stress symptoms are associated with decreased academic performance (Awadalla et al., 2020; Frazier et al., 2019). There are global efforts being made to provide guidelines for institutions of higher

education to embed and increase health promotion on college campus worldwide like the Okanagan Charter (*Okanagan Charter*, 2015).

***Depressive Symptoms.*** Depression is a disorder diagnosed by the presence of multiple symptoms over a period of time, thus making feelings of depressive symptoms dangerous as it can lead to a future diagnosis (American Psychiatric Association, 2022). The prevalence rate of depression in college students ranges from 22% to 34% (Coakley et al., 2022; Kang et al., 2021; Rogowska et al., 2022). Depressive symptoms may negatively impact students' academic performance (Awadalla et al., 2020; Wagner et al., 2022). Awadalla et al. (2020) found that in a sample of 404 university students, high levels of depressive symptoms were associated with lower grade point averages (GPA) and decreased academic satisfaction. Another study found that moderate depressive symptoms predicted delayed graduation two-fold and severe depressive symptoms predicted delayed graduation three-fold (Wagner et al., 2022). This highlights the relationship between depressive symptoms and academic performance. Academic success is highly valued; therefore, the pressure to succeed can contribute to depressive symptoms and depressive symptoms can lead to diminished academic performance (Awadalla et al., 2020).

Research suggests that there is a higher prevalence of depression in female college students than in their male counterparts (ACHA, 2023; Cheong et al., 2022; Kang et al., 2021; Rogowska et al., 2022). This gender disparity has repercussions that go beyond mental health symptomatology and diagnoses. In a global meta-analysis of multiple world mental health surveys, researchers found major depressive disorder predicted a higher rate of attrition in females college students (Auerbach et al., 2016).

Ethnic disparities are present in prevalence of depressive symptoms among college students, a cross-sectional study found that the prevalence of depressive symptoms were higher among Hispanic respondents than non-Hispanic respondents (Worthen et al., 2023). Findings are consistent with that of two other large cross-sectional study that found Hispanic students reported higher depressive symptoms than white, black, Asian, and multiracial counterparts (Eisenberg et al., 2013; Zvolensky et al., 2021). This may be due to many factors such as discrimination and worry (Worthen et al., 2023; Zvolensky et al., 2021).

***Anxiety Symptoms.*** Anxiety is defined as an emotion characterized by fear and worry about the impending future that leads to physiological symptoms (APA Dictionary of Psychology, 2018). Anxiety has an average age of onset that ranges from 15 to 21 years old. Anxiety symptoms may develop or worsen during college years due to responsibilities that arise when in college (de Lijster et al., 2017). Studies suggest that 50 to 85% of undergraduate students have moderate to severe anxiety symptoms (Amir Hamzah et al., 2019; de Sá Alves et al., 2021). Anxiety symptoms include difficulty making decisions, gastrointestinal disturbances, heart palpitations, irritability, shakiness, sleeping disturbances, and a sense of impending misfortune (WHO, 2023).

While depression and anxiety are clinically distinct disorders, they are often cooccurring conditions in college students. The NCHA found that depression and anxiety, as cooccurring conditions, presented in 12% of male college students and 27% of female college students (ACHA, 2023). The NCHA is supported by other research that suggest anxiety and depression are often times cooccurring conditions (ACHA, 2023 and Coakley et al, 2022).

It is reasonable to expect that students experiencing sleeping disturbances, decision difficulty, and irritability may struggle with the strenuous workload that college life entails. For example, Awadalla et al. (2020) found that female college students with anxiety had lower GPAs than those who did not have anxiety. Coakley and colleagues (2022) found that basic need insecurities, like food and housing, were associated with anxiety in college students (Coakley et al., 2022). This is important as 50% of college students reported high food insecurity in the United States in 2023 (ACHA, 2023).

In 2023, 40% of female college students reported being diagnosed with anxiety and 24% of male college students, illustrating a gap in the mental health of women and men (ACHA, 2023). Gender disparity is not the only difference in anxiety prevalence. A post-lockdown study reported that Hispanic respondents reported a higher anxiety prevalence than non-Hispanic respondents (Khubchandani et al., 2021). A study conducted at a primarily Hispanic-serving university found that rates of anxiety were lower among non-Hispanic respondents than among Hispanic students (Ibarra-Mejia et al., 2023). Cano et al. (2016) found that ethnic discrimination and self-esteem were associated with anxiety symptoms in Hispanic students (Cano et al., 2016). The increase in anxiety symptomatology may be due to factors such as acculturation stress and anxiety sensitivity (Jardin et al., 2018).

***Stress Symptoms.*** With a constant stream of new information, continuous deadlines, and the pressure to meet all expectations, it is no surprise that college is a stressful time for undergraduates (Mofatteh, 2020). Reports indicate 76% of college students experience moderate to severe stress, and approximately 43% of students feel stress is an impediment to academic performance (ACHA, 2023). Mesghina et al. (2021) investigated the impact of the Covid-19



pandemic on the stress regulation of college students. They found that learning and mind wandering were significantly impacted by Covid-19 distress (Mesghina et al., 2021). This study's findings are particularly important when considering stress in students today because the world is still recovering from the Covid-19 pandemic in 2020. Although many of the undergraduates who were in this study have graduated, current undergraduates include students who were in high school during the pandemic, and therefore may also have impacted stress regulation. One study at a university in Greece examined the mental health of college students three years after the pandemic and found that younger students were at higher risk for stress, anxiety, and depression (Kavvadas et al., 2023). These findings suggest that the current and upcoming generation of students are at particular risk for stress, anxiety, and depression due to their age and brain developmental stage at the time of the pandemic.

Research suggests that female college students have higher perceived stress than males. For example, Graves et al. (2021) examined the gender difference between male and female college students and found that approximately 22% of female students reported severe stress, whereas only 7% of male college students reported severe stress (Graves et al., 2021). In a nationwide survey, 78% of female college students reported moderate to high levels of stress compared to 68% of male college students (ACHA, 2023). Gender disparity, however, is not the only difference in college stress. A study comparing stressors in white, non-Hispanic female college students and white, Hispanic female college students found that white, Hispanic students experience greater stressors than their counterparts, suggesting ethnic disparity among stress prevalence in college students (Holliday et al., 2016). Minority college students, Hispanic students for example, experience the same stressors as other college students, but they also

experience additional stressors like minority status stress (Arbona et al., 2018). A systematic review examining stressors in the Hispanic community identified seven stressors experienced by this community: discrimination, family culture conflict, acculturative stress, bicultural stress, intragroup rejection, immigration stress, and context of reception (McCord et al., 2019). The presence of higher stress levels in the Hispanic college students may be due to the additional stressors experienced by those in the Hispanic community.

Stress, like anxiety and depression, has been shown to negatively impact academic performance (Awadalla et al., 2020; Frazier et al., 2019). Frazier et al. (2019) studied nearly 9000 students from 2-year and 4-year colleges to examine the impact of stress on college students' life. Analyses revealed that those who reported stress had less coping self-efficacy, less resilience, and less social support than those who reported experiencing no stress (Frazier et al., 2019). Additionally, those who reported stress that negatively impacted academic performance had the lowest GPAs when compared to those who reported no stress and those who reported stress that did not impact their academic performance (Frazier et al., 2019).

### **Physical Health in College Students**

Physical health behaviors are practices that enhance or diminish one's physical health such as diet and PA. Physical health behaviors develop all throughout life, but one study found that the decrease in PA is greatest in the transition from adolescence to young adulthood (Kwan et al., 2012). The findings of Kwan et al. (2012) are supported by two systematic reviews that establish a decline in PA from adolescence to young adulthood (Corder et al., 2019; Gropper et al., 2020). While physical health behaviors, as the name suggests, impact physical health like heart health and body composition, current research supports that physical health behaviors are

associated with mental health as well (WHO, 2022b). PA has been shown to decrease depressive and anxiety symptoms as well as mediate stress (Catling et al., 2022; Johnston et al., 2021; Tong et al., 2021; Yuan et al., 2022). As with most areas in life, there is not one component that determines mental health outcomes, but a combination of physical health behaviors that holistically impact mental health. So, while PA impacts mental health, diet quality does as well. Diet quality has been associated with anxiety, depression, and stress levels (Keck et al., 2020; Solomou et al., 2022).

***Diet Quality and Mental Health.*** Diet quality is defined as a “score” or assessment of the patterns and categories of food/beverage items that are consumed (Krebs-Smith et al., 2018). Diet quality can either protect against or increase the risk noncommunicable diseases like cancer, cardiovascular disease, hypertension, and type 2 diabetes (WHO, 2020). Due to the life changes experienced by college students, especially living without parental supervision and having new responsibility for one’s food intake, the diet of many college students change once they begin college (Small et al., 2013; Sogari et al., 2018; Stok et al., 2018).

National guidelines for fruit and vegetable consumption are 1.5 to 2 cups and 2.5 to 3 cups respectively (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020). One study found that college students report meeting fruit and vegetable recommendations on less than half of the days of the week (Odum & Xu, 2019). In a longitudinal study, Small et al. (2013) found that the consumption of fruits and vegetables from the beginning of college to the end of college decreased by 14%. A systematic review examining college student diet quality found that the food environment of university campuses leads to decreased diet quality (X. Li et al., 2022).

Evidence suggests that diet quality may be associated with psychological distress in female college students. Pacheco-Salles et al. (2022) examined the relationship between perceived stress and food intake in university students. Findings showed higher levels of perceived stress were associated with higher unhealthy food consumption and lower healthy food consumption (Pacheco Salles et al., 2022). In a systematic review of 68 articles, Solomou et al. (2022) found 20 articles had findings that suggest an inverse relationship between depression and diet quality. Eight studies had significant findings that suggest an inverse relationship between diet quality and anxiety (Solomou et al., 2022). Eight studies' findings suggest an inverse relationship between diet quality and stress (Solomou et al., 2022). Researchers identified factors that influence diet being: the presence of fast food/prepared foods on campus, financial strain, lack of access to healthy foods, and lack of companionship during meals (Solomou et al., 2022). These findings are important because college students are at risk for unhealthy diets which research suggests could possibly exacerbate existing mental health disorders or contribute to the development of a new one.

When it comes to gender gaps in diet quality, the literature is clear on one thing: regardless of gender, college student diet quality is poor (Alkazemi, 2019; X. Li et al., 2022). One study reports that female students ate more chips and sweets than male students, but male students ate more protein than female students (Alkazemi, 2019). As for ethnic differences in diet quality, the national average Healthy Eating Index HEI score for young adults is 57, whereas Landry et al. (2019) found that the average HEI score for Hispanic college freshmen was  $54.9 \pm 13.4$  (U.S. Department of Agriculture et al., 2023). This suggests Hispanic college students have poorer diet quality than non-Hispanic college students, supported by the findings of Rupp et

al. (2022) that report Hispanic college students eat less fruits and vegetables than non-Hispanic counterparts (Rupp et al., 2022). Additionally, research suggests that younger Hispanic females have poorer diet quality than younger Hispanic males regarding fruit and vegetable intake (Tam et al., 2017). Furthermore, the Covid-19 pandemic had immense repercussions on the economy, but research suggests Hispanic families were hit at the greatest magnitude regarding unemployment; and therefore, dealt with great financial strain (Ramirez et al., 2023). As mentioned earlier, the effects of the Covid-19 pandemic are not stuck in 2020, but rather have altered life for nearly everyone. The financial strain that hit the Hispanic community during the pandemic may still be impacting families today, and in turn impacting Hispanic student diet quality since lower socioeconomic status impacts dietary choices (Merhout & Doyle, 2019). While the literature has examined Hispanic college student diet quality, the literature lacks a closer look at how diet quality may be impacting mental health outcomes in Hispanic female college students.

***Physical Activity and Mental Health.*** PA is defined as any movement that requires energy whether it be leisure activities or walking as a means to get from one place to another (Solomou et al., 2022). Current guidelines for adults 18-64 years old are 150-300 minutes of moderate PA or 75-150 minutes of vigorous PA along with at least two days of strength training (WHO 2022b). These guidelines are set to help adults attain the benefits that physical activity offer like the reduction of depressive and anxiety symptoms, management of cardiovascular diseases and diabetes, and enhancing learning and cognition (WHO, 2022b). Incorporating regular PA into everyday life can be challenging for undergraduate students due to lack of time,

finances, and places to exercise (Ferreira Silva et al., 2022). For reference, less than half of college students report meeting guidelines for physical activity (ACHA, 2023).

An interventional study found that by implementing exercise, a decrease in depressive symptoms and perceived stress level occurred (Herbert et al., 2020). Another study found that those who took better care of their body, meaning regular exercise or an extracurricular sport, were significantly more likely to have a higher stress tolerance (Welle & Graf, 2011). Johnston et al. (2021) investigated the relationship between team sports and mental health in college students through an experimental study. Participants were split into two groups: the experimental group being students enrolled in a team sports class and a comparison group enrolled in an aerobic dance class (Johnston et al., 2021). Both groups saw decreased levels of depression, although the teams sports group saw a sharper decrease (Johnston et al., 2021). Additionally, Yuan et al. (2022) examined the impact of regular exercise on stress during the Covid-19 pandemic. Regular exercise habits were negatively associated with perceived academic stress (Yuan et al., 2022). Similarly, findings from longitudinal study that found exercise was effective for coping with stress in college freshmen (Garett et al., 2017).

Tong et al. (2021) explored the relationship between yoga, aerobic exercise, and stress. Results demonstrated both aerobic exercise and yoga decreased negative emotions, mindfulness, and self-compassion (Tong et al., 2021). The studies mentioned above focus on different intensities of PA and support the positive relationship between PA and psychological distress.

Considering gender differences, 40% of female college students report meeting PA guidelines in comparison to 55% of male college students (ACHA, 2023). Considering female college students specifically, Catling et al. (2020) found that higher stress levels and lower

exercise levels predicted higher anxiety levels. Differences between levels of PA do not stop at gender differences, there are differences in ethnicities as well. In one study that investigated the health of Hispanic college students exclusively, Karabulut et al. (2018), found that only 25% of females in the study were considered active (Karabulut et al., 2018). This is 15% less than what is reported nationally for all female college students. Furthermore, Magoc et al. (2016) investigated PA in Hispanic students and found that male students reported higher PA levels than female students (Magoc et al., 2016). This raises questions of how this PA difference may be impacting the wellbeing of female Hispanic college students who, as forementioned, experience greater stress and anxiety than their peers (Holliday et al., 2016; Ibarra-Mejia et al., 2023). Even so, the literature demonstrates the immense and measurable influence that physical activity has on improving mental well-being. However, to the best of our knowledge, there are no studies that look at PA and mental health in Hispanic female college students.

## **Summary**

The literature demonstrates an alarming presence of psychological distress in college students including depression, anxiety, and stress. Female college students report higher levels of psychological disturbances than male counterparts. There are disparities that exist among racial and ethnic minority groups (i.e., Hispanics). Current research suggests a relationship between mental health and health behaviors like physical activity and diet quality. The habits that undergraduates adopt in their college years can influence long-term lifestyle changes, so the importance of identifying and encouraging healthy habits is essential for institutions and undergraduates.

There is limited research on these associations in female Hispanic college students. It is crucial to investigate the associations between physical health behaviors and mental health outcomes in female Hispanic college students because research suggests they are at higher risk for poor mental health outcomes and diet quality along with lower levels of PA. Having information on Hispanic female college students' mental health and physical health behaviors allows universities and practitioners to cater their treatment for these students through targeted therapies and informed behavior guidelines. A public Southeastern University, the home of this research, has a diverse population including a large Hispanic population. This provides a unique opportunity to study a Hispanic female population and gain more insight into their mental health status as well as their physical activity levels and diet quality. Upon comparing the university NCHA to the national NCHA, it appears mental health and health behavior trends do not differ from national trends. **The purpose of this study is to examine the relationship between physical health behaviors (i.e., physical activity and diet quality) and mental health (i.e., depression, anxiety, and stress) in female Hispanic undergraduate students.**



## AIMS AND HYPOTHESES

The primary purpose of this study was to examine the relationship between physical health behaviors (i.e., physical activity and diet quality) and mental health (i.e., depression, anxiety, and stress) in female Hispanic undergraduate students.

### **Primary Aims**

*Hypothesis 1.* Diet quality (a) and physical activity (b) will be negatively associated with depression, anxiety, and stress.

*Hypothesis 2.* There will be significant group level differences between low, moderate, and high (a) depression, (b) anxiety, and (c) stress on diet quality.

*Hypothesis 3.* There will be significant group level differences between low, moderate, and high physical activity on depression, anxiety, and stress.

## **METHODOLOGY**

### **Participants and Study Design**

A descriptive, cross-sectional study design was used to examine the relationship between physical health behaviors and mental health outcomes in Hispanic female college students. Participants were undergraduate college students enrolled in courses at a large metropolitan university in the Southeast United States. Recruitment occurred from July – December 2023. Individuals at least 18 years of age who self-identified as Hispanic and female were invited to participate in the study. Participants were recruited from posted flyers around the campus, in-person classroom recruitment, and online announcements distributed by course instructors. Participants completed an online questionnaire disseminated via Qualtrics that was estimated to take 15 minutes to complete. Participants who completed all survey items were compensated with a \$10 Amazon gift card for their time. An a priori power analysis was run using the bivariate correlation statistical test and determined that minimum sample size needed for this study was 193 participants. The sample includes a total of 232 who met eligibility requirements and participated in the survey, but the final sample includes 109 participants who completed the survey in its entirety. This study protocol was approved by the university's IRB which can be seen in Appendix A.

### **Measures**

The online survey consisted of three subparts with a total of 66 questions. The first part of the survey examined participants' level of physical activity. The second part of the survey

measured diet quality, and the final section of the survey recorded mental health status by measuring depressive, anxiety, and stress symptoms.

***Diet Quality.*** The Dietary Quality Questionnaire (DQQ) was used to measure diet quality. The DQQ is a self-report, previous recall questionnaire that consists of 29 questions. The DQQ measures food group intake from the day before. The questions are all “Yes or No” where Yes is 1 point and No is 0 points. The DQQ was developed to collect diet quality data on the population level more effectively than the commonly used 24-hour recall (Uyar et al., 2023). The DQQ has been validated for the female population in three different countries (Uyar et al., 2023). There are multiple different scoring strategies, but for the purpose of this study we used two: the Dietary Diversity Score (DDS) and the Global Dietary Recommendations (GDR). The DDS determines if one’s micronutrient intake is sufficient. The GDR determines if one’s diet meets global recommendations by subtracting the amount of “risky” foods as defined by the Noncommunicable Diseases-Risk (NCD-R) consumed, from the amount of protective foods as defined by Noncommunicable Diseases-Protect (NCD-P). A copy of the DQQ and scoring guide can be found in Appendix C.

#### *Dietary Diversity Score (DDS)*

The DDS has ten different food groups, some of which include more than one item from the DQQ. The total score range for the DDS was 0-10. If “Yes” was answered for any one of the items included in the food group, it was scored 1. If “No” was answered for all items in the food group, it was scored 0. A total score of 5 or more indicates sufficient micronutrient intake.

#### *Global Dietary Recommendations (GDR)*

The GDR score range is 0-18 and is calculated by the following equation:  $\text{NCD-P} - \text{NCD-R} + 9$ . The NCD-P totals the number of food groups consumed that are considered health promoting according to the WHO. The score is 0-9 with a higher score meaning more consumption of those healthy foods, indicating better diet quality. The NCD-R totals the number of food groups consumed that the WHO suggests avoiding for health purposes. The score is 0-9 with a higher score indicating higher consumption of these “risky” foods, indicating worse diet quality. A higher GDR score indicates a diet that meets global dietary recommendations.

### ***Physical Activity***

The International Physical Activity Questionnaire - Short Form (IPAQ-SF) was used to measure PA. The IPAQ-SF (See Appendix D for the entire IPAQ-SF) measures the amount of moderate and vigorous PA, amount of time spent walking, and amount of time spent sitting in the previous 7 days. For each level of activity, participants report the total days (0 to 7) and the average duration of PA each day in minutes. The questionnaire has been shown to have good reliability and validity (Dinger et al., 2006; Nascimento-Ferreira et al., 2022). The IPAQ-SF scoring is translated into metabolic equivalents (METs). METs are the amount of energy an activity requires when compared to the energy resting requires (Ainsworth et al., 2011). Total METs were calculated for each level of activity (i.e., vigorous, moderate, and walking) according to the IPAQ-SF Protocol and summed for a total METs score. Walking METs were calculated using the following equation:  $3.3 \times (\text{walking minutes}) \times (\text{days of walking})$ . Moderate PA was calculated using the following equation  $4.0 \times (\text{moderate activity minutes}) \times (\text{days of moderate activity})$ . Vigorous PA was calculated using the following equation:  $8.0 \times (\text{minutes of vigorous activity}) \times (\text{days of vigorous activity})$ . During data cleaning, all bouts of activity greater than 180

minutes were truncated to 180 minutes due to unrealistic reports. Categories were created using total METs quartile cut points, low ( $\text{METs} \leq 1378$ ), moderate ( $1379 \leq \text{METs} \leq 2830$ ), and high ( $2831 \leq \text{METs}$ ). The present study sample had a particularly high self-reported PA, thus cut points represent the quartile ranges.

***Mental Health.*** The Depression Anxiety Stress Scale (DASS-21) was used to measure psychological distress in the current study. The 21 item scale measures depressive (7 items), anxiety (7 items), and stress (7 items) symptoms. Participants were asked to indicate how often they experience statements using a 4-point Likert scale, 0 = never, 1 = sometimes, 2 = often, and 3 = almost always. A copy of the DASS Severity Ratings can be found in Appendix B. Due to the small sample size of this study, researchers collapsed the five categories into three categories. Normal remained the same, but a new moderate group was made by combining the mild and moderate groups together, and a new severe group was made by combining the severe and extremely severe groups into one. Cronbach's alpha of the DASS-21 suggests good reliability in college students for the depression scale ( $\alpha = 0.91$ ), anxiety scale ( $\alpha = 0.84$ ), and the stress scale ( $\alpha = 0.90$ ) (Amir Hamzah et al., 2019). In this study, the Cronbach's alpha suggested good internal reliability in Hispanic female college students for the depression scale ( $\alpha = 0.87$ ), anxiety scale ( $\alpha = 0.76$ ), and the stress scale ( $\alpha = 0.82$ ).

## **Statistical Analysis**

Descriptive characteristics were summarized using mean, standard deviation, and frequencies and screened for skewness, kurtosis, and outliers. Pearson correlations were used to examine associations between primary study variables. One-way analysis of variance (ANOVA) was conducted to examine group mean differences for each variable of interest. If significant

differences were detected between groups, a post-hoc Tukey's honest significant difference (HSD) test was employed. Cronbach's alpha was used to analyze the reliability of scales used and examine all tests of significance. Data analysis was undertaken using IBM SPSS® version 29 (IBM Corp, Armonk, NY, USA).

## RESULTS

### Participant Demographics

Table 1 shows participant characteristics. The average age of participants in the final sample was 21.9 ( $\pm$  2.9) years old with 42% reporting full-time employment. The mean total PA measured by the IPAQ-SF was 2,792 ( $\pm$  2,608) METs. Measured by the DQQ, the mean DDS was 6.54 ( $\pm$  2.0), a score above the cutoff for a diverse diet suggesting this sample had an adequately diverse diet. The mean GDR score was 9.32 ( $\pm$ 2.8). Approximately 53% of the sample reported moderate to severe depressive symptoms, 70% moderate to severe anxiety symptoms, and 53% moderate to severe stress symptoms.

Table 1. Participant Characteristics and Demographics

<b>Employment Status (N=133)</b>	<b>N (%)</b>	<b>M (SD)</b>
Full-time	25 (42.1%)	
Part-time	52 (39.1%)	
Not Employed	25 (18.8%)	
<b>Participant Age (N=121)</b>		
Age		21.93 (2.87)
<b>Physical Activity (METS) (N=131)</b>		
Vigorous PA		1362.52 (1687.08)
Moderate PA		385.24 (655.19)
Walking		1029.30 (1006.87)
Total PA		2791.63 (2608.13)
<b>Diet Quality Indicators</b>		
Dietary Diversity Score (DDS) (N=109)		6.54 (1.96)
Global Dietary Recommendations (GDR) (N=111)		9.32 (2.80)
<b>Mental Health Indicators*</b>		
Depression		6.02 (4.49)
Severe (11+)	21 (18%)	
Moderate (5-10)	40 (35%)	
Normal (0-4)	55 (47%)	
Anxiety		6.59 (4.25)
Severe (8+)	48 (41%)	
Moderate (4-7)	33 (29%)	
Normal (0-3)	35 (30%)	
Stress		8.41 (4.25)
Severe (13+)	25 (21%)	
Moderate (8-12)	37 (32%)	
Normal (0-7)	54 (47%)	

\*Mental Health Indicators (N=113)

## Diet Quality and Mental Health

The relationships between diet quality and mental health outcomes were examined. There were significant inverse relationships between the DDS and depression  $r([109]) = [-0.32]$ ,  $p = [<0.001]$  and the GDR and depression  $r([107]) = [-0.34]$ ,  $p = [<0.001]$ . There was a significant



inverse relationship between the DDS and stress  $r([109]) = [-0.27]$ ,  $p = [0.004]$ . There were also significant inverse relationships between the GDR and stress  $r([107]) = [-0.27]$ ,  $p = [0.005]$  and anxiety  $r([107]) = [-0.25]$ ,  $p = [0.009]$ . See Table 2 for all correlations.

*Table 2. A correlational analysis between physical health behaviors and mental health correlates*

Variables	1	2	3	4	5	6	7
1. DDS	-						
2. GDR	0.48*	-					
3. Total METs	0.17	0.25*	-				
4. Depression	-0.32*	-0.34*	-0.15	-			
5. Anxiety	-0.16	-0.25*	-0.17	0.67*	-		
6. Stress	-0.27*	-0.27*	-0.18	0.71*	0.78*	-	
7. Age	-0.09	0.04	-0.10	0.16	0.17	0.11	-

NOTE: DDS= Dietary Diversity Score, GDR= Global Dietary Recommendations

\*Correlation is significant at the 0.01 level (2-tailed)

Group mean differences between measures of mental health symptoms and diet quality were conducted. The one-way ANOVA found significant differences between DDS and levels of depressive symptoms  $[F(2,108) = 6.91, p = 0.002]$  and levels of stress symptoms  $[F(2,108) = 4.07, p = 0.02]$ . The one-way ANOVA also found significant differences between GDR and levels of depressive symptoms  $[F(2,106) = 5.37, p = 0.006]$  and anxiety symptoms  $[F(2,106) = 4.94, p = 0.009]$ . Post-hoc tests indicate that there were significant differences between the severe depressive group DDS score and the moderate and normal depressive groups DDS scores and the severe depressive group GDR score and the normal depressive group GDR scores. Post-hoc tests indicated significant differences between the severe anxiety group mean GDR score and the normal anxiety group mean GDR score. Lastly, post-hoc tests indicated that there were significant differences between the moderate stress group mean DDS score and the normal stress group mean DDS score. Table 3 includes the group means gathered from the Tukey's HSD test.

Table 3. One-way ANOVA between diet quality correlates and mental health correlates (N=111)

Mental Health Correlate	Diet Quality Scores M (SD)	
	DDS	GDR
<b>Depression</b>		
Severe (11+)	5.1 (1.94)*	7.60 (2.14)*
Moderate (5-10)	6.66 (1.91)*	9.19 (2.49)
Normal (0-4)	6.94 (1.91)*	9.91 (2.97)*
<b>Anxiety</b>		
Severe (8+)	6.07 (2.14)	8.36 (2.55)*
Moderate (4-7)	6.69 (2.05)	9.38 (2.76)
Normal (0-3)	6.97 (1.69)	10.30 (2.81)*
<b>Stress</b>		
Severe (13+)	6.09 (1.98)	8.73 (2.37)
Moderate (8-12)	5.97 (2.14)*	8.63 (2.38)
Normal (0-7)	7.08 (1.81)*	9.88 (3.10)

NOTE: DQQ= Dietary Quality Questionnaire, GDR= Global Dietary Recommendations

\*Significant at the 0.01 level (2-tailed)

### Physical Activity and Mental Health

Pearson correlations were performed to evaluate the association between PA and mental health outcomes and found no significant associations (Table 2). Similarly, the one-way ANOVA did not identify any statistically significant group level differences between physical activity groups and mental health; however, trends are outlined in Table 4. In general, as group level of PA decreases, depressive and stress symptoms trend upwards. For anxiety, the moderate PA group reported less anxiety symptoms than those who have low levels of physical activity. However, those in the highly active group report higher anxiety symptoms than those who are moderately active.

Table 4. One-way ANOVA between physical activity groups and mental health correlates (N=113)

Physical Activity	n (%)	Mental Health Scores M(SD)		
		Depression	Anxiety	Stress
High	56 (43.1)	5.55 (4.38)	6.33 (4.17)	7.71 (3.95)
Moderate	31 (23.8)	5.43 (4.04)	5.89 (4.76)	8.29 (4.90)
Low	43 (33.1)	6.67 (4.80)	7.33 (4.08)	9.06 (4.06)

## **DISCUSSION**

### **Overview**

The purpose of this study was to examine the relationship between physical health behaviors (i.e., physical activity and diet quality) and mental health outcomes (i.e., depression, anxiety, and stress) in Hispanic female college students. We hypothesized that diet quality and physical activity would be negatively correlated with mental health symptoms (Hypothesis 1) and was partially supported by our findings. Our findings supported all of hypothesis 2 in that group level differences between mental health categories (i.e., normal depressive symptoms, moderate depressive symptoms, severe depressive symptoms, etc.) and diet quality were present. Lastly, we hypothesized that there would be significant group level differences between low, moderate, and high PA and mental health outcomes (Hypothesis 3); however, our findings did not support this hypothesis.

### **Mental Health Outcomes in Hispanic Female College Students**

In this study, the prevalence of depressive symptoms among Hispanic female college students was 53%; whereas, a systematic review of depression in college students found that the prevalence of depressive symptoms is 33% (W. Li et al., 2022). This higher prevalence of depressive symptoms is corroborated in other research that suggest Hispanic females have a higher prevalence of depressive symptoms (Worthen et al., 2023). As for prevalence of anxiety symptoms (70%) in this study, our results differ from other studies that have reported anxiety symptom prevalence from 18% to 42% in a sample of Hispanic women (Cano et al., 2016; Ross

et al., 2019; Ryan et al., 2021). One possible explanation for the differences between the aforementioned studies is the inclusion of women older than college aged, whereas this study's sample is strictly college-aged students, who experience academic stressors not experienced by non-students. The study by Cano et al. (2016), however, was conducted with a college-aged sample and still found a lower anxiety prevalence (42%) than this study (70%) (Cano et al., 2016). A potential reason for the difference in anxiety symptom prevalence could be the fact that this present study was conducted in a post-Covid environment and anxiety symptoms have notably increased since the Covid pandemic especially in the Hispanic population (Ibarra-Mejia et al., 2023). Additionally, being on a college campus means interacting with many different people, and for Hispanic college students, this means they may encounter ethnic discrimination at times. Cano et al. (2016) found that ethnic discrimination was positively associated with anxiety symptoms suggesting that ethnic discrimination may contribute to this higher prevalence of anxiety (Cano et al., 2016).

Lastly, 79% of the sample was reported moderate to severe stress symptoms. These findings are similar to the national average stress reported by female college students who report 76% are moderately to severely stressed (ACHA, 2023). This is different from the findings of Holliday et al. (2016) that found Hispanic students are more stressed than their counterparts (Holliday et al., 2016). In the aftermath of the Covid-19 pandemic, it is possible that all college students are experiencing similar levels of stress due to impacted stress regulation during the pandemic that has long lasting effects (Kavvadas et al., 2023).

## **Diet Quality and Mental Health**

***Diet Quality and Depression.*** In this study, as depressive symptoms increased, group mean diet quality decreased in both the DDS and GDR score suggesting that decreased depressive symptoms may be associated with higher diet quality. This finding aligns with the results of previous research, which suggests that a balanced diet may lower the risk of depressive symptoms (Selvaraj et al., 2022). Other research states that nutrient contents of higher diet quality, specifically vitamins, minerals, and pre- and probiotics, may lower risk of depression suggesting that a diverse diet may lower depression (Ekinici & Sanlier, 2023). Nutrients like vitamin B6, vitamin B12, and magnesium are inversely related to depression and are found in foods like dark leafy greens, whole grains, and fruits (Ekinici & Sanlier, 2023).

Depression was the only mental health indicator that demonstrated significant relationships between the group mean differences in both the DDS and the GDR. The difference between the DDS and GDR is that the DDS includes only health-promoting food groups like dark leafy greens and fruits, whereas the GDR subtracts consumption of “risky” food groups from the health promoting food groups. Some of the foods considered “risky” are soft drinks, packaged ultra-processed salty snacks, and sweets. Baked sweets and soft drinks are considered “risky” because they contain large amounts of sugar which, when consumed in excess can increase the risk for cardiovascular disease, type 2 diabetes, and depression (Grases et al., 2019; Stanhope, 2016). When considering just the DDS, the lower diet quality scores of the severe depressive group demonstrates that those in this group are not consuming the healthful nutrients that lower the risk of depression compared to those in the moderate and normal depressive groups. On the other hand, the low GDR scores in the severe depressive group demonstrates that

those in this group may be consuming more “risky” foods than those in the moderate or normal depressive groups and thus may be at higher risk for depression. These findings are supported by research that found diets with high amounts of sugar are associated with a higher risk of depression due to increased oxidative stress during metabolism (Grases et al., 2019; Hu et al., 2019). This study’s findings, along with the aforementioned studies, support Hypothesis 2A that there are group level differences between depressive classifications on diet quality.

Considering the prevalence of depression on college campuses and the association between diet quality and depression, universities are unable to meet the food accessibility needs to obtain a diverse, nutrient-dense diet. In nearly every building at higher education institutions, there are vending machines filled with “risky” snacks and drinks like chips, candy, and sodas that are quick and easy food options for students passing through the building (Cleveland, 2023). Imagine the change that could be enacted by universities moving the money they put into vending machines into a shop with fresh, healthy snack alternatives readily available like apples, bananas, salads, and to-go veggie trays. This would benefit students both physically and mentally as many of those foods listed contain B vitamins, magnesium, and other nutrients that are suggested to be protective against depression (Ekinici & Sanlier, 2023).

***Diet Quality and Anxiety.*** In this study, it was revealed that those in the high anxiety group had lower mean GDR scores than those in the normal anxiety group, but no significant differences regarding the DDS. As discussed previously, the DDS includes only health-promoting food groups, whereas the GDR includes both healthy food groups and “risky” food groups. Research shows that a diet high in fat and sugar is associated with higher anxiety, and inversely, consumption of more fruits and vegetables, healthy fats, and protein is associated with

lower anxiety (Aucoin et al., 2021). Additionally, Penaforte et al. (2019) found that college students with anxiety symptoms experience sugar cravings 2.71 times more than those without anxiety symptoms (Penaforte et al., 2019). It is possible that the mean GDR score was found significant, opposed to the DDS scores, because anxiety symptoms increase the risk of sugar cravings; therefore, those in the high anxiety group may indulge in more sugary foods than those in the low anxiety group and is thus reflected in their mean GDR score (Penaforte et al., 2019). This prevalence of anxiety and its relationship to diet quality reinforces the need for more nutritious food option availability on college campuses.

***Diet Quality and Stress.*** In this study, the moderately stressed group had a statistically significant lower group mean DDS score than those in the normal stress group. This study's findings support Hypothesis 2C, that there are stress level group mean differences in diet quality. This is supported by other research that suggests stress is associated with poorer diet quality (Khaled et al., 2020; Schwaren et al., 2021; Solomou et al., 2022). Specifically within the college student population, higher stress levels are positively correlated with unhealthy food consumption and negatively correlated with healthy food consumption (Pacheco Salles et al., 2022). Factors like food accessibility, lack of companionship, and ample fast foods options are linked to unhealthy food consumption and may explain the relationship between stress and diet quality (Solomou et al., 2022).

## **PA and Mental Health**

There were no significant associations between PA and mental health outcomes, incongruent with hypothesis 1B. Researchers believe this may be a result of a small sample size and self-report bias due to the utilization of self-report measures. The one-way ANOVA revealed



no statistically significant PA group mean differences and depressive, anxiety, and stress symptoms. Nonetheless, from the low to moderate PA group depressive, anxiety, and stress symptoms decreased. Interestingly, from the moderate to high PA group, depressive and anxiety symptoms increased, and with a greater difference in anxiety symptoms.

The lack of a statistically significant association between PA and depression was unexpected and conflicts with the majority of literature on the relationship between PA and depression. Research has found an inverse relationship between depression and PA (Johnston et al., 2021; Singh et al., 2023; Wanjau et al., 2023; Zhang et al., 2022). Controversially, the high PA group in this study had a slightly higher mean depressive score than those in the moderate PA group. While less common, research suggests that too much exercise may be linked to increased risk of depression (Weinstein et al., 2015). When discussing “too much exercise,” Weinstein et al. (2015) is referring to those who compulsively exercise. This is important to consider when thinking about those in the highly active group of this study because this sample had an unusually high level of reported PA. The average MET score of this sample was 2792 which is considered highly active according to the IPAQ-SF scoring guide (*IPAQ*, 2022). This could be a result of using self-reported measures. People tend to misreport on self-reported measures, and in this study, it could be that this sample overreported their PA. Additionally, the amount of walking is calculated into total METs, so it is possible that this college-aged population is getting a substantial amount of PA from walking all around their college campus. Nonetheless, considering this sample’s particularly high level of PA, those in the high PA group could potentially fall into the category of excessive or compulsive exercise because it would take a lot of dedication and time to attain the PA that those in the high PA group achieved.

Like the depressive mean scores, from the moderate to high PA group, the group mean anxiety score decreased, but with a greater difference than that of the depressive scores. These findings are supported by a large study that examined the dose responsiveness of PA and anxiety (Kim et al., 2020). Kim et al. (2020) found that for females the optimal METs for reducing anxiety are between  $1800 \leq \text{METs} < 3000$ . The odds ratio begins to trend upward after the range given above is surpassed. The high PA group in this study was defined as  $2831 \leq \text{METs}$ . 2831 METs is simply the low end of the high PA group (33% of this sample) which insinuates that many of those in the high PA group are hitting over 3000 METs and may be increasing their risk of anxiety by surpassing 3000 METs per week. This may explain why there were higher anxiety scores in the high PA group compared to the moderate PA group. As mentioned above, some of the participants in the high PA group could potentially be compulsively exercising. Compulsive exercise has psychological components like negative perfectionism and affect, along with obsessive-compulsive behaviors, which Kim et al. (2020) deems as risk factors for developing anxiety symptoms. The dose-responsiveness of PA on anxiety may explain why those with too little (low PA group) or too much PA (high PA group) experience increased anxiety symptoms compared to those with moderate amounts of PA (moderate PA group).

Mean stress scores were the only mental health outcome that exhibited a steady trend throughout each PA group. As group level of physical activity increased, group mean stress scores decreased with each PA increase. Previous research suggests that there is an inverse relationship between physical activity and stress (Herbert et al., 2020; Stults-Kolehmainen & Sinha, 2014; Tong et al., 2021; Wright et al., 2023). This study's findings did not reach statistical significance, but this trend suggests that there are group mean differences between PA on stress

symptoms. While it is possible that significance was not found because of the small sample size, it is also possible that the reported PA levels were so high that the PA groups had relatively higher levels of PA overall and could have experienced the stress reduction benefits, just not to a statistically significant degree that differentiated the group means from one another. Future research in this population may benefit from using objective measures of PA (e.g., accelerometers) to investigate this relationship further.

While this study's results do not support any parts of hypothesis 3 about PA group level differences on mental health outcomes because all PA findings were statistically insignificant, this is contradictory to the vast majority of research. The majority of research suggests an inverse relationship between PA and mental health outcomes (Dong et al., 2022; Herbert et al., 2020; Johnston et al., 2021; Kim et al., 2020; W. Li et al., 2022; Singh et al., 2023; Wanjau et al., 2023; Wright et al., 2023).

## **Summary**

Based on the findings of this study, there is a significant negative correlation between diet quality and mental health outcomes in Hispanic female college students. There appears to be significant group level differences between depressive, anxiety, and stress symptoms on diet quality. PA was not found to be significantly correlated with mental health outcomes nor were there significant group level difference between PA groups on depressive, anxiety, and stress symptoms. The prevalence of depressive, anxiety, and stress symptoms were higher in this Hispanic female population than that reported of other female students and older Hispanic women (ACHA 2023; Ross et al., 2019; Ryan et al., 2021). This may be because of factors such as lower diet quality (Tam et al., 2017). The findings of this study support previous research that

suggests a higher rate of mental health symptoms in Hispanic female college students. This study explored the relationship between diet and physical activity in this population. Further research to investigate tools to help alleviate and manage the increased risk for mental health symptomatology in the Hispanic female college student population is warranted, especially the development of tools that include education and support for healthy diets and moderate PA. These tools may incorporate outreach programs that focus on diet education and encourage PA as a relationship between these physical health behaviors and mental health outcomes has been established through this research and is well supported in past research.

## **CONCLUSION**

### **Summary**

This study found a negative correlation between diet quality and depressive, anxiety, and stress symptoms (Table 2), supporting hypothesis 1A. This study did not find a statistically significant correlation between PA and depressive, anxiety, or stress symptoms, and therefore cannot support hypothesis 1B. Group mean differences were found between levels of depressive, anxiety, and stress symptoms and diet quality supporting hypothesis 2A, 2B, and 2C (Table 3). Hypothesis 3, PA group mean differences between depressive, anxiety, and stress symptoms, were not supported by this study's findings.

### **Limitations**

A limitation of this study is the nature of cross-sectional studies. Cross-sectional studies are only looking at one point in time; and therefore, this study does not have a comprehensive view of the physical and mental status of these participants over an extended period. Additionally, cross-sectional studies do not determine causal relationships between variables, but rather look at the association between variables. Another limitation of this study is its small sample size. This means that some associations or correlations may not have been statistically detected due to the study being underpowered (i.e., smaller sample size). Researchers aimed to reach the minimum sample size needed, but many participants started the study and did not complete it, potentially due to the length of survey and a lack of an incentive for the first four months of recruitment. Lastly, this study utilized self-reported measures. Utilizing self-report measures comes with self-report bias that include social desirability bias to recall bias, just to

name a few (Althubaiti, 2016). Future studies may want to bypass these biases due to self-reported measures and utilize objective measures such as a clinical diagnosis from a licensed professional or a motion sensor tool that measures physical activity.

Despite its limitations of a small sample size, this study found statistically significant findings. Additionally, with low expenses we established a foundation for future longitudinal and cohort studies to examine effects of diet interventions in Hispanic female college students to alleviate mental health symptomatology using validated and reliable measures for our population. Arguably the greatest strength of this study is that this sample was solely Hispanic female college students and was able to look at the mental health outcomes and physical health behaviors of a population that little is known about. The literature review and findings of this study establishes a frame of reference for future researchers examining this population.

## **Implications**

Considering the higher prevalence of depressive and anxiety symptoms in Hispanic female college students, universities need to implement support opportunities for these students. This support could be through peer support groups dedicated to Hispanic females as well as advertising university counseling resources to Hispanic student organizations to ensure students are aware of the support available. Cano et al. (2016) suggests that ethnic discrimination may be mediated through self-esteem; therefore, developers and leaders of Hispanic support groups and counselors of Hispanic students may focus on building self-esteem.

Overall, each mental health outcome (i.e., depressive, anxiety, and stress symptoms) examined in this study was negatively correlated with diet quality (Table 1). These findings suggest a need for diet interventions on college campuses. Access to healthier options on campus

is one way to meet this need. Another way to meet this need is increased nutrition knowledge in college students. So much over the conversation around nutrition is focused on the physical health implications like hypertension, heart disease, and diabetes, and the relationship between diet and mental health is forsaken. Universities and government policies require a multitude of required classes for all undergraduate degrees such as writing courses, psychology courses, sociology courses, and statistic courses. However, nutrition courses are not always considered curriculum requirements. Knowledge allows people to make better informed decisions, and a required nutrition course would allow students to make better informed food choices. One nutrition education intervention study found that the nutrition education intervention resulted in decreased fat intake (Yahia et al., 2016). This is an example of the potential advantages of implementing a nutrition course into all degree requirements which include both physical and mental health benefits. A nutrition course could allow students to be both physically healthy in terms of cardiovascular health as well as alleviate mental health symptoms like depressive, anxiety, and stress symptoms as exhibited in this study.

To gain further insight into the Hispanic female college student population, future researchers may implement a longitudinal study design to observe the physical health behaviors and mental health outcomes over an extended period of time. Researchers may want to use objective measures such as clinical diagnoses for mental health or wearable PA trackers for more precision with estimates. For now, however, this study suggests that Hispanic female college students are experiencing depressive, anxiety, and stress symptoms more than their gender and ethnic counterparts. Additionally, there were mental health group mean differences in diet quality suggesting that diet quality may factor that can help depressive, anxiety, and stress symptoms.

This study implicates researchers to evaluate the effectiveness of diet and/or PA interventions in alleviating mental health symptoms among this population. Additionally, this study demonstrates the need for universities and clinicians to carefully create effective treatment and therapy for Hispanic female college students.



**APPENDIX A**

**IRB APPROVAL LETTER**



UNIVERSITY OF CENTRAL FLORIDA

**Institutional Review Board**

FWA00000351  
IRB00001138, IRB00012110  
Office of Research  
12201 Research Parkway  
Orlando, FL 32826-3246

EXEMPTION DETERMINATION

June 20, 2023

Dear A'Naja Newsome:

On 6/20/2023, the IRB determined the following submission to be human subjects research that is exempt from regulation:

Type of Review:	Initial Study, Exempt Category 2
Title:	Relationship between physical health behaviors and mental health in female Hispanic college students
Investigator:	A'Naja Newsome
IRB ID:	STUDY00005680
Funding:	None
Documents Reviewed:	<ul style="list-style-type: none"><li>• Explanation of Research, Category: Consent Form;</li><li>• Recruitment Email to Faculty, Category: Recruitment</li><li>• Recruitment Flyer, Category: Recruitment;</li><li>• Recruitment Script - In class, Category: Recruitment;</li><li>• Request for Exemption, Category: IRB Protocol;</li><li>• Survey Instrument, Category: Survey / Questionnaire</li></ul>

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made, and there are questions about whether these changes affect the exempt status of the human research, please submit a modification request to the IRB. Guidance on submitting Modifications and Administrative Check-in is detailed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system. When you have completed your research, please submit a Study Closure request so that IRB records will be accurate.

If you have any questions, please contact the UCF IRB at 407-823-2901 or [irb@ucf.edu](mailto:irb@ucf.edu). Please include your project title and IRB number in all correspondence with this office.

Sincerely,

Renea Carver  
Designated Reviewer

## **APPENDIX B**

### **DASS-21**



**DASS 21** NAME \_\_\_\_\_ DATE \_\_\_\_\_

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.  
The rating scale is as follows:

- 0 Did not apply to me at all - NEVER
- 1 Applied to me to some degree, or some of the time - SOME TIMES
- 2 Applied to me to a considerable degree, or a good part of time - OFTEN
- 3 Applied to me very much, or most of the time - ALWAYS

FOR OFFICE USE

		N	S	O	AA	D	A	S
1	I found it hard to wind down	0	1	2	3			
2	I was aware of dryness of my mouth	0	1	2	3			
3	I couldn't seem to experience any positive feeling at all	0	1	2	3			
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3			
5	I found it difficult to work up the initiative to do things	0	1	2	3			
6	I tended to over-react to situations	0	1	2	3			
7	I experienced trembling (eg, in the hands)	0	1	2	3			
8	I felt that I was using a lot of nervous energy	0	1	2	3			
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3			
10	I felt that I had nothing to look forward to	0	1	2	3			
11	I found myself getting agitated	0	1	2	3			
12	I found it difficult to relax	0	1	2	3			
13	I felt down-hearted and blue	0	1	2	3			
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3			
15	I felt I was close to panic	0	1	2	3			
16	I was unable to become enthusiastic about anything	0	1	2	3			
17	I felt I wasn't worth much as a person	0	1	2	3			
18	I felt that I was rather touchy	0	1	2	3			
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3			
20	I felt scared without any good reason	0	1	2	3			
21	I felt that life was meaningless	0	1	2	3			
TOTALS								

### DASS Severity Ratings

The DASS is a **quantitative** measure of distress along the 3 axes of depression, anxiety<sup>1</sup> and stress<sup>2</sup>. It is not a categorical measure of clinical diagnoses.

Emotional syndromes like depression and anxiety are intrinsically dimensional - they vary along a continuum of severity (independent of the specific diagnosis). Hence the selection of a single cut-off score to represent clinical severity is necessarily arbitrary. A scale such as the DASS can lead to a useful assessment of **disturbance**, for example individuals who may fall short of a clinical cut-off for a specific diagnosis can be correctly recognised as experiencing considerable symptoms and as being at high risk of further problems.

However for clinical purposes it can be helpful to have 'labels' to characterise degree of severity relative to the population. Thus the following cut-off scores have been developed for defining mild/moderate/severe/extremely severe scores for each DASS scale.

**Note:** the severity labels are used to describe the full range of scores in the population, so 'mild' for example means that the person is above the population mean but probably still way below the typical severity of someone seeking help (ie it does not mean a mild level of disorder).

The individual DASS scores do not define appropriate interventions. They should be used in conjunction with all clinical information available to you in determining appropriate treatment for any individual.

<sup>1</sup>Symptoms of psychological arousal

<sup>2</sup>The more cognitive, subjective symptoms of anxiety

### DASS 21 SCORE

DEPRESSION SCORE	ANXIETY SCORE	STRESS SCORE

	Depression	Anxiety	Stress
<b>Normal</b>	0 - 4	0 - 3	0 - 7
<b>Mild</b>	5 - 6	4 - 5	8 - 9
<b>Moderate</b>	7 - 10	6 - 7	10 - 12
<b>Severe</b>	11 - 13	8 - 9	13 - 16
<b>Extremely Severe</b>	14 +	10 +	17 +

## **APPENDIX C**

### **DQQ**

## DIET QUALITY QUESTIONNAIRE (DQQ)



### UNITED STATES

**Read:** Now I'd like to ask you some yes-or-no questions about foods and drinks that you consumed yesterday during the day or night, whether you had it at home or somewhere else.

First, I would like you to think about yesterday, from the time you woke up through the night. Think to yourself about the first thing you ate or drank after you woke up in the morning ... Think about where you were when you had any food or drink in the middle of the day ... Think about where you were when you had any evening meal ... and any food or drink you may have had in the evening or late-night... and any other snacks or drinks you may have had between meals throughout the day or night.

I am interested in whether you had the food items I will mention even if they were combined with other foods.

Please listen to the list of foods and drinks, and if you ate or drank ANY ONE OF THEM, say yes.

	Yesterday, did you eat any of the following foods:	(circle answer)
1	Bread, rice, pasta, tortilla, or cereal?	YES or NO
2	Fresh corn, popcorn, oats, granola, brown rice, or quinoa?	YES or NO
3	Potato?	YES or NO
4	Beans, refried beans, peas, lentils, hummus, chickpeas, tofu, or lima beans?	YES or NO
	Yesterday, did you eat any of the following vegetables:	
5	Carrots, orange squash, pumpkin, sweet potato, or red bell pepper?	YES or NO
6.1	Broccoli, spinach, arugula, kale, collards, turnip greens, or mustard greens?	YES or NO
7.1	Lettuce, tomatoes, green beans, celery, green peppers, cabbage, or cucumber?	YES or NO
7.2	Zucchini, mushrooms, eggplant, cauliflower, okra, asparagus, or radish?	YES or NO
	Yesterday, did you eat any of the following fruits:	
8	Cantaloupe, mango, papaya, apricots, or dried apricots?	YES or NO
9	Orange, clementine, mandarin, tangerine, or grapefruit?	YES or NO
10.1	Banana, apple, watermelon, grapes, avocado, berries, or cherries?	YES or NO
10.2	Pineapple, pear, kiwi, plums, prunes, peaches, or nectarines?	YES or NO
	Yesterday, did you eat any of the following sweets:	
11	Cakes, cookies, brownies, donuts, pastries, or pie?	YES or NO
12	Candy, candy bars, chocolates, ice cream, popsicles, milkshake, or pudding?	YES or NO
	Yesterday, did you eat any of the following foods of animal origin:	
13	Eggs?	YES or NO
14	Cheese?	YES or NO
15	Yogurt?	YES or NO
16	Sausages, hot dogs, pepperoni, luncheon meat, ham, or bacon?	YES or NO
17	Beef, hamburger, lamb, or venison?	YES or NO
18	Pork?	YES or NO
19	Chicken or turkey?	YES or NO
20	Fish, tunafish, shrimp, or seafood?	YES or NO
	Yesterday, did you eat any of the following other foods:	
21	Peanut butter, almond butter, peanuts, almonds, cashews, walnuts, pecans, or pistachios?	YES or NO
22	Potato chips, Cheetos, Doritos, Fritos, or Pringles?	YES or NO
23	Ramen noodle soup or other instant soup?	YES or NO
24	French fries, onion rings, fried chicken, chicken nuggets, fish sticks, fish fry, or fried shrimp?	YES or NO
	Yesterday, did you have any of the following beverages:	
25	Milk, including dairy milk on cereal or in lattes?	YES or NO

26	Coffee with sugar, sweet coffee drinks, hot cocoa, or chocolate milk?	YES or NO
27	Fruit juice, fruit-flavored drinks, lemonade, or sweet tea?	YES or NO
28	Soft drinks or pop such as Coke, Pepsi, Sprite, or Dr Pepper, sports drinks, or energy drinks?	YES or NO
	Yesterday, did you get food from any place like...	
29	McDonald's, Burger King, Subway, Dunkin, Wendy's, Taco Bell, or Chick-Fil-A?	YES or NO

Adapted by the Global Diet Quality Project, [www.dietquality.org](http://www.dietquality.org). 2021.  
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#### INSTRUCTIONS:

- 1) Read the DQQ exactly as written. Do not include additional dialogue or probing questions. Do not add or remove food items. It is important for the integrity of the questionnaire and comparability of results to not modify the DQQ. Further instructions on how to use the DQQ can be found at our website, [www.dietquality.org/dqq](http://www.dietquality.org/dqq)
- 2) If you desire to collect information on additional food items, or to add supplementary questions, these additional questions can be placed at the end of the questionnaire.
- 3) The Global Diet Quality Project has undertaken a systematic process to identify food items for each food group. If you would like to suggest changes to the DQQ, please contact the team using the "Contact Us" button on our website.



# 1. MDD-W & Dietary Diversity Score (DDS)

An indicator of micronutrient adequacy

**Minimum Dietary Diversity for Women of Reproductive Age (MDD-W)** is achieved when  $\geq 5$  out of 10 specific food groups are consumed by an individual over the course of a day. Women in low- and middle-income countries who do not meet the MDD-W are at higher risk of inadequate micronutrient intakes.

A score of 5 or more indicates higher likelihood of adequate micronutrient intake for women of reproductive age (age 15–49 years). MDD-W is expressed as a binary score (1/0), and can therefore be used to identify the percentage of a population who is meeting the MDD-W. This indicator is only validated for women age 15–49 years in low- and middle-income countries.

When these food groups are applied to the general population, the indicator is called the **Dietary Diversity Score (DDS)**. It is not validated as an indicator of nutrient adequacy for the general population, but gender equity of food group diversity can be assessed. The DDS is a semi-continuous score (0–10), expressed as the average score out of 10 for the population.

A YES response to ANY of the question numbers confers a YES response to the MDD-W / DDS food group. For example, if a respondent answered YES to **any or all** of three questions (question 1, question 2, or question 3), their response is scored as 1 point.

## **Dietary Diversity Score (DDS)**

1 point for each “YES” answer to the following food groups:

MDD-W Food group	DQQ Question numbers	Possible points
<i>Grains, white roots and tubers, and plantains</i>	1, 2, 3	1
<i>Pulses (beans, peas and lentils)</i>	4	1
<i>Nuts and seeds</i>	21	1
<i>Dairy</i>	14, 15, 25	1
<i>Meat, poultry and fish</i>	16, 17, 18, 19, 20	1
<i>Eggs</i>	13	1
<i>Dark green leafy vegetables</i>	6*	1
<i>Other vitamin A-rich fruits and vegetables</i>	5, 8	1
<i>Other vegetables</i>	7*	1
<i>Other fruits</i>	9, 10*	1
<b>TOTAL</b>		<b>SUM (0–10)</b>

## 1. NCD-Protect score

*previously published as “GDR-Healthy”*

**An indicator of dietary factors protective against NCDs** (articulated by WHO):

- At least 400g of fruits and vegetables per day
- Whole grains, pulses, and nuts or seeds
- At least 25g of fiber per day

The NCD-Protect score is a score with a range from 0 to 9. It is a sub-component of the GDR score, and reflects adherence to global dietary recommendations on healthy components of the diet. The NCD-Protect score is based on food consumption from 9 healthy food groups during the past day and night. A higher score indicates inclusion of more health-promoting foods in the diet, and correlates positively with meeting global dietary recommendations. It is expressed as the average score for the population.

1 point for each “YES” answer to the following food groups:

Food group	DQQ Question numbers	Possible points
<i>Whole grains</i>	2	1
<i>Pulses</i>	4	1
<i>Nuts and seeds</i>	21	1
<i>Vitamin A-rich orange vegetables</i>	5	1
<i>Dark green leafy vegetables</i>	6*	1
<i>Other vegetables</i>	7*	1
<i>Vitamin A-rich fruits</i>	8	1
<i>Citrus</i>	9	1
<i>Other fruits</i>	10*	1
<b>TOTAL</b>		<b>SUM (0-9)</b>

\*Note that these groups may be asked in two or more questions (e.g. 6.1 and 6.2).

## 2. NCD-Risk score (-)

*previously published as “GDR-Limit”*

**An indicator of dietary factors for NCDs** (articulated by WHO and derived from WHO International Agency for Research on Cancer):

- Less than 10% (ideally less than 5%) of total energy from free sugars
- Less than 10% of total energy from saturated fat, and less than 30% from total fat
- Less than 5g of salt per day
- Little if any processed meat, and red meat limited to no more than 350–500g per week.

**The NCD-Risk score is also a proxy for ultra-processed food intake.** A higher NCD-Risk score is closely related to higher ultra-processed food consumption.

The NCD-Risk score is a score with a range from 0 to 9. It is a sub-component of the GDR score, and reflects adherence to global dietary recommendations on components of the diet to limit or avoid. A higher score indicates higher consumption of foods and drinks to avoid or limit, and correlates negatively with meeting global dietary recommendations. The NCD-Risk score is based on food consumption from 8 food groups to limit or avoid during the past day and night (one food group, processed meat, is double weighted). This is a negative indicator, and is expressed as the average score for the population.

1 point for each “YES” answer to the following food groups, except processed meats receive a double weight:

<b>Food group</b>	<b>DQQ Question numbers</b>	<b>Possible points</b>
<i>Soft drinks</i>	28	1
<i>Baked / grain-based sweets</i>	11	1
<i>Other sweets</i>	12	1
<i>Processed meat</i>	16	2
<i>Unprocessed red meat</i>	17, 18	1
<i>Deep fried food</i>	24	1
<i>Fast food &amp; Instant noodles</i>	23, 29	1
<i>Packaged ultra-processed salty snacks</i>	22	1
<b>TOTAL</b>		<b>SUM (0-9)</b>

## 1. Global Dietary Recommendations (GDR) score

The GDR score is a score with a range from 0 to 18 that indicates adherence to global dietary recommendations, which include dietary factors protective against non-communicable diseases. (**See Annex 1**). The higher the GDR score, the more recommendations are likely to be met. The GDR score is based on food group consumption during the past day and night.

The GDR score is calculated as follows: **NCD-Protect - NCD-Risk + 9 = GDR score**  
It is expressed as the average score for the population.

## **APPENDIX D**

### **IPAQ-SF**

# INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE (August 2002)

## SHORT LAST 7 DAYS SELF-ADMINISTERED FORMAT

### FOR USE WITH YOUNG AND MIDDLE-AGED ADULTS (15-69 years)

The International Physical Activity Questionnaires (IPAQ) comprises a set of 4 questionnaires. Long (5 activity domains asked independently) and short (4 generic items) versions for use by either telephone or self-administered methods are available. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health-related physical activity.

#### ***Background on IPAQ***

The development of an international measure for physical activity commenced in Geneva in 1998 and was followed by extensive reliability and validity testing undertaken across 12 countries (14 sites) during 2000. The final results suggest that these measures have acceptable measurement properties for use in many settings and in different languages, and are suitable for national population-based prevalence studies of participation in physical activity.

#### ***Using IPAQ***

Use of the IPAQ instruments for monitoring and research purposes is encouraged. It is recommended that no changes be made to the order or wording of the questions as this will affect the psychometric properties of the instruments.

#### ***Translation from English and Cultural Adaptation***

Translation from English is supported to facilitate worldwide use of IPAQ. Information on the availability of IPAQ in different languages can be obtained at [www.ipaq.ki.se](http://www.ipaq.ki.se). If a new translation is undertaken we highly recommend using the prescribed back translation methods available on the IPAQ website. If possible please consider making your translated version of IPAQ available to others by contributing it to the IPAQ website. Further details on translation and cultural adaptation can be downloaded from the website.

#### ***Further Developments of IPAQ***

International collaboration on IPAQ is on-going and an ***International Physical Activity Prevalence Study*** is in progress. For further information see the IPAQ website.

#### ***More Information***

More detailed information on the IPAQ process and the research methods used in the development of IPAQ instruments is available at [www.ipaq.ki.se](http://www.ipaq.ki.se) and Booth, M.L. (2000). *Assessment of Physical Activity: An International Perspective*. Research Quarterly for Exercise and Sport, 71 (2): s114-20. Other scientific publications and presentations on the use of IPAQ are summarized on the website.

# INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

\_\_\_\_\_ **days per week**

No vigorous physical activities

***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

\_\_\_\_\_ **days per week**

No moderate physical activities

***Skip to question 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

\_\_\_\_\_ **days per week**

No walking

***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

Don't know/Not sure

<sup>56</sup>  
**This is the end of the questionnaire, thank you for participating.**

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