Influence of Nutrition and Health Behaviors on Academic Performance of Students at a Public Midwestern University

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In Partial Fulfillment

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Doctor of Education

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by

JOEL RAMDIAL

Dr. Bret D. Cormier, Dissertation Supervisor

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The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

INFLUENCE OF NUTRITION AND HEALTH BEHAVIORS
ON ACADEMIC PERFORMANCE OF STUDENTS
AT A PUBLIC MIDWESTERN UNIVERSITY

presented by Joel Ramdial,

a candidate for the degree of Doctor of Education,

and hereby certify that, in their opinion, is worthy of acceptance.

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Dr. Bret D. Cormier

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Dr. Jeremy Heider

_____

Dr. Melissa Odegard-Koester

_____

Dr. William Bratberg

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INFLUENCE OF NUTRITION AND HEALTH BEHAVIORS ON ACADEMIC PERFORMANCE OF STUDENTS AT A PUBLIC MIDWESTERN UNIVERSITY

Joel Ramdial

Dr. Bret Cormier, Dissertation Supervisor

ABSTRACT

This mixed-methods, grounded theory study investigated the relationship between health behaviors and academic performance among university students. The survey instrument collected data related to academic performance, demographic information, and health-related behaviors. 5 validated scales related to healthy eating habits, food security, physical activity levels, alcohol consumption, and sleep quality were included in the survey. 561 participants completed the survey, 20 survey participants were interviewed, and 5 participated in respondent validation interviews.

Quantitative data analyses revealed diet quality and food security were significant positive correlates with academic performance, while body mass index was a significant negative correlate. Food secure students were found to have significantly higher grade point averages than students who were food insecure.

Extant literature, survey data, and interview data were used to develop a substantive theory that proposed an explanation of how health behaviors influence academic performance. Following respondent validation interviews, a final grounded theory emerged. In the final model, access to food and stress were determined to be independent variables and nutrition, exercise, sleep, and alcohol were found to be mediating variables that may influence academic performance.

Keywords: academic performance, health behaviors, nutrition, food security, stress

SECTION ONE

INTRODUCTION TO DISSERTATION-IN-PRACTICE

Background of the Study

Adequate nutrition and an active lifestyle are two components of health that contribute to an individual's overall well-being. Ideally, university students will be in good health and an optimal state of well-being. When students' basic health and safety needs are met, they focus more intently on academics. Likewise, when students' health and safety are in jeopardy, their focus on academics is logically impaired (Dani et al., 2005). Individual studies indicate nutrition, alcohol consumption, physical activity, sleep habits, stress and mental health influence academic performance among college students, however there is a lack of research that examines these factors holistically, combined with traditional intellective and non-intellective factors as they pertain to academic performance (Reuter et al., 2020; Richardson et al., 2012; Wald et al., 2014).

The purpose of this research study is to investigate the relationship between health and nutrition-related behaviors and academic performance amongst students at a public four-year Midwestern university, while controlling for traditional intellective and non-intellective factors. This section provides a brief overview of the study methodology. A more detailed accounting of the methods is provided in section four of this dissertation.

Statement of the Problem

A growing body of evidence indicates mental and physical health of college students influences their academic performance (Wald et al., 2014). Enhancing student health as a means to increase academic performance and retention of college students is a potentially underutilized strategy in need of investigation.

Problem of Practice

The most widely used models for predicting academic performance and retention of college students account slightly for aspects of mental health and psychosocial factors, but do not account for the influence of physical health (Kerby, 2015; Richardson et al., 2012; Tinto, 1975). If nutrition and health behaviors are uncovered as an influence on academic performance in college students, institutions of higher education can focus on these additional factors to improve students' performance in the classroom. Since academic performance is consistently found to a be a major predictor of student retention, student health could be a potential moderator of retention and enrollment numbers at universities across the country if found to correlate with academic performance.

Despite the thorough investigation into predictors and influences of retention and academic performance, little research has investigated the potential influence of nutrition and health on these metrics. The problem of practice being addressed by this research is that the specific relationship between health behaviors and academic performance of college students is not well-known.

Existing Gap in Literature

Despite evidence that health-related factors, such as physical activity, nutritional adequacy of meals, and food insecurity influence academic performance at an elementary and secondary school level, little research has been conducted that analyzes the influence of these health-related variables on academic performance and retention at the college level (Nasui & Popescu, 2014; O'Neill & Maguire, 2017; Shaw et al., 2015; Valladares, et al., 2016). In addition, the influence of other health-related factors such as sleep habits, alcohol consumption, and stress on academic performance have been studied

individually, but few studies have investigated these factors along with nutrition and physical activity in a holistic approach.

Research in the area of college academic performance tends to focus in two major areas: 1) Intellective factors; and 2) Non-intellective factors (Richardson et al., 2012). Many recent studies have found positive associations between healthy behaviors and academic performance of college students, including several that focused on healthy eating habits, but these relationships have not been investigated holistically in a manner that includes other traditional intellective and non-intellective factors (Burrows et al., 2017; Reuter et al., 2020; Singleton & Wolfson, 2009; Valladares et al., 2016; Wald et al., 2014). To the knowledge of this researcher, this will be the first study that includes intellective, non-intellective, and health-related factors when investigating influences of academic performance in college students.

Purpose of the Study

To address this gap in the research, this study investigated influences of academic performance, with a specific focus on nutrition and health-related behaviors of students at a public four-year Midwestern university. The purpose of the study was to determine the influence of nutrition and health related behaviors on academic performance of university students.

Research Questions

To address the purpose of this study and investigate solutions to the problem of practice, the following research questions were addressed:

1. Is there a relationship between health-related behaviors and academic performance among college students at a Public Midwestern University?

a. $H_{1:}$ A significant positive relationship exists between healthy behaviors and academic performance among students at the university.

a. $H_{0:}$ No relationship exists between healthy behaviors and academic achievement among students at the university.

1a. Is there a relationship between nutrition habits and academic performance among college students at a Public Midwestern University?

a. $H_{1:}$ A significant positive relationship exists between nutrition habits and academic performance among students at the university.

b. $H_{0:}$ No relationship exists between nutrition habits and academic achievement among students at the university.

1b. Is there a relationship between exercise habits and academic performance among college students at a Public Midwestern University?

a. $H_{1:}$ A significant positive relationship exists between exercise habits and academic performance among students at the university.

b. $H_{0:}$ No relationship exists between exercise habits and academic achievement among students at the university.

1c. Is there a relationship between sleep habits and academic performance among college students at a Public Midwestern University?

a. $H_{1:}$ A significant positive relationship exists between sleep habits and academic performance among students at the university.

b. $H_{0:}$ No relationship exists between sleep habits and academic achievement among students at the university.

1d. Is there a relationship between alcohol use and academic performance among college students at a Public Midwestern University?

a. $H_{1:}$ A significant negative relationship exists between alcohol use and academic performance among students at the university.

b. $H_{0:}$ No relationship exists between alcohol use and academic achievement among students at the university.

2. Is there a significant difference in academic performance of food secure and food insecure college students at a Public Midwestern University?

a. $H_{1:}$ A significant difference exists between academic performance of those who are food secure and food insecure.

b. $H_{0:}$ No significant difference exists between academic performance of those who are food secure and food insecure.

Conceptual and Theoretical Frameworks

The base model for investigating the initial hypotheses of this mixed-methods study stemmed from McClusky's Theory of Margin and Power-Load-Margin framework, Maslow's Hierarchy of Needs, and Kerby's Model of Student Retention (Kerby, 2015; Maslow, 1943/2005; McClusky, 1970). The initial relationships between variables were theorized into hypotheses based on extant literature. Hypotheses were tested through quantitative data analysis. Relationships were further investigated in the qualitative data analysis. Variables were conceptualized as factors that contribute to one's power or load based on the results of interview data analysis, while considering the relationships proposed by Maslow (1943/2005) and Kerby (2015). Using the grounded theory approach, a new theory was developed that identifies health-related variables that are

related to academic performance, demonstrates how variables in the model influence one another, and proposes how these variables and their interactions influence academic performance. The final grounded theory model utilizes underlying concepts of McClusky's Theory of Margin and Power-Load-Margin framework, Maslow's Hierarchy of Needs, and Kerby's Model of Student Retention (Kerby, 2015; Maslow, 1943/2005; McClusky, 1970).

McClusky's Theory of Margin

In 1963, Howard McClusky introduced the Theory of Margin, in which he proposed an adult's ability to perform a behavior is dependent on a margin of resources to complete the tasks associated with the behavior (Hiemstra, 1981; Merriam & Caffarella, 2007; McClusky, 1970). McClusky conceptualized this theory into the Power-Load-Margin (PLM) formula, with power referring to one's power to complete a task and load referring to burdens that limit one's ability to complete a task. When power is greater than load, the individual has an excess margin of resources that increases one's ability to complete the tasks associated with a behavior (Hiemstra, 1981; Main, 1979; Merriam & Caffarella, 2007; McClusky, 1970). Factors that contribute to one's load present obstacles that interfere with one's ability to perform well at a given task, while factors that contribute to one's power empower students to perform well (Hiemstra, 1981; Main, 1979; Merriam & Caffarella, 2007; McClusky, 1970). Several researchers have set a precedence for using the PLM formula to understand factors that contribute to success in areas such as performance and longevity in work, higher education, and health environments with mixed results (Main, K., 1979; Stevenson, 1982; Stoddary et al., 2013). While the PLM formula may be too general to serve as a predictive instrument, it

has utility in broadly conceptualizing factors that may influence academic performance and may be refined with enough data into a usable tool or guide (Main, 1979). This research utilized the power and load constructs to identify factors that contribute to improving academic performance (power) and factors that hinder academic performance (load), with a focus on how health related behaviors contribute to PLM among university students.

Maslow's Hierarchy of Needs

Maslow's Hierarchy of Needs (HN) has been used frequently throughout many fields, including health and nutrition, to predict and analyze one's priorities according to a base set of needs (1943/2005). When applied to academics and healthy behaviors, one can hypothesize that students will not adopt the desired healthy behaviors unless these behaviors represent a level of concern that is prioritized in the hierarchy at an attainable level (Maslow, 1943/2005). Access to enough food to stay alive and function normally is likely to be placed on the first level: physiological needs. Being on the level one hierarchy means these needs must be satisfied before an individual will be motivated to satisfy needs on a higher level of the hierarchy (Maslow, 1943/2005). As the theory posits, once an individual has level one needs met, he or she will focus on level two needs; once level two needs are met, he or she will progress to level three needs, and so on (Maslow, 1943/2005). Level two safety needs include shelter, absence of violence, and absence of other dangers; Level three love needs include love, friendships, companionship, and other related social needs; Level four esteem needs include achievement, prestige, and other experiences that results in self-esteem and self-respect; Level five self-actualization needs include achieving one's purpose or reaching his or her

potential (Maslow, 1943/2005). Interview data were analyzed through the lens of Maslow's Hierarchy of Needs by considering how certain factors fit into the grounded theory framework.

Kerby's Model of Student Retention

The dependent variable in the quantitative portions of this research is academic performance, which is measured by GPA. Academic performance has been found to be a predictor of retention in many studies and falls into many researchers' retention frameworks as a result. Kerby (2015) developed a New Model of Voluntary Dropout Decision which she adapted from Tinto's Explanatory Model of the Dropout Process (1975). Kerby's model was also influenced by the work of many other retention experts. Kerby's model predicts retention using many variables organized longitudinally in the following categories: "external factors," "pre-college factors," "internal factors," "adaptation," and "outcomes" (Kerby, 2015, pp. 154).

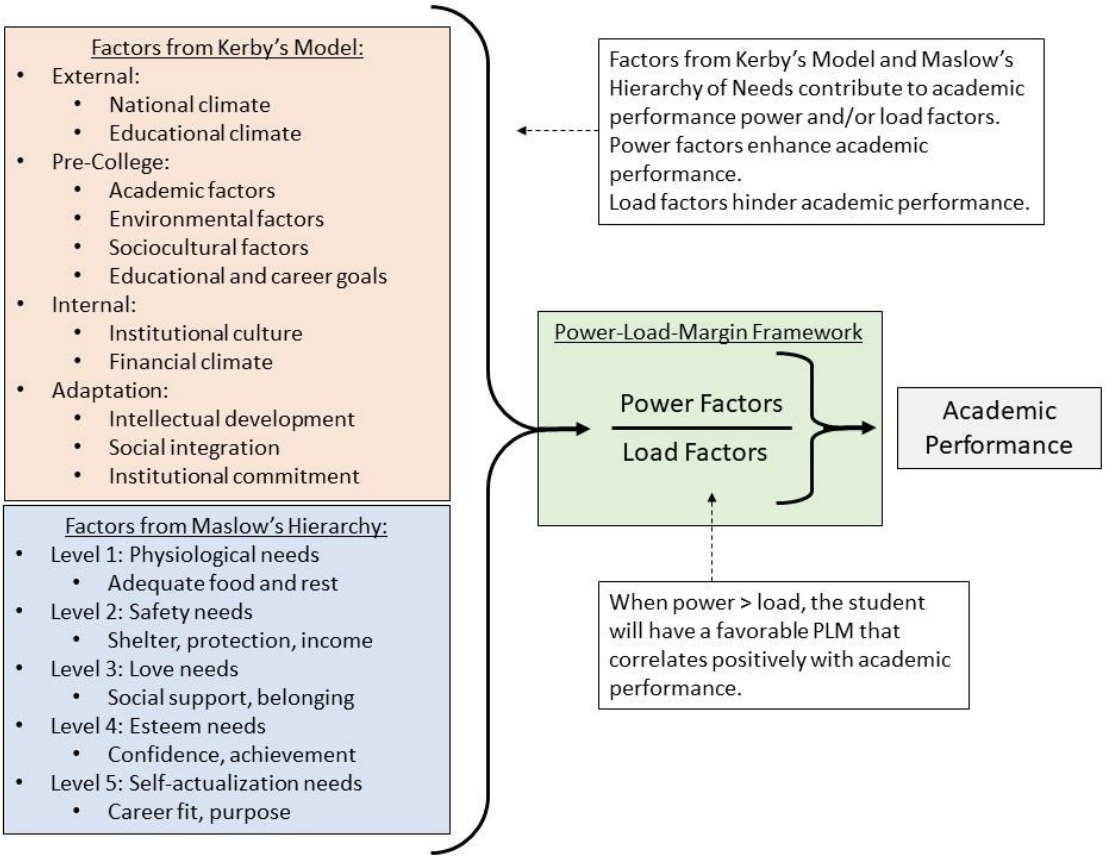
Kerby's (2015) model includes factors such as external influences on students prior to attending college, family and sociocultural factors, institutional characteristics, and additional academic outcomes to Tinto's explanatory model of the dropout process (1975). While the purpose of this research was not to investigate retention, Kerby's (2015) model provides a well-informed pathway that leads to academic performance. The systematic, logical nature of Kerby's (2015) model complements the research design of this study.

When considering the power load margin equation from McCluskey, Maslow's Hierarchy, and the components of Kerby's model that are relevant to the potential influence of health, nutrition, and food security on academic performance, a general

relationship emerges which served as a framework in this research. See Figure 1, below, for the original framework that considered these three frameworks' influences on academic performance. Throughout the literature review, quantitative, and qualitative portions of this study, power and load factors were identified, categorized, and added to this model.

Figure 1

Initial Framework Considering the Theory of Margin, Maslow's Hierarchy of Needs, and Kerby's New Model of Voluntary Dropout Decision



Note. Kerby's Model refers to Kerby's New Model of Voluntary Dropout Decision (Kerby, 2015, pp. 154). Maslow's Hierarchy refers to Maslow's Hierarchy of Needs (Maslow, 1943/2005). Power-Load-Margin refers to McClusky's Theory of Margin and Power-Load-Margin formula (McClusky, 1970).

Design of the Study

This explanatory mixed-methods (MM) grounded theory (GT) research began with a quantitative survey and was followed by a series of interviews, development of a

substantive theory, a second series of interviews for respondent validation, and concluded with development of the final grounded theory (Guetterman et al., 2019). Review of literature uncovered a base of hypotheses and underlying framework on which additional data were added throughout the research process. Several theoretical frameworks provided the underlying structure, but variables and framework emerged as part of the theory development in the qualitative and quantitative portions of the study.

The grounded theory was built on the framework of the PLM formula, with factors identified to correlate with high academic performance included in the power components of the formula, and factors identified to correlate with poor academic performance included in the load components of the formula. Concurrent analysis of data from the review of literature, interviews, and survey were used iteratively to develop a theory grounded in the data (Guetterman et al., 2019; Merriam & Tisdell, 2016; Tie et al., 2019).

Setting

This research study utilized an online Qualtrics survey and recorded remote Zoom interviews. The research took place at a public, four-year university, referred to in this study as City University (CU). City University enrollment is approximately 10,000 students, with close to 9,000 undergraduates and 1,000 graduates (City University, 2020). Institutional Review Board (IRB) approval was obtained in October 2021. See Appendix A for the IRB approval documents from University of Missouri and City University.

Participants

Participants in this research included undergraduate and graduate students enrolled in face-to-face and online classes at CU.

Recruitment. Recruitment of participants for the quantitative survey portion of the study followed email protocol suggested by Dillman et al. (2014). The recruitment procedures for the quantitative survey portion of the study are outlined below. See Appendix B for copies of the recruitment emails.

The survey instrument began with an informed consent page which led to the first questions of the survey if participants chose to participate, or to the end-of-survey thank you message if participants chose not to participate. See Appendix C for the informed consent and survey instrument. The survey concluded with an invitation and directions for participants to schedule an interview. Participants who elected to sign up for an interview were directed to a page of instructions that provided a link to a separate interview sign-up-survey. See Appendix D for the end-of-survey interview sign-up directions. The interview sign-up survey included the survey informed consent, fields to enter name and email address, and a link to a Doodle scheduling poll to sign up for an interview. See Appendix E for a copy of the interview sign-up survey. Participants who only elected to enter the raffle were directed to a page of instructions that provided a link to a separate survey for raffle entry. See Appendix F for the end-of-survey raffle entry directions. The survey for raffle entry only contained a field for participants to enter their name and email address. See Appendix G for the raffle entry survey.

Once a participant scheduled an interview through the Doodle scheduling poll, the researcher emailed the participant to confirm the interview and provide a Zoom meeting link. See Appendix H for an example email sent to confirm an interview with a participant. Once a substantive theory was developed, the researcher contacted all round one interview participants and asked for participation in a focus group for respondent

validation of interpretations and theory. All participants failed to attend a focus group at the specified time, therefore the focus group was not conducted. Instead of a focus group, participants were invited to participate in individual interviews or to provide feedback through email for respondent validation. See Appendix I for respondent validation recruitment emails.

Incentives. By completing the survey and electing to provide their names and email address, participants became eligible to win one of two $25.00 Amazon gift cards. The Qualtrics HTTP Referrer Verification setting was selected so that only respondents who were sent to the raffle survey through the original Qualtrics survey could participate (Qualtrics, 2021). In addition, participants who were interviewed automatically became eligible to win one of two additional $25.00 Amazon gift cards. See Appendix J for one of the raffle winner announcement emails.

Anonymity and Confidentiality. Throughout the qualitative and quantitative portions of the study, participants' identities were protected, and information was kept confidential in many ways: 1) In the design of the interview protocol and survey instrument, questions that would result in collecting potentially identifiable or harmful information were proactively avoided (Creswell, 2014). 2) Interview participants' names were disassociated during coding and pseudonyms were used when reporting data (Creswell, 2016). 3) Interview videos and transcriptions were permanently deleted from Zoom cloud storage (Fink, 2017). 4) Pseudonyms were assigned to interview participants when data were reported (Creswell, 2013; Novak, 2014). 5) The survey instrument was designed to be anonymous by using Qualtrics' anonymous link and anonymize response functions (Qualtrics, 2021; Fink, 2017). 6) Interview videos, transcribed interview data,

memos, coding documents, exported survey data, and data analysis files were saved and secured on a password-protected USB storage drive (Fink, 2017). 7) Once raffle winners claimed all the gift cards, all identifiable information associated with the raffle was permanently deleted.

Sample Size. Of the 8,592 CU students who were emailed the survey recruitment invitations, 788 began the survey and 561 completed it. The response rate was 9.17 % (788 ÷ 8592). The completion rate was 71.19% (561 ÷ 788).

Of the 561 students who completed the survey, 35 scheduled an interview for round 1. Of these 35 who scheduled, only 20 participated in a round 1 interview. All 20 round one interviewees volunteered to participate in a follow-up respondent validation focus group in the subsequent spring semester. Ultimately, there was no single time for which more than five participants could attend a focus group in the spring semester. As an alternative, the researcher interviewed five participants individually and collected written feedback from one participant for respondent validation. See Appendix I for respondent validation recruitment emails.

Data Collection Tools

This MM-GT study collected data from participants through a survey instrument and interviews. Descriptions of these tools as well as procedures for developing, administering, establishing reliability, and determining validity are provided in the subsections below.

Quantitative Data Collection Tool. A survey was developed using data from extant literature in topic areas related to traditional and health-related predictors of academic performance. Many variables in the survey were included to control for

moderating variables, such as demographics, suggested by the literature to moderate the influence of the independent variables on academic performance (Creswell, 2016).

Five validated subscales were used to develop the survey instrument. These subscales are listed below. See Appendix C for the survey and Appendix K for the rationale and sources of survey items.

- The Short Health Eating Index (Colby et al., 2020) was used to evaluate quality of nutrition and eating habits.
- The Vital Signs 2 Question Screening tool (Hager et al., 2010) was used to evaluate food security status.
- The International Physical Activity Questionnaire (IPAQ) – Short Form (Craig, 2003) was used to evaluate exercise and physical activity habits.
- The Medical Outcomes Study (MOS) Sleep Scale, developed by Stewart and Ware (Hays and Stewart, 1992) was used to evaluate sleep duration and quality.
- The National Institute on Alcohol Abuse and Alcoholism's (2021) three-question Alcohol Consumption Assessment was used to evaluate alcohol consumption habits.
- Demographic questions were modeled after recommendations of Fernandez et al. (2016).
- Academic performance questions were developed by the researcher and asked:
    - How many college credit hours have you earned?
    - Are you an undergraduate student or graduate student?

- What is your current cumulative grade point average (GPA)? This is your total GPA as a college student.
- To the best of your ability, estimate your current fall 2021 GPA including all your classes. This is what you believe to be your current GPA when averaging all your fall 2021 classes.

Qualitative Data Collection Tool. Qualitative data were collected during interviews conducted through live remote meetings facilitated and recorded using the Zoom Video Communications tool (Zoom). Due to the COVID-19 pandemic-related restrictions and to reduce burden on participants, interviews only occurred through Zoom. The Zoom interviews followed computer-mediated communication guidelines provided by Merriam and Tisdell (2016). See Appendix L for the complete interview protocol. In general, round 1 interview participants were asked to do the following:

- Discuss factors that influence their academic performance, specifically how health-related factors add to their power or load
- Confirm whether factors supported by empirical data and uncovered in the scholarly review influence their academic performance in a similar manner

After the first five interviews, the researcher concluded that stress and mental health were large health-related influences on academic performance and academic behaviors that contribute directly to academic performance. Consistent with the GT CCA approach, one question was added to the end of the interview protocol related to stress and mental health if the participant did not already discuss the topic in response to the other questions. See Appendix M for a transcribed copy of field notes for one interview.

Respondent validation data collection included obtaining feedback through email and Zoom interviews. The respondent validation interviews were recorded through Zoom and field notes. All five interview recordings and transcripts were saved to the researcher's password-protected USB drive and deleted from the Zoom cloud storage afterwards.

The respondent validation interviews were semi-structured. The participant's answer guided the majority of the interview questions as follow-up and probing questions to extract more specific information about the topic.

Data Analysis

Data analysis followed the explanatory GT methodology as outlined by Guetterman et al. (2019), in which quantitative data are collected and analyzed first, followed by a qualitative portion to explain and add depth to the quantitative results. Survey responses were analyzed using SPSS using multiple regression, independent samples *t-tests* and ANOVA. Multiple studies investigating predictive relationships between an independent variable and academic performance utilized a type of regression model and informed the selection of regression as the primary analysis method for this research (Klomegah, 2007; McIlroy et al., 2017; Meyer & Larson, 2018; Payne-Sturges et al., 2018; Saunders-Scott et al., 2018; Singleton & Wolfson, 2009; Taylor et al., 2013; Wald et al., 2014; Westrick et al., 2015).

Qualitative data were analyzed using CCA, memoing, and thematic analysis throughout the qualitative portion of the study. Formal coding, analysis, and development of the grounded theory were completed using NVivo (QSR, 2020).

Quantitative Data. Survey response data were downloaded from Qualtrics into Microsoft Excel, where they were coded and scored according to the instructions for each of the subscales as instructed by their source documents.

Qualitative Data Analysis and Theory Development. During the qualitative data analysis, interview responses were analyzed, coded and broadly categorized into power and load themes using NVivo (QSR, 2020). Power themes are those which improve academic performance and load themes are those which hinder academic performance. During additional rounds of coding, theoretical sensitivity was utilized to form a grounded theory that attempts to explain how health and nutrition behaviors influence academic performance. Results from theoretical coding of qualitative data, quantitative data analysis, and analysis of empirical data collected from literature were utilized to answer research questions and induce a grounded theory that aligns with the basic structure of McClusky's PLM Formula (McClusky, 1970; Merriam & Tisdell, 2016; Tie et al., 2019).

Definitions of Key Terms

Definitions of key terms used in this study are provided in Table 1 below.

Table 1

Definitions of Key Terms

Term	Definition	Source
Advanced coding	The phase in which codes and categories are integrated into a theory that is grounded in the data and has explanatory power.	Tie et al., 2019
Alc. Drinks	Alc. Drinks refers to the variable used in this study to describe the total number of alcoholic drinks consumed per year as estimated from responses to the NIAAA three-item questionnaire (2021).	NIAAA, 2021
BMI	Body Mass Index refers to one's kg of bodyweight per m^2 of height; a reference to overall weight status. Underweight: BMI < 18.5 kg/m^2; Normal: BMI 18.5 – 24.9 kg/m^2; Overweight: BMI 25 – 29.9 kg/m^2; Obese: BMI 30 kg/m^2 and above.	

(Continued)

Table 1 (continued)

Definitions of Key Terms

Constant comparison analysis	Constant comparative analysis (CCA) is an analytical process used in GT for coding and category development. CCA is used to find consistencies and differences, with the aim of continually refining concepts and theoretically relevant categories. The CCA iterative process that encompasses GT research sets it apart from a purely descriptive analysis.	Tie et al., 2019
Diet Quality Score (DQS)	DQS refers to diet quality score as determined by responses to Colby et al.'s (2020) Diet Quality survey.	Colby et al. (2020)
Food Security Status (FS)	FS is the variable in this study used to describe food security status as determined by responses to Hager's (2010) 2-item food insecurity screening tool.	Hager, 2010

(Continued)

Table 1 (continued)

Definitions of Key Terms

Grounded theory	An umbrella term denoting a family of interrelated approaches aimed at developing an inductively derived theory, explanation, or conceptual framework grounded in the data.	Guetterman et al., 2019
Inductive	Start with a broad idea. Allow theory to emerge through research using CCA (concurrent data collection, analysis, thematic organization).	Tie et al., 2019
Initial coding	Preliminary step in grounded theory research where data is split to compare incident to incident and the researcher looks for similarities and differences in beginning patterns.	Tie et al., 2019
Intermediated coding	Begins to transform the basic data into more abstract concepts, allowing the theory to emerge from the data.	Tie et al., 2019

(Continued)

Table 1 (continued)

Definitions of Key Terms

PA Category	PA Category describes physical activity category as determined as by responses to the International Physical Activity Questionnaire (IPAQ) – Short Form, seven-item scale.	Craig et al., 2003
Sleep Score	Sleep Score describes the reverse coded Sleep Problems 2 sub-score from the MOS sleep scale.	Hays & Stewart, 1992
Theoretical sampling	An often ignored but foundational form of purposeful sampling used in grounded theory referring to the ongoing selection or revisiting of participants, sites, and events directly aimed at the analytical development of theoretical categories and concepts.	Guetterman et al., 2019
Theoretical saturation	Signals the end of data gathering in grounded theory analysis when no new properties are emerging that contribute to the further elaboration of theoretical constructs.	Guetterman et al., 2019

Significance of the Study

The results of this study could have several benefits. The research uncovered a link between health-related behaviors, food security, and academic performance in university students which will have benefits to scholarship and practice.

Scholarship

This study contributes to the body of literature related to academic performance and health behaviors, and specifically adds to the scarce research on the influence of nutrition on academic performance amongst university students. Even though the study sample includes university students, some findings may be applicable to the general population and lead to further research in different populations of participants. In addition, the study culminated in a grounded theory that utilizes McClusky's Theory of Margin. A theory such as this expands the use of an existing theory and provides additional options for researchers to investigate related topics.

Practice

Results of this study have widespread benefits to fields concerned with nutrition, exercise, sleep, stress management, and substance abuse. Findings of this research add to the body of knowledge related to the relationship between student health behaviors and academic performance, which will benefit professionals in health- and wellness-related fields. Evidence to show these behaviors influence academic performance may increase demand for student wellness programs and education-based interventions.

In addition, this research could inform development of interventions or programs that could help disadvantaged students perform at a higher level in their courses and may aid in retaining students who are food insecure. Relationships identified between health

behaviors and academic performance may also inform interventions and programs that improve academic performance and retention rates of university students.

Higher education institutions may be inclined to consider several changes:

1. Place a greater focus on providing health education to incoming freshmen.
2. Provide an emphasis on a healthy lifestyle in institutional messages from administration and faculty to students.
3. Provide greater access to healthy, low-cost meals on college campuses.
4. Provide a food pantry or expand the role of the food pantry on campus.

Additionally, these results will benefit the student population by helping them understand the relationship between their health behaviors and success as a student. This may influence student behavior in a manner that not only improves their grade point average, but also improves their health.

Lastly, the grounded theory which emerged from this study may be applied to improve the health and academic performance of university students. Operationalizing a theory such as this could provide a framework on which student wellness programs could be built and tested for effectiveness.

Summary

An abundance of literature shows a relationship between many health behaviors, food security and academic performance in K-12 students. Research investigating this relationship in university and college students is less common. Many studies focus on specific health behaviors, but few take a holistic approach when investigating how these behaviors are connected and influence academic performance. Even fewer studies focus on the impact of nutrition on academic performance.

To investigate how health behaviors, specifically nutrition and food security, influence academic performance, this research analyzed the relationship between health behaviors and grade point average, while considering many factors known or theorized to influence academic performance. This research utilized a mixed method grounded theory approach to develop a theory grounded in qualitative and quantitative data.

The theoretical framework of this study is modeled after McClusky's Theory of Margin, which was applied to frame factors that influence academic performance into those that improve one's power of performing well, and those that hinder performance. Hypotheses, developed through qualitative interviews and literature, were tested in the quantitative analysis and the grounded theory emerged from the results of the qualitative analysis. Findings of this study are potentially useful for institutions because they uncovered additional opportunities for institutions to improve their students' academic success, which may contribute to an increase in retention rates.

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SECTION TWO

PRACTITIONER SETTING FOR THE STUDY

Practitioner Setting for the Study

This mixed-methods grounded theory (MMGT) research study investigated how nutrition and health-related behaviors influence academic performance, measured by grade point average (GPA) of City University (CU) students. The survey was emailed to students and administered through Qualtrics and the interviews were conducted using Zoom. The setting, CU, is a public university with approximately 10,000 students, typically, enrolled in undergraduate or graduate programs (City University [CU], 2020). Results of this study may be used to inform student wellness and student success programming to improve academic performance amongst students at CU, and possibly to inspire similar research at other institutions.

History of the Organization

City University began as a normal school (purposed to educate teachers, known as a teacher's college) in 1873 (Criblez & Dunn, 2018). In the early 1900s CU, under the direction of President Dearmont, established a 120-credit hour minimum and four-year standard for earning a bachelor's degree (Criblez & Dunn, 2018). Over the 20th century, CU grew and embraced technology. In 1966, CU became accredited by the North Central Association of Colleges and Secondary Schools and began offering fully online degrees in 2003 (Criblez & Dunn, 2018). The university grew from a normal school to a college, to a campus that housed several colleges; and in 1972 included "University" into its name (Criblez & Dunn, 2018). Currently, CU offers "more than 145 undergraduate majors, 100 minors, and more than 75 graduate programs" (CU, 2020l). In addition to a focus on technological and global expansion, CU has consistently focused on the success and experience of its students, including a focus on student health and wellness.

In 1910, passing gym was mandatory for CU students, and in the 1940s students were required to take a gym class for six semesters (Criblez & Dunn, 2018). With the individualization of university education and diversity amongst student circumstances, the focus shifted away from requiring wellness activities and physical activity as academic classes and moved towards providing health and wellness options. What began as mandatory physical activity classes continues to expand to include health and wellness activities, services, and programs offered by multiple divisions and departments. Many academic programs still require courses that are related to one or more aspects of health and wellness, and CU has developed many support programs and services for students that are centered around health and wellness. In 2017, CU opened a campus food pantry in response to nationwide data and campus research indicating the prevalence of food insecurity among CU's students (CU, 2020h). In 2020, CU opened the Division of Equity, Access and Behavioral Health, which includes a number of student success-focused programs and services and expanded the role of the Center for Behavioral Health and Accessibility (CU, 2020c).

Organizational Analysis

Like many universities, CU utilizes an organizational structure that aligns with Mintzberg's Five; A model in which five levels fit together to make up an organizational structure. Within this general hierarchy is a bureaucratic structure in which the organization is divided into individual divisions, colleges, departments, and units that are modeled after the same five components seen at the broader university level (Bolman & Deal, 2013; Mintzberg, 2005). The divisions and their designated leaders give the organizational structure a blend of lateral and top-down hierarchy, which tends to be a

sustainable approach and may have contributed to the university's ability to succeed in recent years of budget cuts and reorganization efforts (Bolman & Deal, 2013). See Table 2 for a description of how Mintzberg's Five model applies at CU.

Table 2

City University Hierarchy Framed in Mintzberg's Five Model

Mintzberg's Level	Definition	Application to CU
Strategic Apex	Highest level of management and authority	Board of Regents President
Middle Line	Directly supervise the operating core and communicate between the core and apex. Has authority of the strategic apex within its designated area but reports to the apex as a subordinate.	Provost Vice Presidents Vice Provost Deans Chairs Directors
Operating Core	Workers who provide the service.	Faculty Academic program directors and coordinators

(continued)

Table 2 (continued)

City University Hierarchy Framed in Mintzberg's Five Model

Mintzberg's Level	Definition	Application to CU
Technostructure	Facilitate production of the operating core.	Enrollment management Student success Academic support Campus health clinic Accessibility services Behavioral health Marketing Information technology Human resources Budget office Student financial services University foundation
Support Staff	Coordinate workflow for other parts of the structure.	Administrative Assistants Facilities Management

Note. Adapted from "The Five Basic Parts of an Organization," by H. Mintzberg, 2005, *Classics of Organization Theory*, pp. 219-230.

The organizational hierarchy at CU allows for a controlled, streamlined line of communication from the apex to the middle line, operating core, technostructure, and support staff (Bolman & Deal, 2013; Mintzberg, 2005). Communication can be efficiently disseminated from top to bottom, which assigns power to those in an apex position to bypass levels of the hierarchy and directly contact those at the lower levels. This is a crucial consideration, in that student wellness initiatives and programming

information can be communicated by the strategic apex to everyone in the CU organization.

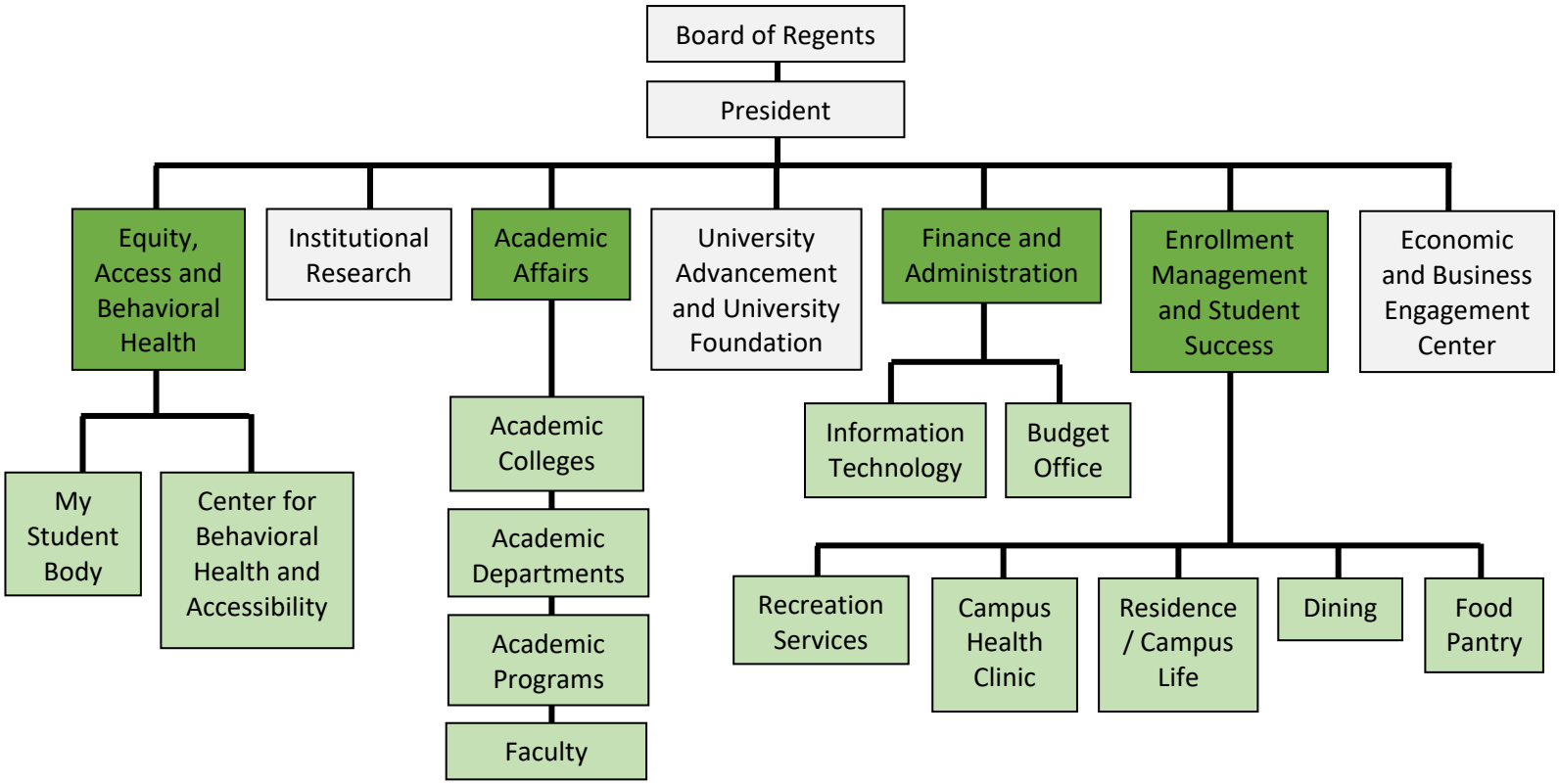
Communicating from a lower position in the structure to the apex is more challenging (Mintzberg, 2005). Hierarchy helps to set a structure that facilitates delegation of tasks, allocation of resources, and accountability from the apex down to the operating core (Bolman & Deal, 2013; Bolman & Gallos, 2011; Mintzberg, 2005). This top-down direction presents challenges for members of the operating core to initiate new programs because the communication channel is designed to limit the amount of unrequested information that reaches those at the top of the middle line and the strategic apex. Communication in a bureaucracy is governed by formal rules and expectations (Manning, 2013). Employees must communicate with the supervisor and cannot skip a step in the chain of command. Following the hierarchy and established chain of command, those in the operating core have a direct line of communication to their immediate supervisors in the middle line, who have a direct line of communication to the next level in the chain of command. Communication of one's idea relies on a direct supervisor to reach the next level in the hierarchy. Once an idea is communicated to the next higher level in the chain, the supervisor must decide if the idea is worth taking to the next level of hierarchy. This bureaucratic process can lead to delays and challenges in initiating change within an organization from the bottom up. In the context of this research, if valuable findings warrant changes to student wellness policies and programming, proper steps must be followed to communicate the recommendations at the right level of the hierarchy. Since many divisions within CU could be affected by changes in student wellness policies and programs, it will be important to identify the

appropriate individuals to contact in the middle line, who can then communicate the ideas and requests up the chain to the peak of the middle line and strategic apex.

Another important consideration is the level at which program and budget decisions are made in the organizational structure. In many instances, the middle line of the hierarchy has authority to make decisions about programming and minor budget items. Depending on the nature of the request, there may be some ideas and requests that can be approved without permission from the strategic apex. For a broader student wellness program, however, individuals and offices representing the university's strategic apex would need to approve. Specific to student wellness, several positions at the peak of the middle line represent divisions crucial to programming directed at improving students' academic performance through wellness initiatives. Figure 2 provides an overview of the organizational structure at CU with departments and divisions highlighted which include programs that are relevant to student wellness and their academic performance. Following Figure 2 is a description of the highlighted departments and divisions along with discussion of key programs within each.

Figure 2

Organizational Map of Hierarchy at City University with Wellness and Academic Performance Programming ***Highlighted***



Note. Adapted from, and informed by content from the following sources "2019 Office Organizational Chart," by City University, 2019, https://semo.edu/president/pdf/2019-presidentorgchart.pdf.; " Academic Affairs Office Organizational Chart," by City University, 2019, https://semo.edu/pdf/President-AcademicOrgChart.pdf.; "Division of Enrollment Management and Student Success – Organizational Chart," by City University, 2019, https://semo.edu/pdf/EMSS-org_chart.pdf?ver=1.1.; "City University Appoints Rucker Vice President for Equity, Access and Behavioral Health," by City University, 2020, https://news.semo.edu/southeast-appoints-rucker-vice-president-for-equity-access-and-behavioral-health/.; "Departments," by City University, 2020, https://semo.edu/enrollment/departments.html."

Finance and Administration

The Finance and Administration division, which is led by the Vice President of Finance and Administration, includes many important offices and units. The Budget Office and Information Technology will be most relevant to initiating any new programs for student wellness by assisting with budgeting for new programs and technological infrastructure required for new programs (CU, 2020j).

Academic Affairs

The Academic Affairs division, which is led by the Provost, includes the Vice Provost, Faculty Senate chair, and all colleges' deans (CU, 2019c). Just below these members are the directors of academic support programs and department chairs. All members and offices of this division would find relevance in efforts that target student success and increase academic performance. These academic offices and units would most likely contribute to a student wellness effort by communicating information to students at a faculty level. In addition, several academic classes contribute to the health and wellness of students due to the subject matter covered in the coursework.

Equity, Access and Behavioral Health

The Division of Equity, Access and Behavioral Health, which is led by the Vice President for Equity, Access and Behavioral Health, includes several important units that contribute to student success (CU, 2020c).

Center for Behavioral Health and Accessibility. The Center for Behavioral Health and Accessibility provides services related to mental health and substance abuse. This office provides support for students dealing with eating disorders, trauma, depression, anxiety, substance abuse, and other afflictions (CU, 2021e).

My Student Body. The Division of Equity, Access and Behavioral Health and Dean of Students also require all students to complete the My Student Body course. This course provides health and lifestyle education in an online module (CU, 2020b).

Enrollment Management & Student Success

The Enrollment Management & Student Success division, which is led by the Vice President for Enrollment Management & Student Success, includes many departments that contribute to student success (CU, 2019e). There are many departments within Enrollment Management & Student Success that could directly contribute to wellness programming and initiatives that could improve academic performance. The most relevant departments and programs include the Campus Health Clinic, Residence Life, Campus Life and Events Services, Dining Services, Recreation Services, and the CU Food Pantry.

Campus Health Clinic. The Campus Health Clinic offers many medical screenings and services to students (CU, 2021d). While not directly related to the focus of this research, this type of care is valuable to student wellness.

Residence Life and Campus Life. Residence Life, Campus Life, and Event Services (CU, 2020f; CU, 2021b) provide many opportunities for students to connect with other students, faculty, and the community through events and student organizations. There are many student organizations that promote health and wellness including Advanced Health, Everybody for Every Body, Friends of Recovery, Health and Wellness Association, Psychology Club, CU Health Educators, Running Club, Student Dietetic Association, Student Medical Society, Student Nurses' Association, Vegetable Enthusiasts Group, and a number of spirituality-based clubs.

Dining Services. Dining Services, in coordination with Chartwells offers nutritious dining options and nutrition and wellness education (CU, 2021f). Chartwells, employs a nutrition/wellness professional, which is typically a Registered Dietitian capable of providing nutrition counseling and group education.

Recreation Services. Recreation Services is the most connected to student wellness. Recreation Services offers a variety of wellness programs including personal training and group exercise classes. In addition, Recreation Services maintains the student recreation centers on CU's campus. The CU Health Educators are a student group of peer educators who are supervised by Recreation Services. These peer educators provide education to students on mental health, physical activity, nutrition, and sexual health (CU, 2021a).

Food Pantry. The CU Food Pantry also exists under the umbrella of Enrollment Management & Student Success. The food pantry provides non-perishable food and additional supporting items (CU, 2020h). Additionally, the food pantry has partnered with a local food bank to provide a mobile food pantry for students, faculty, and staff (CU, 2020a).

As is indicated by the many divisions and programs in the organizational structure focused on student health and wellness, one can surmise that administration and leadership at CU assumes health and wellness are imperative for student success. Upon completion of this research, the investigator will utilize the organizational structure to communicate the results and promote changes that may improve students' academic performance through health and wellness programming.

Leadership Analysis

This analysis of leadership will focus on leadership as it pertains to student success and wellness through Bolman and Deal's (2013) human resources and symbolic frames. When analyzing treatment of students and student wellness programs at CU through the human resource frame, the several tenets of leadership apply (Bolman & Deal, 2013). By focusing on student wellness programs that target mental health, food insecurity, and physical activity, CU is attempting to meet the needs of its students. As Maslow theorized, it is imperative that students have their basic physiological, safety, and security needs met before they can most effectively focus on studying and performing their best, academically (Bolman & Deal, 2013; Maslow, 1943/2005). The benefit for the university is that by providing services and programs that help to meet these basic physiological and safety needs, the university may help to improve the ability of students to focus on their coursework. A greater focus on coursework, coupled with a reduced concern about physiological and safety needs should contribute to improving student success and academic performance. This relationship aligns with the human resources tenets that suggest the university should seek to meet the students' needs and that the university and students symbiotically depend on each other (Bolman & Deal, 2013).

Through the human resources frame, many policy and program changes at CU demonstrate: 1) evidence that CU values students as members of the university system; 2) devotion to student success and the student experience from a holistic perspective; and 3) a commitment to making large scale changes to benefit students. Symbolically, this creates an atmosphere where students feel valued as well. Through a complete overhaul of marketing, branding, and student-focused initiatives, leadership at CU has cultivated a

culture that symbolizes inclusivity and student-centeredness. The “Will To Do” and “We Can’t Wait to See What You’ll Do” brand convey a CU system-wide excitement for student potential and commitment to creating an environment that helps students succeed and persist (CU, 2020k). According to Bolman and Deal (2013), developing a culture and tradition through symbolic leadership, rituals, ceremonies, humor, embracing diversity, and a shared vocabulary through messaging and branding may have long-term benefits for the students and the university. Students may be more loyal and help with recruitment and alumni efforts. In addition, these steps taken to create a sense of culture and tradition may improve students’ sense of belonging and socialization, which will help them ascend to a higher level on Maslow’s Hierarchy of Needs and contribute to their motivation to focus on academic performance (Bolman & Deal, 2013; Maslow, 1943/2005).

Student success has been a long-standing priority for CU, which is evident in the mission statement, vision, and values stated in the Strategic Plan (CU, 2018b), but many changes demonstrate an increased focus on this area. A major factor that increased the student success focus is the current President of CU. Since becoming President in 2015, the leader of CU has made student success a priority. This is evident in the university’s priorities communicated in the annual State of the University. Since the current President began, the State of the University has formally established the Academic Experience as priority 1 and the Student Experience as priority 2, placing these student-centered concerns above the Faculty and Staff Experience (priority 3), External Engagement (priority 4), Fiscal Resources (priority 5), and Technology and Infrastructure (priority 6) (CU, 2019d). Each priority aligns with several measurable objectives and initiatives developed in the university’s Strategic Plan.

In alignment with human resources and symbolic leadership foci, CU has made student success a priority by creating a supporting, inclusive culture. In recent years, CU launched the University Task Force for Student Success to track and communicate student progress, enhance student success, increase retention rates, and improve graduation rates (CU, 2019a). In 2016, CU launched the President's Task Force on Diversity Education and made diversity a high priority at the university (CU, 2020g). The task force researched key issues related to diversity within and outside of the university and made recommendations that led to sweeping changes related to diversity education, training, conversations, and events at CU (CU, 2020g). One change was the new Division of Equity, Access and Behavioral Health that would include the Office of Institutional Equity & Diversity (CU, 2020c). The Office of Institutional Equity & Diversity primarily functions to protect faculty and staff from discrimination and harassment, which includes graduate assistants and student workers (CU, 2020i).

The development and expansion of services provided by the Division of Equity, Access and Behavioral Health; Enrollment Management & Student Success; and President's Task Force on Diversity are indicators of CU's devotion to student success and well-being (CU, 2020d; CU, 2020c).

According to the President of CU:

> "Student success is a core institutional value at [CU]. We have bold, yet achievable goals for retaining our students and helping them achieve their academic, personal, and professional goals. At [CU], we are very proud of the services we provide to support our students. The success of our students is

everyone's responsibility, and we take this charge very seriously" (CU, 2019a, para. 1).

The emphasis on student success and related aspects of a student's experience under the current CU administration reflects the high priority placed on academic and student experiences. The subject area of this research aligns to this focus as the results and information could be used to further promote student wellness initiatives and improve academic performance.

Implications for Research in the Practitioner Setting

This research attempts to determine how health and nutrition behaviors influence academic performance. Specific research questions were answered to determine the influence of a variety of health behaviors on academic performance, and if food secure students outperform food insecure students academically. Results will be beneficial to CU and other institutions in that information on this topic can inform evidenced-based decisions surrounding student success and wellness programs.

If a particular health behavior is found to predict academic performance, the results could be used to develop or enhance existing programs related to the health behavior. For example, Recreation Services already offers many wellness program options related to physical activity, but additional promotions, funding and programs may be warranted if it is found that physical activity is related to higher academic performance. Likewise, the Center for Behavioral Health and Accessibility offers many programs and services that target mental health. If stress management is found to predict academic performance, the results could be used to inform programming and counseling

services. If food security is found to play a significant role, additional funding or expansion of the food pantry may be warranted.

In addition to enhancing existing programs, the findings of this research may justify new programs. The food pantry is one type of program that helps students with hunger and food insecurity, but there is not an existing program or service that helps students plan and follow healthy nutrition habits. Chartwells, through Dining Services, offers some general nutrition counseling, but does not always have a Registered Dietitian available to provide this type of education or counseling service. If the findings of this research indicate healthy nutrition habits are predictive of academic performance, it may be wise to consider new services through which students have access to nutrition counseling and personalized education through a Registered Dietitian as one component of a holistic wellness program.

Because of the many student success-focused offices and programs, the results of this research may be shared with many middle line individuals at CU. The Vice President for Equity Access and Behavioral Health and Vice President for Enrollment Management and Student Success are the most connected to student wellness and success programs at CU. Through the proper chain of communication, the researcher will attempt to meet with these Vice Presidents to share pertinent research findings. If there is value and buy-in at this level, the information may be communicated higher in the hierarchy and eventually to the strategic apex.

The researcher will share data, findings, and suggestions through the human resources frame and symbolic frames with a focus on the long-term benefits for student success that may come from potential changes to policy and programming. Using data to

demonstrate projected, tangible evidence-based benefits will be crucial to gain administrative support. As explained by Bolman and Deal (2013), a weakness of human resources initiatives is that they typically do not provide immediate results, are time-consuming, and are not guaranteed to provide a return on investment and most always require support from the strategic apex. To capitalize on the collaborative benefit of suggestions that fall within the human resource frame, an approach will be used that demonstrates how health and nutrition-based initiatives could be connected and beneficial to multiple entities across the university (Bolman & Deal, 2013). Since many of the university's efforts and student success programs are related to symbolism, efforts will also be made to convince administrators of the positive impacts enhanced health and nutrition behavior programs could have on student and stakeholder perception of the university (Bolman & Deal, 2013). Ultimately, the researcher will make suggestions and requests through the human resources and symbolic lenses to improve student success, academic performance, and wellness through health and nutrition initiatives based on the findings of this study.

Summary

From its humble beginnings as a normal school to its current status as an innovative, quality university, CU has maintained a focus on student wellness and student-centeredness. Student-centeredness and focus on student success are evident in the university's mission statement, values, and brand (CU, 2018a; CU, 2020k). A key component of student success, student-centeredness, and student success is wellness. The student wellness options at CU are broad and include many facets of wellness: Physical activity; emotional; and nutritional (CU, 2018c). The results of this study will potentially

help improve the student wellness offerings at CU and may support the importance of wellness and food security efforts that may help improve academic performance of students.

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SECTION THREE

SCHOLARLY REVIEW FOR THE STUDY

Scholarly Review for the Study

Improving academic performance of university students can be beneficial to higher education institutions for many reasons. Because of these benefits, universities invest large amounts of human and financial resources into programs and facilities aimed at improving academic performance and student success. The following scholarly review includes a broad investigation into potential intellective and non-intellective influences on academic performance. To address the identified gap in literature, this scholarly review includes a specific focus on health-related influences on academic performance.

The content of this review helped to guide the methodological plan of the research study in the following ways: 1) By identifying theoretical constructs and hypotheses by which factors may contribute to a student's power and load; 2) By informing the development of the interview protocol; and 3) By informing the survey instrument draft. The iterative and recursive nature of grounded theory research required additional investigation and inclusion of extant literature as the hypotheses and grounded theory emerged (Glazer & Strauss, 1967; Guetterman et al., 2019; Tie et al., 2019). In alignment with grounded theory methodology, this scholarly review was updated as a result of constant comparative analysis; aided in coding qualitative data; informed theoretical sensitivity; and facilitated development of a grounded theory (Glazer & Strauss, 1967; Guetterman et al., 2019; Tie et al., 2019).

Academic Performance

Academic performance is a crucial measurable outcome for college administrators. Not only does it measure the students' performance, but it also predicts retention. Westrick et al. (2015, p. 26) report that multiple studies have found that first

year GPA is the "strongest predictor of retention through the first and third years, and of degree attainment within four years" when considering multiple academic and non-academic factors. Research performed by Westrick et al. (2015) confirmed these results, reporting results of their study in which first year GPA was the strongest predictor (moderately positive correlation) of second year retention compared to high school GPA, ACT scores, and SES (weak to negligible positive correlations). Because of this importance, many studies have investigated predictors of and influences on academic performance.

Factors Related to Academic Performance: Traditional Intellective and Non-Intellective

Many factors have been investigated as predictors of academic performance. Researchers in this field tend to divide the variables into two large categories of intellective and non-intellective factors (Richardson et al., 2012). The overwhelming body of evidence in extant literature shows intellective factors such as high school GPA and ACT scores to be the most reliable, strongest predictors of academic performance for students in higher education institutions (Richardson et al., 2012; Westrich et al., 2015). Traditionally, intellective factors such as these have been used to predict academic performance and success in higher education, however, an approach that included non-intellective factors has been gaining support through observations and research (Richardson et al., 2012).

Despite the many studies that investigated factors outside of high school GPA, standardized test scores, and other metrics of intelligence, few non-intellective factors have been found to represent a comparable share of predictability of academic

performance. The strongest theories of non-intellective predictors of academic performance point to many potential factors ranging from psychological to academic self-perceptions and behaviors.

To examine the influence of these many traditional and non-intellective factors commonly theorized to predict academic performance, Richardson et al. (2012) completed a meta-analysis which included 241 data sets and 50 variables with a total sample size of 210,941 participants. Variables in Richardson et al.'s meta-analysis included factors in the following domains: 1) Traditional correlates such as high school GPA and ACT scores; 2) Personality traits; 3) Motivation factors; 4) Self-regulatory learning strategies; 5) Students' approaches to learning; and 6) Psychosocial contextual influences (Richardson et al., 2012, pp. 354-355).

Results of Richardson et al.'s (2012) meta-analysis found that the strongest positive correlations emerged in the domains of traditional correlates, motivation factors, and self-regulatory learning strategies. Specifically, the strongest positive relationships between predictor and academic performance were in the following descending order: Performance self-efficacy (.59); High school GPA (.4); ACT scores (.4); grade goal (.35); Effort regulation (.32); and Academic self-efficacy (.31) (2012). There were no negative correlations reported that were considered stronger than weak. For the sake of comparison, however, the strongest negative correlations between predictor and academic performance were in the following descending order: Test anxiety (- 0.24); Procrastination (-0.22); Surface approach to learning (- 0.18); General stress (- 0.13); and Academic stress (- 0.12) (Richardson et al., 2012).

Standardized Test Scores and High School GPA. Many researchers assert standardized tests such as the SAT, ACT, and other traditional measures of intelligence may be biased against underserved individuals and do not account for other non-intellective characteristics and factors that can contribute to one's success (Richardson et al., 2012). Westrick et al. (2015) explains the controversy surrounding the use of standardized test scores as predictors or measures of academic performance. In summary of Westrick et al.'s (2015) explanation: Some suggest standardized tests reflect students' previous SES rather than their ability to perform well in a higher education setting. To test this assertion, Sacket et al. (as cited in Westrick et al., 2015) performed a series of meta-analyses investigating the influence of SES and SAT scores on college GPA. These researchers found when controlling for SES, SAT scores moderately predicted first year college GPA; however, when controlling for SAT, SES negligibly predicted first year GPA (Sacket, 2009, as cited in Westrick, 2015, pp. 26-27). Data in many studies indicate standardized test scores, such as ACT and SAT, as well as high school GPA, have a predictive relationship with academic performance and persistence (Westrick et al., 2015).

Grade point average (GPA) has many limitations when used to measure and predict academic performance in higher education students. Grade point average is determined by completing a different set of courses, with different assignments, from different instructors, under varying sets of circumstances which may lead to grading differences from institution to institution and grade inflation (Richardson et al., 2012). Despite these limitations, GPA is used consistently throughout extant literature to define academic performance.

High school GPA has been found to consistently predict academic performance in higher education (Noble & Sawyer, 2013; Richardson et al., 2012; Westrich et al., 2015). Noble and Sawyer (2013) suggest high school GPA implies more about a student than strict cognitive potential because a student's GPA depends on many factors that influence the ability to perform in a class and what a teacher considers when assigning a grade. The academic factors, non-academic factors, and intangibles that contribute to a student's high school GPA all indicate the student's ability to succeed in a school setting (Westrick et al., 2015), whereas standardized test scores like the ACT and SAT are more limited to indicating a student's cognitive ability. Westrick et al. (2015) explains that high school GPA is correlated with standardized test scores, but because of these differences, high school GPA and standardized test scores are individual predictors of academic performance in higher education students when analyzed separately. Results of Westrick et al.'s (2015) longitudinal meta-analysis also support the inclusion of ACT scores and high school GPA as predictors of college GPA. According to Westrick et al.: "These results clearly indicate that both ACT scores and high school GPA are valid and important predictors of college outcomes for the three institutional selectivity subgroups" (2015, p. 36). These researchers found that high school GPA was a slightly stronger predictor of both first and second-year GPA than ACT scores (Westrick et al., 2015).

In research conducted by Saunders-Scott et al. (2018), ACT scores and high school GPA were also found to predict college GPA. In alignment with Westrick et al. (2015), Saunders-Scott et al. (2018) found high school GPA to be the strongest predictor of college GPA.

Intelligence. Intelligence has been shown to correlate with standardized test scores such as ACT scores, therefore few studies include intelligence and standardized test scores as independent variables (Richardson et al., 2012; Westrick et al., 2015). Typically, ACT scores are used because they have been shown to be a stronger predictor of academic performance and are easier to collect on a survey instrument than intelligence (Richardson et al., 2012). Richardson et al.'s findings supported this trend in that intelligence was found to have a small positive correlation with GPA, while high school GPA, ACT, and SAT scores had medium positive correlations (2012).

Motivation and Grit. Motivation is a common predictor included in studies investigating academic performance. Motivation is difficult to define and measure and therefore is often captured by a variety of factors including grit, grade goals, and effort regulation (Richardson et al., 2012). Richardson et al. (2012, p. 357) define effort regulation as "persistence and effort when faced with challenging situations." Dunn et al. (2015) refined and validated a shortened version of Pintrich et al.'s (1991) MSLQ subscale on Metacognitive Self-Regulation (MSR) and Effort Regulation (ER). These shortened subscales assess multiple aspects of self-regulation that are important for students to succeed (Dunn et al., 2015).

Similarly, grit is defined as "trait-level perseverance and passion for long-term goals," and involves "the capacity to complete a task over extended periods of time" (Duckworth & Quinn, 2009, p. 166). According to Duckworth and Quinn (2009), grit predicts achievement in a wide range of applications and settings. When analyzing first-year students only, Saunders-Scott et al. (2018) found that only grit significantly predicted retention of first year students into the second year of college. Closely aligned

to motivation and grit is goal setting. Latham and Locke (1991) explain that setting a goal automatically initiates effort and persistence, thus motivating the individual to work towards task completion when a goal is challenging and attainable. Richardson et al.'s (2012) findings confirm the importance of goal setting by identifying grade goals as a significant predictor of GPA.

Self-Efficacy. Self-efficacy is also related to motivation and grit. Bandura (as cited in Choi, 2005, p. 197) defines self-efficacy as "an individual's perceived capability in performing necessary tasks to achieve goals." Richardson et al. (2012, p. 356) defined two types of self-efficacy: 1) Performance self-efficacy: "perceptions of academic performance capability"; and 2) Academic self-efficacy: "general perceptions of academic capability." The defining difference between the two types is performance self-efficacy involves overcoming a familiar task, while academic self-efficacy involves overcoming an unfamiliar task (Richardson et al., 2012). In their largescale regression study, Richardson et al. (2012) found performance self-efficacy to be the single strongest predictor of GPA and academic self-efficacy to be the sixth strongest predictor. Because these variations are so close, many researchers only focus on general self-efficacy. Brady-Amoon and Fuertes (2010) found a positive significant relationship between general self-efficacy and GPA, however Choi (2005) did not. Choi (2005), like Richardson et a. (2012), found significant correlations between academic self-efficacy and college academic performance.

Time / Study Management. Time management and study management refer to the ability of a student to budget time in a manner that allows one to complete coursework, study adequately, and have time for other activities (Richardson et al.,

2012). The ability to manage time is related to self-regulation and one's ability to conceptualize future time and planning, which influence academic performance (Shell & Husman, 2001). An accepted measure of time management and study habits is Pintrich et al.'s (1991) MSLQ questionnaire Time and Study Environment subscale.

Socio-Economic Status. Socio-economic status (SES) is another predictor that has seen contradictory influences over academic performance. Westrich et al. (2015) claim SES is anecdotally associated with measures of academic performance and retention, but the relationship has not been consistently shown to be predictive in research studies. On the contrary, Burrows (2017) confirms SES is a predictor of GPA. Recent studies, however, may indicate this trend is reversing. Taylor et al. (2013) explain that their research did not find SES to be a predictor of academic performance in college students, and state that this is the growing trend. The researchers go on to theorize institutional interventions to assist low-income students may be working, which is why fewer studies are finding correlations between SES and GPA (Taylor et al., 2013). Cady (2014) suggests SES may moderate the influence of other predictors, which supports the strategy used by many researchers to collect SES data and include them in the analysis to control for their effect.

First-Generation. It is well known that first-generation college students experience lower GPAs and are more likely to drop out of college (DeFreitas &Rinn, 2013; Stephens et al., 2012; Stephens et al., 2014). DeFreitas and Rinn (2013) posit this is due to having a lower academic self-concept, while Stephens et al. (2012) suggest it is also due to experiencing a cultural mismatch when adjusting to a college or university setting.

Other Demographic Variables Commonly Used as Controls. Many demographic variables such as gender, race, ethnicity, age, hours spent at work, and hours spent using a smartphone or electronic device have been included in several studies that look for relationships between predictors and academic performance (Abbasi et al., 2021; Richardson et al., 2012; Scott et al., 2016; Singleton & Wolfson, 2009; Taylor et al., 2013; Valladares et al., 2016; Wald et al., 2014). In some instances, these variables have been found to independently predict academic performance. For example, Wald et al. (2014) found race/ethnicity to be an independent predictor of GPA, while Singleton and Wolfson (2009) found gender to be an independent predictor of GPA.

Summary

The majority of research in the area of academic performance and retention focuses on intellective factors and non-intellective psychosocial factors that may predict academic performance (Richardson et al, 2012; Westrich et al., 2015). In the next section of the scholarly review, health-related factors will be investigated.

Factors Related to Academic Performance: Health-Related Factors

Many health-related factors have a small amount of evidence to justify investigation as a predictor of academic performance including dietary habits, alcohol consumption, physical activity, stress, and sleep habits (Abbasi et al., 2021; Aimé et al., 2017; Burrows et al., 2017; Meyer & Larson, 2018; Nasui & Popescu, 2014; O'Neill & Maguire, 2017; Payne-Sturges et al., 2018; Reuter et al., 2020; Singleton & Wolfson, 2009; Taylor et al., 2013; Valladares et al., 2016; Wald et al., 2014). Throughout the remainder of the literature review, these factors will be discussed including the research that supports this relationship and the potential mechanism behind the relationship.

Dietary Factors

There are many dietary factors that could potentially impact one's ability to perform as a college student. The most commonly studied aspects as they pertain to academic performance are fruit and vegetable intake, fast food consumption, breakfast consumption, alcohol consumption, and food security. Wald et al. (2014) found that fruit and vegetable intake was a significant predictor of academic performance, but also found the majority of students did not consume the recommended number of servings. Valladares et al. (2016) found females who scored high on the ability to restrict intake had higher GPAs, and females who scored lower on uncontrolled eating behaviors had lower GPAs. Burrows et al. (2017) found both fruit and vegetable intake to positively associate with GPA. Multiple researchers have found regularly consuming breakfast to be associated with higher GPA (Burrows et al., 2017; Reuter et al., 2020). Researchers also investigated food insecurity and found a negative correlation between food insecurity and GPA (O'Neill & Maguire, 2017). A growing body of research indicates rates of food insecurity are higher among college students than what is experienced by American households (Broton & Goldrick-Rab, 2016; Cady, 2014; 2016; Nazmi et al., 2018; Nikolaus et al., 2020; O'Neill & Maguire, 2017; Payne-Sturges et al., 2018; Wolfson & Leung, 2020).

Diet Quality and Academic Performance. The functions of nutrients in the human body are widespread and connected to many possible routes towards academic performance. Researchers Burrows et al. (2017) explain that missing meals or eating a deficient diet could lead to low levels of essential nutrients such as folate, iron, and Alpha-Linolenic Omega 3 fatty acids. These particular nutrients are necessary for proper

brain development and function. Burrows et al. (2017) also explain that the brain needs to be continuously fueled to function properly. Gomez-Pinilla (2008) explains that omega 3 fatty acids, especially Docosahexaenoic Acid (DHA), support cognitive processes and brain function and are components of brain cells, while saturated fats impair cognitive function. Saturated fats are primarily found in fats that are solid at room temperature such as those found in meat, butter, and cheese; while DHA is found primarily in cold water fatty fish such as salmon (Gomez-Pinilla, 2008). Gomez-Pinilla (2008) explains that in recent history, intake of DHA and other omega 3 fatty acids has decreased, while intake of saturated, trans, and omega 6 fatty acids has increased, which may have contributed to a rise in depressive symptoms in Americans. In addition, omega-3 deficiency is associated with many mental disorders such as attention-deficit disorder and many others, which could be detrimental to academic performance (Gomez-Pinilla, 2008). Research by Zamroziewicz et al. (2018) affirms the idea that omega 3 fatty acids are important for cognitive function, finding that omega 3 fatty acid consumption may be linked to fluid intelligence in older individuals. Additional functions of omega 3 that may contribute to this boost in cognitive function include "reducing inflammation, reducing oxidative stress, reducing platelet aggregation, improving blood pressure, and improving arterial compliance" (Zamroziewicz et al., 2018, p. 577).

In addition to omega 3 fatty acids, several nutrients and phytochemicals found in plant foods have been shown to enhance brain function by either protecting the brain from oxidative damage or directly performing a function. Some examples include curcumin, vitamin E, flavanols, polyphenols, alpha lipoic acid, and folic acid (Gomez-Pinilla, 2008).

High sugar consumption is also known to negatively impact college function. A study conducted in Malaysia demonstrated high sugar intake impaired performance on a cognitive examination (Chong et al., 2019). In addition, Freeman et al. (2018) state excessive sugar consumption is associated with cognitive impairments and memory dysfunction. Several sources indicate college students eat in a manner described above that impairs cognitive function and provides little protection (Reuter et al., 2020; Wald et al., 2014).

Alcohol consumption is consistently negatively associated with academic performance, possibly through the negative impact on study habits, sleep, learning, and memory (Burrows et al., 2017; Singleton & Wolfson, 2008). The work of Singleton and Wolfson (2008) showed that alcohol negatively influenced grades directly and indirectly through sleep as a mediator.

Food insecurity and hunger. In 2017, it was estimated that 11.8% of American households experienced food insecurity and acutely increased to 38% during the middle of the COVID-19 pandemic in April 2020 (Nikolaus, 2020; Wolfson & Leung, 2020). An abundance of research demonstrates that food insecurity negatively impacts health, behavior, and academic outcomes among children, adolescents, and college-age students (Broton & Goldrick-Rab, 2016; Cady, 2014; 2016; Nazmi et al., 2018; Nikolaus et al., 2020; O'Neill & Maguire, 2017; Payne-Sturdes et al., 2018; Wolfson & Leung, 2020). A recent, pre-COVID-19, systematic review and meta-analysis of 51 food insecurity studies completed by Nikolaus et al. (2020) found that 41% of college students in the United States experienced food insecurity over a 9-month recall period.

O’Neill and Maguire (2017) found, in their investigation into food insecurity, that food secure students had higher GPAs and were in better health. Interviews with college students revealed that the lack of food was associated with lack of energy, and reduced focus and concentration, and poorer health (O’Neill & Maguire, 2017). Payne-Sturges et al. (2018) experienced similar findings to those of O’Neill and Maguire (2017), but also found minority students to be more likely to experience food insecurity and observed food insecure individuals were more likely to be depressed.

One reason for the inability to concentrate and focus when hungry is because the brain needs fuel (Reuter et al., 2020). Freeman et al. (2018) explain the brain’s primary energy source is glucose. Humans use their stored glucose (glycogen) overnight and wake in the morning needing to replenish their stores. When students go to class on an empty stomach they have not replenished their primary brain fuel (Reuter et al., 2020).

Body Mass Index

Glick (2020) and Boersma et al. (2018) report our current population is less healthy than their previous generation; over 30% of our population remains obese, and the rates of adults with multiple chronic diseases continues to climb. These statistics point to excessive caloric consumption. Gomez-Panilla (2008) explains this trend is also problematic for cognitive health, as evidence demonstrates cognitive benefits from eating slightly less energy than one’s needs. Studies confirm this pattern is likely to negatively impact cognitive function as high body mass index (BMI) is negatively associated with academic performance in college (Aimé et al., 2017; Wald et al., 2014).

Exercise and Physical Activity

In some study models, exercise was found to have a moderating effect. In research conducted by Abbasi et al. (2021), the primary predictor was smart phone addiction and the outcome variable was academic performance. Exercise was found to be a moderating variable in that exercise reduced the negative influence of a smartphone addiction on GPA (Abbasi et al., 2021). Meyer and Larson (2018) found exercise was a moderator of the impact of stress on GPA. These findings indicate exercise may help cope with smartphone addiction and stress. Wald et al. (2014) found a direct positive association between moderate and vigorous exercise and academic performance. Some of the benefits of exercise can be explained by its moderating effect on other known predictors, but its direct influence could have many explanations. One possible mechanism that explains exercise's positive influence on GPA is exercise's ability to enhance learning and memory described by Gomez-Pinilla (2008).

Sleep Habits

Many studies have found a correlation between sleep and academic performance (Burrows et al., 2017; Singleton & Wolfson, 2008; Taylor et al., 2013). Singleton and Wolfson (2008) found that sleep duration and daytime sleepiness were significant predictors of academic performance, and that alcohol consumption influenced them. This suggests that sleep directly impacts academic performance, while alcohol consumption influences sleep (Singleton & Wolfson, 2008). Taylor et al. (2013) found later bedtimes, later wake times, and long naps negatively impacted grades.

Stress Management

The work of multiple researchers has found a negative correlation between stress levels and college GPA (Meyer & Larson, 2018; Richardson et al., 2012; Saunders-Scott et al., 2018). In addition to its impact on academic performance, stress seems to influence retention rates. Saunders-Scott et al. (2018) found perceived stress to be significantly predictive of retention throughout all college years.

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SECTION FOUR

CONTRIBUTION TO PRACTICE

Contribution to Practice

Statement of the Problem

A growing body of evidence indicates mental and physical health of college students influences their academic performance (Wald et al., 2014). The state of Americans' health is worsening, and undergraduate college enrollment numbers are declining (Boersma et al., 2018; Glick, 2020; Mojtabai & Olfson, 2020; National Center for Education Statistics [NCES], 2020; National Center for Health Statistics, 2019). Academic performance is a known predictor of retention of college students (Kerby, 2015; Richardson et al., 2012; Tinto, 1975). Enhancing student health as a means to increase academic performance and retention of college students is a potentially underutilized strategy in need of investigation.

Problem of Practice

The higher education landscape is a competitive marketplace for students who are savvy consumers (Sousa, 2015). The competition for students is fueled by a shift in the ratio of students to the number of universities; from 2010 to 2015, in the United States this ratio has steadily declined from 2,993 students per degree granting institution to 2,846 students per degree granting institution (Institute of Education Sciences, 2017, 2018). One reason this shift has occurred is because there are fewer students attending colleges and universities than in 2010, but there are more institutions. Undergraduate enrollment has declined by 8.1% from 2010 to 2018 (NCES, 2020). In this competitive environment, higher education administrators are focused on increasing retention and completion rates (Aljohani, 2016). Not only are institutions judged on these numbers, but retaining students also saves dollars. According to the United States Department of

Education College Scorecard (2019), average annual cost to attend a public university in the Midwest is $12,655. If this university's average enrollment was 10,000 students with a freshman class of 3,000, increasing the retention rate of freshmen from 70% (2,100 students retained) to 75% (2,250 students retained) would result in retaining an additional 150 students. The savings from retaining these 150 students would be $1,898,250 in one year.

When attempting to retain students, universities tend to focus on the major predictors such as academic performance, social integration, and behavioral support services (Kerby, 2015). Not only is academic performance another important metric, but it is also consistently found to be a predictor of retention and completion (Baylor University, 2007; Hanover Research, 2011; Kerby, 2015). The most widely used models for predicting academic performance and retention of college students account slightly for aspects of mental health and psychosocial factors, but do not account for the influence of physical health (Kerby, 2015; Richardson et al., 2012; Tinto, 1975). If nutrition and health behaviors are uncovered as an influence of academic performance in college students, institutions of higher education can focus on this additional factor to improve students' performance in the classroom. Consistently high rates of overweight/obese individuals and food insecure households, coupled with declining health outcomes in America, may suggest college students are at risk of consuming nutritionally inadequate diets and leading less healthy lives in general, which may negatively impact their ability to perform well in the classroom and be retained as students (Boersma et al., 2018; Burrows et al., 2017; Cady, 2014; Glick, 2020; Nikolaus et al., 2020; O'Neill & Maguire, 2017; Reuter et al., 2020; Wald et al., 2014). Since academic performance is consistently

found to a be a major predictor of student retention, student health could be a potential moderator of retention and enrollment numbers at universities across the country if found to correlate with academic performance.

Many studies have investigated predictors of and strategies to improve college academic performance and retention (Hanover Research, 2011; Westrick et al., 2015). Factors related to achievement, socio-economic status, demographics, psychological traits, social support, and institutional support are typically the focus of this research (Hanover Research, 2011; Tinto, 2017). Despite the thorough investigation into predictors and influences of retention and academic performance, little research has investigated the potential influence of nutrition and health on these metrics. The problem of practice being addressed by this research is that the specific relationship between health behaviors and academic performance of college students is not well-known.

Existing Gap in Literature

Despite evidence that health-related factors, such as physical activity, nutritional adequacy of meals, and food security influence academic performance at an elementary and secondary school level, little research has been conducted that analyzes the influence of these health-related variables on academic performance and retention at the college level (Nasui & Popescu, 2014; O'Neill & Maguire, 2017; Shaw et al., 2015; Valladares, et al., 2016). Many assume that providing access to meal plans and restaurants on campus meets students' primary nutrition needs. However, this assumption discounts the scientific evidence behind nutritional requirements, functions of nutrients, and health implications of chemicals in our foods and beverages. This lack of a focus on nutrition ignores the students who cannot afford to eat adequate amounts while attending college.

Research conducted by Nazmi et al. indicates as many 43% of university students in the United States are hungry or food insecure (2018). A lack of nutritionally adequate foods and beverages places students in a state that is detrimental to their health and possibly their academic performance. Like nutrition, exercise and physical activity have many physical and cognitive benefits. Many studies have shown that healthy behaviors such as obtaining proper nutrition and amounts of physical activity have positive outcomes on cognition and academic performance, however the majority of these studies take place in P – 12 educational settings (Burrows et al., 2017; Payne-Sturges et al., 2018; Reuter et al., 2020). In addition, the influence of other health-related factors such as sleep habits, alcohol consumption, and stress on academic performance have been studied individually, but few studies have investigated these factors along with nutrition and physical activity in a holistic approach.

Research in the area of college academic performance tends to focus on two major areas: 1) Intellective factors; and 2) Non-intellective factors (Richardson et al., 2012). Historically, intellective factors such as intelligence, high school grade point average (GPA), standardized test scores, etc. and non-intellective factors such as social support systems, socio-economic status, motivation, self-efficacy, etc. have been cited as factors that influence the academic performance of college students (Klomegah, 2007; McIlroy et al., 2017; Richardson et al., 2012). The influence of health-related factors such as sleep, alcohol and substance use, physical activity, and mental health have been investigated individually in college and university students, but not holistically with traditionally included factors. In addition, diet quality and food security have largely been left out of the research in this area (Cady, 2014; Wald at el., 2014). Health and nutrition-

related factors have been studied extensively in the pre-school through 12th grade (P-12) levels and found to consistently correlate with academic performance (Reuter et al., 2020).

Many recent studies have found positive associations between healthy behaviors and academic performance of college students, including several that focused on healthy eating habits, but these relationships have not been investigated holistically in a manner that includes other traditional intellective and non-intellective factors (Burrows et al., 2017; Reuter et al., 2020; Singleton & Wolfson, 2009; Valladares et al., 2016; Wald et al., 2014). To the knowledge of this researcher, this will be the first study that includes intellective, non-intellective, and health-related factors when investigating influences of academic performance in college students.

Purpose of the Study

To address this gap in the research, this study investigated influences of academic performance, with a specific focus on nutrition and health-related behaviors of students at a public four-year Midwestern university. The purpose of the study was to determine the influence of nutrition and health related behaviors on academic performance of university students.

Research Questions

To address the purpose of this study and investigate solutions to the problem of practice, the following research questions were addressed by this research:

1. Is there a relationship between health-related behaviors and academic performance among college students at a Public Midwestern University?

a. $H_{1:}$ A significant positive relationship exists between healthy behaviors and academic performance among students at the university.

a. $H_{0:}$ No relationship exists between healthy behaviors and academic achievement among students at the university.

1b. Is there a relationship between nutrition habits and academic performance among college students at a Public Midwestern University?

a. $H_{1:}$ A significant positive relationship exists between nutrition habits and academic performance among students at the university.

b. $H_{0:}$ No relationship exists between nutrition habits and academic achievement among students at the university.

1c. Is there a relationship between exercise habits and academic performance among college students at a Public Midwestern University?

a. $H_{1:}$ A significant positive relationship exists between exercise habits and academic performance among students at the university.

b. $H_{0:}$ No relationship exists between exercise habits and academic achievement among students at the university.

1d. Is there a relationship between sleep habits and academic performance among college students at a Public Midwestern University?

a. $H_{1:}$ A significant positive relationship exists between sleep habits and academic performance among students at the university.

b. $H_{0:}$ No relationship exists between sleep habits and academic achievement among students at the university.

1e. Is there a relationship between alcohol use and academic performance among college students at a Public Midwestern University?

a. $H_{1:}$ A significant negative relationship exists between alcohol use and academic performance among students at the university.

b. $H_{0:}$ No relationship exists between alcohol use and academic achievement among students at the university.

3. Is there a significant difference in academic performance of food secure and food insecure college students at a Public Midwestern University?

a. $H_{1:}$ A significant difference exists between academic performance of those who are food secure and food insecure.

b. $H_{0:}$ No significant difference exists between academic performance of those who are food secure and food insecure.

Methods

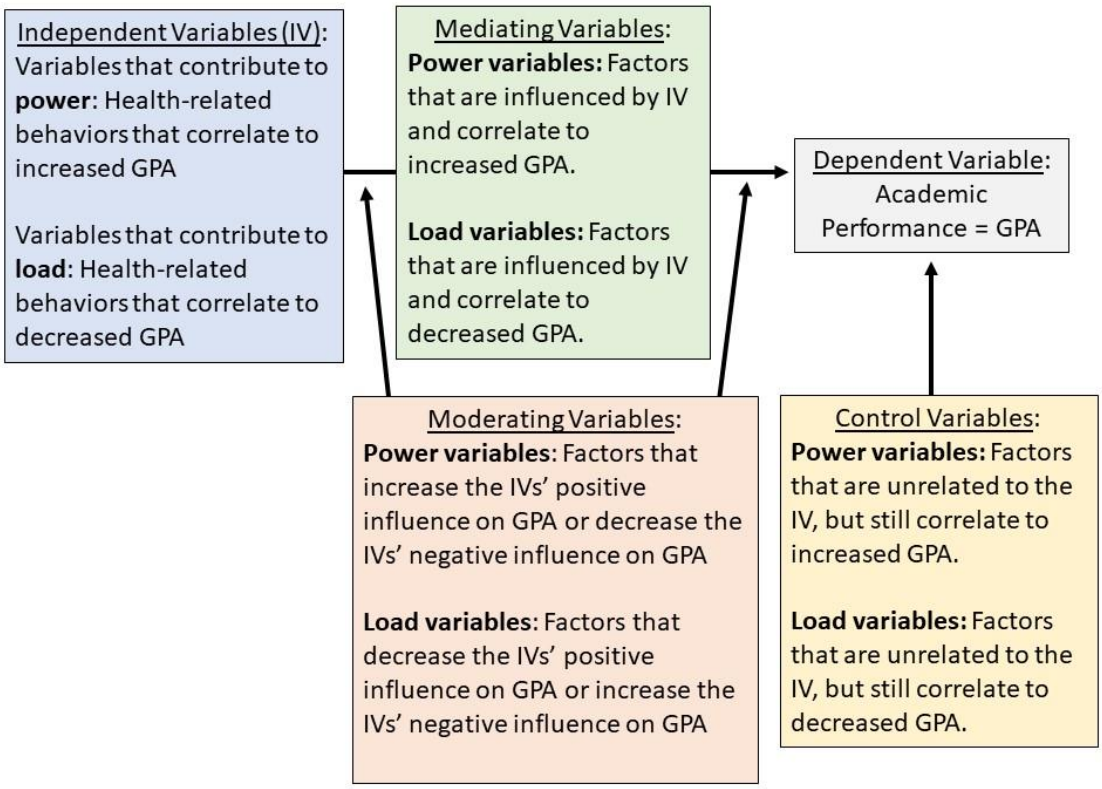
This explanatory mixed-methods (MM) grounded theory (GT) research began with a quantitative survey and was followed by a series of interviews, development of a substantive theory, a second series of interviews for respondent validation, and concluded with development of the final grounded theory (Guetterman et al., 2019). As with GT research, existing theories influenced this research, but the final grounded theory emerged from the data (Noble & Mitchell, 2016). Review of literature uncovered a base of hypotheses and underlying framework on which additional data were added throughout the research process. Several theoretical frameworks provided the underlying structure, but the actual variables and framework emerged as part of the theory development in the qualitative and quantitative portions of the study.

The grounded theory was built on the framework of the PLM formula, with: 1) Components of Maslow's Hierarchy of Needs and Kerby's New Model of Voluntary Dropout Decision; 2) Factors identified to correlate with high academic performance included in the power components of the formula; and 3) Factors identified to correlate with poor academic performance included in the load components of the formula. As the review of literature deepened and study planning evolved, independent variables and confounding variables were thematically categorized into layers of variables based on how they might influence one another. Each type of variable retained the power and load constructs, but some were identified as potentially influencing one another directly or influencing another variable's ability to influence academic performance.

To aid in categorizing the variables, the initial framework was further adapted to model the PLM constructs and expanded to include mediating, moderating, and controlling variable effects. This PLM framework is provided in Figure 3, below.

Figure 3

Expanded Power Load Margin Framework



Note. This figure demonstrates the general framework inspired by McClusky's Theory of Margin. Initial placement of the variables on this model was informed by the review of literature and refined using constant comparative analysis during the quantitative and qualitative portions of this research.

The scholarly review for this study revealed many potential independent, control, moderating, and mediating variables that may be directly or indirectly related to academic performance (Creswell, 2014; Field, 2018). Data and existing survey instruments found through the review of literature were used to develop a survey instrument that asked participants about several health-related behaviors, academic performance metrics, and demographic information. Data from the review of literature

and quantitative analysis of survey data informed a qualitative interview protocol which asked participants about influences of academic performance. Concurrent analysis of data from the review of literature, interviews, and survey were used iteratively to develop a theory grounded in the data (Guetterman et al., 2019; Merriam & Tisdell, 2016; Tie et al., 2019).

Through the methods described above and outlined in Figure 4, the researcher developed a theory that explains how health behaviors such as dietary intake, alcohol consumption, physical activity habits, sleep habits, and stress levels contribute to a college student's academic performance.

Figure 4

Dissertation Timeline and Methodology Overview

Month	Event / activity	Concurrent GT data collection, coding, and analysis	GT processes			
July	Dissertation proposal		Memo throughout the study	Constant comparative analysis	Concurrent data collection and analysis	Utilize theoretical sensitivity throughout the study
October	IRB proposal and approval Obtain permission to recruit					
November	Survey email distributed Interviews scheduled Interviews began					
December	Analyzed survey data Continued interviews Began coding survey data	**Initial coding** Created broad categories from codes based on interview questions				
January – March	Coded and categorized interview data Completed thematic coding Developed substantive theory	**Intermediate coding** Coded data thematically according to power and load themes per interview question Reached theoretical saturation in interviews				
April	Sent substantive theory for feedback Scheduled and conducted respondent validation interviews	**Advanced coding** Established core categories according to power and load themes per independent, mediating, moderating, and dependent variables Integrate codes and categories into hypotheses				
May - June	Finalized thematic coding Finalized grounded theory	**Theoretical coding** Used data to support or revoke hypotheses and develop the substantive theory Utilized qualitative data, quantitative data, and extant literature to answer research questions and refined substantive theory into grounded theory.				

Note. Figure adapted from Tie et al., 2019.

Setting

This research study utilized an online Qualtrics survey and recorded remote Zoom interviews. The research took place at a public, four-year university, referred to in this study as City University (CU). City University enrollment is approximately 10,000 students, with close to 9,000 undergraduates and 1,000 graduates (City University, 2020). Institutional Review Board (IRB) approval was obtained in October 2021. See Appendix A for the IRB approval documents from University of Missouri and City University.

Participants

Participants in this research included undergraduate and graduate students enrolled in face-to-face and online classes at CU.

Recruitment. Recruitment of participants for the quantitative survey portion of the study followed email protocol suggested by Dillman et al. (2014). The recruitment procedures for the quantitative survey portion of the study are outlined below. See Appendix B for copies of the recruitment emails.

- November 2, 2021: Initial survey recruitment email sent to 8,592 CU students.
- November 5, 2021: First survey reminder email sent to CU students.
- November 8, 2021: Final survey reminder email sent to CU students.
- November 2 – 8, 2021: Researcher contacted CU faculty from multiple departments and asked them to remind students to complete the survey.
- Survey closed on November 16, 2021.

The survey instrument began with an informed consent page which led to the first questions of the survey if participants chose to participate, or to the end-of-survey thank you message if participants chose not to participate. See Appendix C for the informed

consent and survey instrument. The body of the survey instrument collected data on the variables of interest. The end of the survey contained three options for participants:

1. Sign up for an interview and enter a raffle to win a $25 Amazon gift card.
2. Enter a raffle to win a $25 Amazon gift card, but do not sign up for an interview.
3. End the survey, do not sign up for an interview, and do not enter the raffle.

Participants who elected to sign up for an interview were directed to a page of instructions that provided a link to a separate interview sign-up survey. See Appendix D for the end of survey interview sign-up directions. The interview sign-up survey included the survey informed consent, fields to enter name and email address, and a link to a Doodle scheduling poll to sign up for an interview. See Appendix E for a copy of the interview sign-up survey. Participants who only elected to enter the raffle were directed to a page of instructions that provided a link to a separate survey for raffle entry. See Appendix F for the end-of-survey raffle entry directions. The survey for raffle entry only contained a field for participants to enter their name and email address. See Appendix G for the raffle entry survey.

Once a participant scheduled an interview through the Doodle scheduling poll, the researcher emailed the participant to confirm the interview and provide a Zoom meeting link. See Appendix H for an example email sent to confirm an interview with a participant. Once a substantive theory was developed, the researcher contacted all round one interview participants and asked for participation in a focus group for respondent validation of interpretations and theory. All participants failed to attend a focus group at the specified time, therefore the focus group was not conducted. Instead of a focus group, participants were invited to participate in individual interviews or to provide feedback

through email for respondent validation. See Appendix I for respondent validation recruitment emails.

Incentives. By completing the survey and electing to provide their names and email address, participants became eligible to win one of two $25.00 Amazon gift cards. The Qualtrics HTTP Referrer Verification setting was selected so that only respondents who were sent to the raffle survey through the original Qualtrics survey could participate (Qualtrics, 2021). In addition, participants who were interviewed automatically became eligible to win one of two additional $25.00 Amazon gift cards.

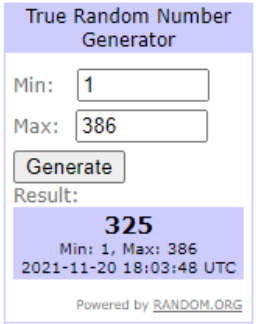
To determine the winners of raffle, the researcher coded the 386 participants who entered the raffle with a number. The range of 1 to 386 numbers were entered into the True Random Number Generator located at www.random.org to generate two random numbers within the number of total participants. See Figure 5 for images of the random number generator process used to randomly select the winners of the raffles.

Figure 5

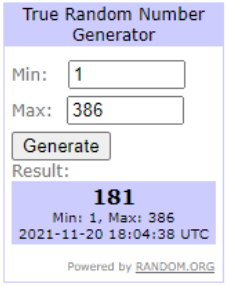
Random Number Generator Survey Raffle Winners Selection Example

Screenshot of entering the range into the generator

Drawing 1: Screenshot of the first winning draw.



Drawing 2: Screenshot of the second winning draw.



Note. This figure shows the actual draw for the survey raffle winners, conducted on November 20, 2021. Same process was used to draw winners of the interview raffle.

The numbers generated determined the winners of the $25 Amazon gift cards by connecting the winning raffle numbers to the participant numbers. Winners were contacted by email to arrange gift card pickup or delivery after their numbers were drawn. See Appendix J for one of the raffle winner announcement emails.

Anonymity and Confidentiality. Throughout the qualitative and quantitative portions of the study, participants' identities were protected, and information kept confidential in many ways: 1) In the design of the interview protocol and survey instrument, questions that would result in collecting potentially identifiable or harmful information were proactively avoided (Creswell, 2014). 2) Interview participants' names were disassociated during coding and pseudonyms were used when reporting data (Creswell, 2016). 3) Interview videos and transcriptions were permanently deleted from Zoom cloud storage (Fink, 2017). 4) Pseudonyms were assigned to interview participants when data were reported (Creswell, 2013; Novak, 2014). 5) The survey instrument was designed to be anonymous by using Qualtrics' anonymous link and anonymize response functions (Qualtrics, 2021; Fink, 2017). 6) Interview videos, transcribed interview data, memos, coding documents, exported survey data, and data analysis files were saved and secured on a password-protected USB storage drive (Fink, 2017). 7) Once raffle winners claimed all the gift cards, all identifiable information associated with the raffle was permanently deleted.

Sample Size. Of the 8,592 CU students were emailed the survey recruitment invitations, 788 began the survey and 561 completed the survey. The response rate was 9.17 % (788 ÷ 8592). The completion rate was 71.19% (561 ÷ 788). Participants were removed from the sample as described below:

- 29 Chose No: Do not wish to participate
    - Removed 29: 788 - 29 = 759
- 59 Chose yes: Wish to participate in the study, but did not submit any responses
    - Removed 59: 759 - 59 = 700
- 84 Exited the survey before finishing the food security questions
    - Removed 84: 700 - 84 = 616
- 616 all completed exercise questions
- 33 did not complete sleep questions
    - Removed 33: 616 - 33 = 583
- 5 did not complete alcohol questions
    - Removed 5: 583 - 5 = 578
- 17 Did not complete the GPA or demographic portion
- Removed 17: 578 - 17 = 561
- 561 completed the survey

The initial minimum targeted sample size for the survey was based on the ratio of 15 participants per predictor. This approach is based on a combination of multiple recommendations. Field (2018) explains for regression analyses, some researchers use a rule of thumb as low as a minimum of 10 cases per predictor to 15 cases per predictor, however he states it is superior to have a higher ratio to avoid creating the appearance of a false strong effect of predictor on the relationship. Jenkins and Quintana-Ascencio (2020) explain for regression analyses, a minimum sample of eight per predictor may be adequate if the variance is low, but a sample of 25 may be necessary when variance is high. Recommendations by Snell et al. (2018) are similar in that these researchers explain

the 10 events per predictor rule of thumb is likely too low, and a ratio of 23 events per predictor may be ideal. The researcher chose to target a minimum of 15 events per predictor since it is between a number considered too low in most circumstances (8 to 10) and the ideal (23 to 25).

The final survey instrument consisted of the questions provided in Table 3 below, which counted towards the total number of questions to determine when the target sample size was reached. See Appendix C for the full survey instrument:

Table 3

Survey Question Groups and Total Number of Survey Questions

Survey Question Group	Related Theme in Data Analysis	Maximum Number of Questions per Group	Minimum Number of Questions per Group	Total Included in the Count
Eating Habits	Nutrition	22	16	22[a]
Food Security	Access	2	2	2
Exercise Habits	Exercise	7	4	6[b]
Sleep Habits	Sleep	12	12	12
Alcohol Consumption Habits	Alcohol	5	2	2[c]
Academic Performance	-	4	4	2[d]
Demographics	-	9	9	0
Total	-	61	49	46

Note. See Appendix C for the full survey, which displays the skip logic and differences between the maximum and minimum number of questions displayed in this table.

[a]Included all possible eating habit questions into the count.

[b]Did not include a question related to time spent sitting as this was not factored into the physical activity category calculation.

[c]Only included questions used to calculate total alcoholic drinks per year. Questions 38 and 39 on survey.

[d]Only included questions that asked for fall 2021 and cumulative GPA.

The targeted sample size for this study was 690 completed surveys (46 predictors x 15 events per predictor). The actual sample that completed the survey was 561, which is 12.2 events per predictor. The observed sample was below the target, but the number falls within the 10 to 15 range of acceptable events per predictor ratio supported by Field (2018) and the 8 to 25 range supported by Jenkins and Quintana-Ascencio (2020). Additionally, it was possible for participants to complete the survey by answering a minimum of 49 questions. If only including the minimum health behavior and two GPA questions, the number of predictors would be 38. If using 38 predictors in these calculations, the event per predictor ratio is 14.7, which is much closer to the initial target. One other factor to consider is that not all of the survey answers were used to calculate the sub-scores used in the analyses, therefore the amount of necessary questions to include in the events per predictor calculations is likely lower than the 46 reported above.

Of the 561 students who completed the survey, 35 scheduled an interview for round 1. Of these 35 who scheduled, only 20 participated in a round 1 interview. Fifteen participants missed or cancelled their interview times. Several were willing to reschedule, however they were not required as theoretical saturation and the maximum target sample size had been reached. The minimum target sample size for the interview portion was determined by the point at which theoretical saturation was reached (Glazer & Strauss, 1967; Guetterman et al., 2019; Tie et al, 2019). The initial targeted minimum sample size

for interviews was eight, which was informed by the recommendations of McLeod (as cited in Milsom & Coughlin, 2015). Theoretical saturation was reached between 10-12 interviews, which was determined when responses become redundant and no new themes were emerging from data analysis (Merriam & Tisdell, 2016; Tie et al., 2019). Because interviews had already been scheduled, interviews continued until 20 had been completed, which is reported by Creswell (2014, p. 239) as a typical sample for interviews in GT research and served as the planned maximum interview sample size.

All 20 round one interviewees volunteered to participate in a follow-up respondent validation focus group in the subsequent spring semester. Ultimately, there was no single time for which more than five participants could attend a focus group in the spring semester. The focus group was scheduled, however participants cancelled prior to the day of the focus group. As an alternative, the researcher interviewed five participants individually and collected written feedback from one participant for respondent validation. See Appendix I for respondent validation recruitment emails.

Data Collection Tools

This MM-GT study collected data from participants through a survey instrument and interviews. Descriptions of these tools as well as procedures for developing, administering, establishing reliability, and determining validity are provided in the subsections below.

Quantitative Data Collection Tool. A survey draft was developed using data from extant literature in topic areas related to traditional and health-related predictors of academic performance. Many variables in the survey draft were included to control for

moderating variables, such as demographics, suggested by the literature to moderate the influence of the independent variables on academic performance (Creswell, 2016).

Five validated subscales were used to develop the survey instrument. These subscales are listed below. See Appendix C for the survey and Appendix K for the rationale and sources of survey items.

- The Short Health Eating Index (Colby et al., 2020) was used to evaluate quality of nutrition and eating habits.
- The Vital Signs 2 Question Screening tool (Hager et al., 2010) was used to evaluate food security status.
- The International Physical Activity Questionnaire (IPAQ) – Short Form (Craig, 2003) was used to evaluate exercise and physical activity habits.
- The Medical Outcomes Study (MOS) Sleep Scale, developed by Stewart and Ware (Hays and Stewart, 1992) was used to evaluate sleep duration and quality.
- The National Institute on Alcohol Abuse and Alcoholism's (2021) three-question Alcohol Consumption Assessment was used to evaluate alcohol consumption habits.
- Demographic questions were modeled after recommendations of Fernandez et al. (2016).
- Academic performance questions were developed by the researcher and asked:
    - How many college credit hours have you earned?
    - Are you an undergraduate student or graduate student?

- What is your current cumulative grade point average (GPA)? This is your total GPA as a college student.
- To the best of your ability, estimate your current fall 2021 GPA including all your classes. This is what you believe to be your current GPA when averaging all your fall 2021 classes.

The survey was developed using Qualtrics to quantitatively test research hypotheses. The survey was an anonymous instrument modeled after the format, visual, and question design suggestions of Dillman et al. (2014).

Quantitative Data Collection Reliability and Validity. According to Field (2018), reliability is a statistical metric that indicates if using an instrument again will produce the same results, while validity indicates if an instrument measures what it is intended to measure.

Reliability is often tested using Cronbach's alpha. The generally accepted interpretation is that a Cronbach's alpha of .7 or above is considered the minimum acceptable score (Field, 2018). Aside from demographic questions, all subscales included in the survey were validated instruments with Cronbach's alpha scores above $\alpha = .7$. Field warns that analysis of an instrument with a higher number of items will lead to a higher Cronbach's alpha score than an instrument with fewer items, and therefore recommends that for survey instruments that contain smaller subscales, each subscale should be tested separately using the Cronbach's alpha analysis (2018). These guidelines supported the use of the validated subscales included in the survey.

Validity was primarily ensured by using validated survey instruments. Using the guidelines outlined by Fink (2019) to source and use pre-existing survey instruments, the

researcher located reliable, validated survey instruments designed to assess independent variables which are included in the survey as subscales.

Qualitative Data Collection Tool. Qualitative data were collected during interviews conducted through live remote meetings facilitated and recorded using the Zoom Video Communications tool (Zoom). Due to the COVID-19 pandemic-related restrictions and to reduce burden on participants, interviews only occurred through Zoom. The Zoom interviews followed the computer-mediated communication guidelines provided by Merriam and Tisdell (2016). Interview questions were developed to verify the relevance of predictors uncovered during the scholarly review and results of the quantitative analysis, seek depth and context related to factors that emerged from survey responses, and investigate predictors and relationships not previously considered. The content of the interview protocol was informed by findings of the literature review and quantitative data analysis. Format and structure of the interview protocol were informed by recommendations of Creswell (2014) and Merriam and Tisdell (2016). See Appendix L for the complete interview protocol. In general, round 1 interview participants were asked to do the following:

- Discuss factors that influence their academic performance, specifically how health-related factors add to their power or load
- Confirm whether factors supported by empirical data and uncovered in the scholarly review influence their academic performance in a similar manner

After the first five interviews, the researcher concluded that stress and mental health were large health-related influences on academic performance and academic behaviors that

contribute directly to academic performance. Consistent with the GT CCA approach, one question was added to the end of the interview protocol related to stress and mental health if the participant did not already discuss the topic in response to the other questions.

Qualitative Data Collection Procedure. Merriam and Tisdell (2016) explain that in qualitative designs, reliability is more accurately considered to be consistency between results and data because it is not possible to reproduce findings in qualitative research, but it is possible to logically deduce findings from data. Because of this position, the approach to establishing reliability in this study relied on establishing a clearly documented, logical pathway from data to conclusions (Merriam & Tisdell, 2016). Establishing internal validity or credibility also relies on demonstrating logical decisions and conclusions made from data through explicit documentation (Merriam & Tisdell, 2016). Because of these similarities, many of the same strategies were employed to increase reliability and validity.

Triangulation methods included interview response data, respondent validation data, data retrieved from scholarly review, and theoretical frameworks to confirm the emergent findings of interviews were grounded in theory and literature (Merriam & Tisdell, 2016). Additionally, respondent validation provided internal validity independently and as a component of triangulation. Respondent validation procedures included having interview participants review and provide feedback on the interpretations and codes derived from the interview responses. The primary purpose of this respondent validation was for participants to verify coding outcomes and the substantive theory accurately portray their experiences (Merriam & Tisdell, 2016).

Data Analysis

Data analysis followed the explanatory GT methodology as outlined by Guetterman et al. (2019), in which quantitative data are collected and analyzed first, followed by a qualitative portion to explain and add depth to the quantitative results. Survey responses were analyzed using SPSS using multiple regression, independent samples *t*-tests, and ANOVA. Multiple studies investigating predictive relationships between an independent variable and academic performance utilized a type of regression model and informed the selection of regression as the primary analysis method for this research (Klomegah, 2007; McIlroy et al., 2017; Meyer & Larson, 2018; Payne-Sturges et al., 2018; Saunders-Scott et al., 2018; Singleton & Wolfson, 2009; Taylor et al., 2013; Wald et al., 2014; Westrick et al., 2015).

Qualitative data were analyzed using CCA, memoing, and thematic analysis throughout the qualitative portion of the study. Formal coding, analysis, and development of the grounded theory were completed using NVivo (QSR, 2020).

Quantitative Data. Survey response data were downloaded from Qualtrics into Microsoft Excel, where they were coded and scored according to the instructions for each of the subscales as instructed by their source documents. A brief overview of the subscale variables created through coding and scoring procedures is provided in Table 4 below.

Table 4

Overview and Explanations of Quantitative Variables

Theme	Source	Variable	Description
Eating Habits	Short Health Eating Index - Total Diet Quality Score	DQS	DQS includes scores from consumption of fruit, whole fruit, vegetables, green beans, whole grains, dairy, proteins, seafood, fatty acids, refined grains, sodium, added sugars, and saturated fats. Scale ranges from 0 – 100. 100 indicates healthiest score.
Food Security	Vital Signs 2 Question Screening - Food Insecurity Screen	FS	Asked if participants 1) were worried about running out of money to buy food and 2) ran out of money to buy food within the past 12 months. Answering yes to either question qualifies as food insecure. 1 = food insecure 0 = food insecure
Exercise Habits	IPAQ Short Form - Physical Activity Category	PA	Asked participants about quantity and frequency of vigorous activity, moderate activity, walking, and sitting to categorize them into 3 Physical Activity (PA) categories. PA Category 3 = Highly active PA Category 2 = Sufficiently active PA Category 1 = Insufficiently active

(Continued)

Table 4 (continued)

Overview and Explanations of Quantitative Variables

Theme	Source	Variable	Description
Sleep Habits	MOS Sleep Scale - Sleep Problems 2 Score	Sleep Score	Reverse coded the Sleep Problems 2 MOS Score to develop the Sleep Score used in data analysis. Sleep Problems 2 was the most comprehensive subscale, included 9 of the 12 possible MOS Sleep Scale questions. Sleep Problems 2 range: 0 – 100, with 100 being the worst/ most problems. Sleep Score scale ranges from 0 – 100, with 100 indicating the best or highest sleep score.
Alcohol Consumption Habits	NIAAA Alcohol Consumption Assessment – Alcohol Consumption Amount	ETOH Total Drinks	Asked participants about the frequency and quantity of alcohol consumed over the past 12 months. Range of scores is 0 to infinite. The score indicates the calculated estimate of total drinks consumed in the past 12 months. The survey defines one drink as "By a drink we mean half an ounce of absolute alcohol (e.g. a 12 ounce can or glass of beer or cooler, a 5 ounce glass of wine, or a drink containing 1 shot of liquor)."

continued

Table 4 (continued)

Overview and Explanations of Quantitative Variables

Cumulative Grade Point Average	-	GPA	Participants were asked to provide their cumulative GPA.
Fall 2021 Grade Point Average	-	Fa2021GPA	Participants were asked to provide their current fall 2021 semester GPA.

Participants were asked to provide both cumulative and fall 2021 GPAs for the following reasons: 1) Many participants in this study were likely to be freshmen who had not yet completed a college semester; and 2) The impact of COVID-19 was unpredictable on students' GPAs and the researcher chose to capture both cumulative and fall 2021 GPAs in case this impacted the outcome of the study. After processing the data to establish subscale scores, quantitative survey data were analyzed through independent samples *t*-tests, ANOVA, and multiple regression using SPSS 25 software. The following sections outline the analyses used to answer each research question. For each research question, the same analyses were run using cumulative GPA as a dependent variable, and again using fall 2021 GPA as the dependent variable.

Research Question 1. Research questions one asks, "Is there a relationship between health-related behaviors and academic performance among college students at a Public Midwestern University?" Research questions 1 and 1a through 1d (listed below) include multiple predictors of a continuous dependent variable. A multiple regression was used to answer research questions 1, 1a, 1b, 1c, and 1d with GPA (repeated with fall 2021 GPA) as the dependent variable and health-related behaviors as the predictors (DQS, FS, PA Category, Sleep score, Alcohol Consumption). According to Field (2018), multiple

regression is the ideal statistical analysis method to assess the relationship between multiple predictors and a single continuous dependent variable.

Research Question 1a. Research question 1a asks about the relationship between nutrition habits and academic performance. Nutrition habit score was determined by responses to a 22-item validated subscale included in the survey instrument. This scale was obtained from the Short Healthy Eating Index (Colby et al., 2020).

Research Question 1b. Research question 1b asks about the relationship between exercise habits and academic performance. Exercise habit score was included as PA category, which was determined by responses to the 7-item validated subscale included in the survey instrument. This scale was obtained from the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003).

Additionally, a One-Way ANOVA with Welch test was conducted to determine if there were significant differences between mean GPAs of students in the three different PA categories. A post hoc Games-Howell multiple comparison was used to determine which groups differed significantly. One-Way ANOVA tests allow for comparison of means between two or more independent groups and indicate whether a statistically significant difference occurs between one or more of the pairs of groups (van der Berg, 2022b). Participants in each of the PA categories were in independent groups from each other, and the dependent variable was continuous, which met initial requirements of One-Way ANOVA, however the sample sizes of PA categories were not normally distributed and Levene's test revealed the assumption of homogeneity was not met (SPSS, 2022a). A Welch test was added to the One-Way ANOVA to reject the null hypothesis of equal

population means, and a Games-Howell post hoc test was added to determine which PA category groups' mean GPAs were significantly different from each other (SPSS, 2022a).

Research Question 1c. Research question 1c asks about the relationship between sleep habits and academic performance. Sleep habit score was included as sleep score, which was a reverse coded version of the Sleep Problems 2 score as determined by responses to the 12-item validated subscale included in the survey instrument. This scale was obtained from the Medical Outcomes Study (MOS) Sleep Scale (Hays & Stewart, 1992).

Research Question 1d. Research question 1d asks about the relationship between alcohol use and academic performance. Alcohol use was included as the total number of alcoholic drinks consumed in the last 12 months, which was estimated from responses to the 3-item validated subscale included in the survey instrument. This scale was obtained from the National Institute of Health: National Institute on Alcohol Abuse and Alcoholism (NIAAA, 2021) three-question set.

Research Question 2. Research question 2 asks, "Is there a significant difference in academic performance of food secure and food insecure college students at a Public Midwestern University?" Students were coded as food secure or food insecure based on their response to the Hunger Vital Sign Two-Question Screening for Food Insecurity, which was included on the quantitative survey instrument (Hager et al., 2010). Students who are food secure were coded into group one, while students who are food insecure were coded into group zero. Mean grade point averages of food secure students were compared to mean grade point averages of food insecure students through an independent samples *t*-test.

Research question 2 includes a single continuous dependent variable and one categorical predictor (food security) with two categories (food secure or food insecure), with different participants in each group (students who are food secure will be in one group and students who are food insecure are in the other group). According to Field (2018), an independent samples *t*-test is the ideal statistical analysis method to determine if a significant difference exists between means of a continuous dependent variable when the predictor is categorical, split into two categories, and comes from participants in two different groups.

Hager et al. (2010) developed and validated the Hunger Vital Sign Two-Question Screening for Food Insecurity from an 18-question food security screening tool originally created by the United States Department of Agriculture. The Hunger Vital Sign Two-Question Screening for Food Insecurity was found to be 97% sensitive and 83% specific (Hager et al., 2010).

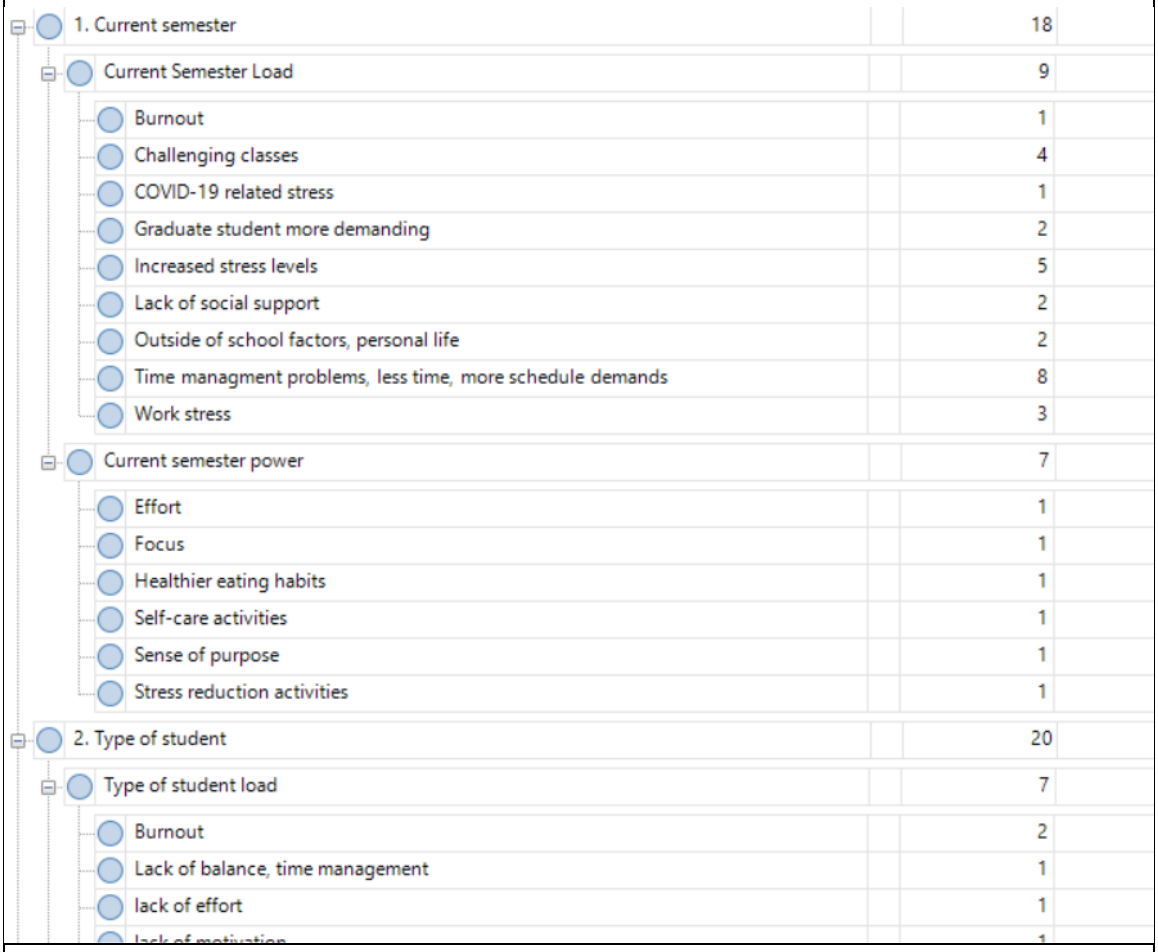
Qualitative Data Analysis and Theory Development. During the qualitative data analysis, interview responses were analyzed, coded and broadly categorized into power and load themes using Nvivo (QSR, 2020). Power themes are those which improve academic performance and load themes are those which hinder academic performance. During additional rounds of coding, theoretical sensitivity was utilized to form a grounded theory that attempts to explain how health and nutrition behaviors influence academic performance. Results from theoretical coding of qualitative data, quantitative data analysis, and analysis of empirical data collected from literature were utilized to answer research questions and induce a grounded theory that aligns to the

basic structure of McClusky's PLM Formula (McClusky, 1970; Merriam & Tisdell, 2016; Tie et al., 2019).

***Initial Coding*.** During initial coding, a base structure was created in NVivo (QSR, 2020), in which nodes were created using similar interview questions such as "Current semester" and "Type of student." Within these broad nodes, power and load categories were created to organize coded data. Responses were coded by first, placing the content into the interview question group node, then they were organized according to the power and load constructs. Similar responses or patterns in the data were categorized into the initial codes. For example, if a student responded to the question that asked about his/her current semester by stating it was more stressful than normal and s/he was burnt out, the passage was coded into the Current Semester node. Once the power and load categories were created, this response was moved into the Current Semester Load category. A third layer of categories was then created to code similar responses such as the one described above into a "Burnout" category. This response was also coded with similar responses into the "Increased Stress Level" category. This process was followed for all interview questions and response. See Figure 6 below for a screenshot showing the broad coding structure used in initial coding. These initial, broad codes established the broad framework through which analysis evolved into a theory (Tie et al., 2019).

Figure 6

Initial Coding Structure: NVivo Screenshot



Note. This figure only shows a portion of the structure as an example.

***Intermediate Coding*.** During intermediate coding, the codes were refined and categories were modified from being based on interview questions as the overall structural framework to themes that influence academic performance (AP) as the overall

framework. The primary thematic structure included the following broad themes with power and load sub-themes for each theme:

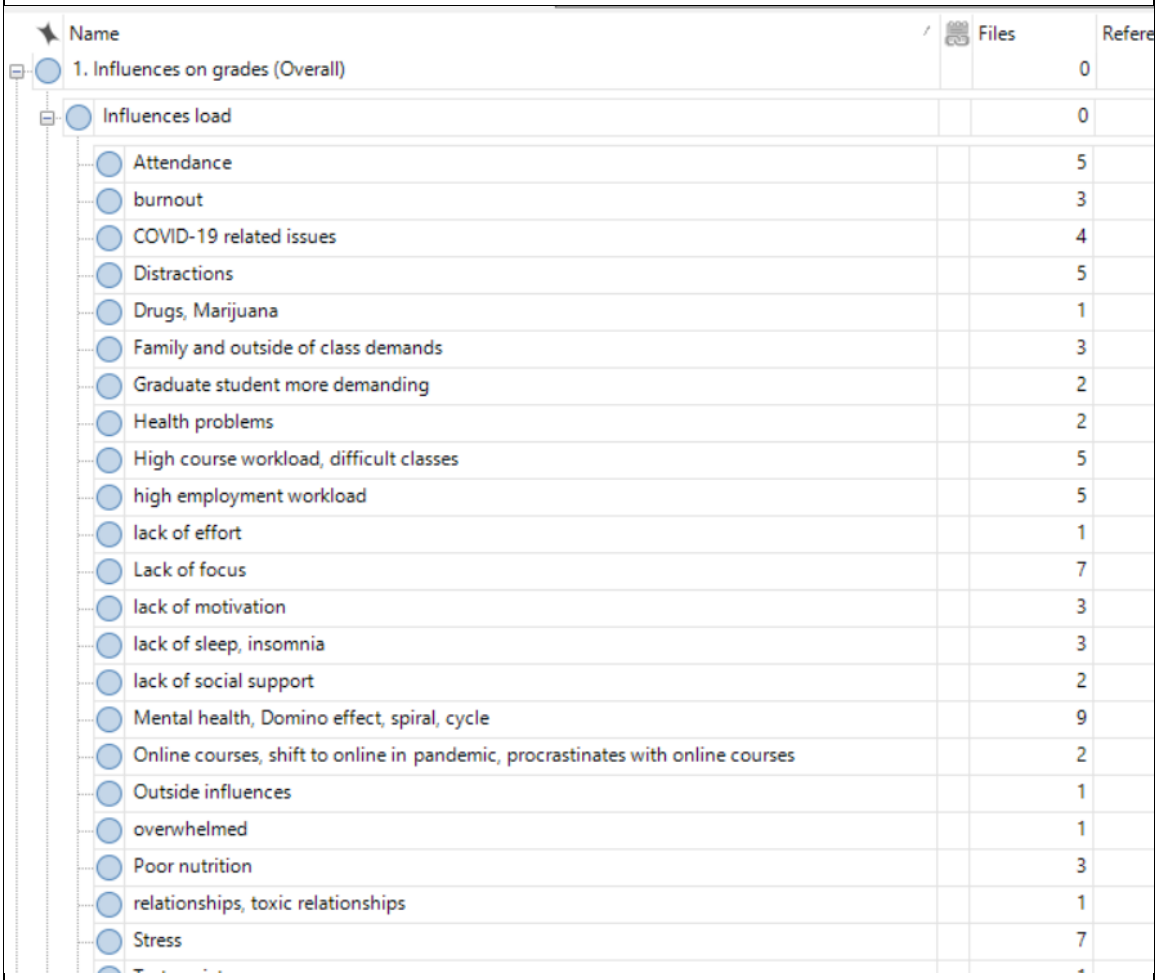
- Overall influences on AP
    - Influences load
    - Influences power
- Access to health foods' influence on AP
    - Access load
    - Access power
- Alcohol's influence on AP
    - Alcohol load
    - Alcohol power
- Exercise's influence on AP
    - Exercise load
    - Exercise power
- Nutrition's influence on AP
    - Nutrition load
    - Nutrition power
- Sleep's influence on AP
    - Sleep load
    - Sleep power
- Social or relationship factors' influence on AP
    - Social load
    - Social power

- Stress and Mental Health's influence on AP
    - Stress load
    - Stress power

Codes from initial coding were moved from the interview question categories into the new influence categories. For example, "Burnout" codes were moved from the "Burnout" Current Semester – Current Semester Load – Burnout category into the Influences on grades (Overall) – Influences load – Burnout category. Once no new codes emerged, coding progressed to advanced coding. Figure 7, below, shows a screenshot of the intermediate coding structure.

Figure 7

Intermediate Coding Structure: NVivo Screenshot



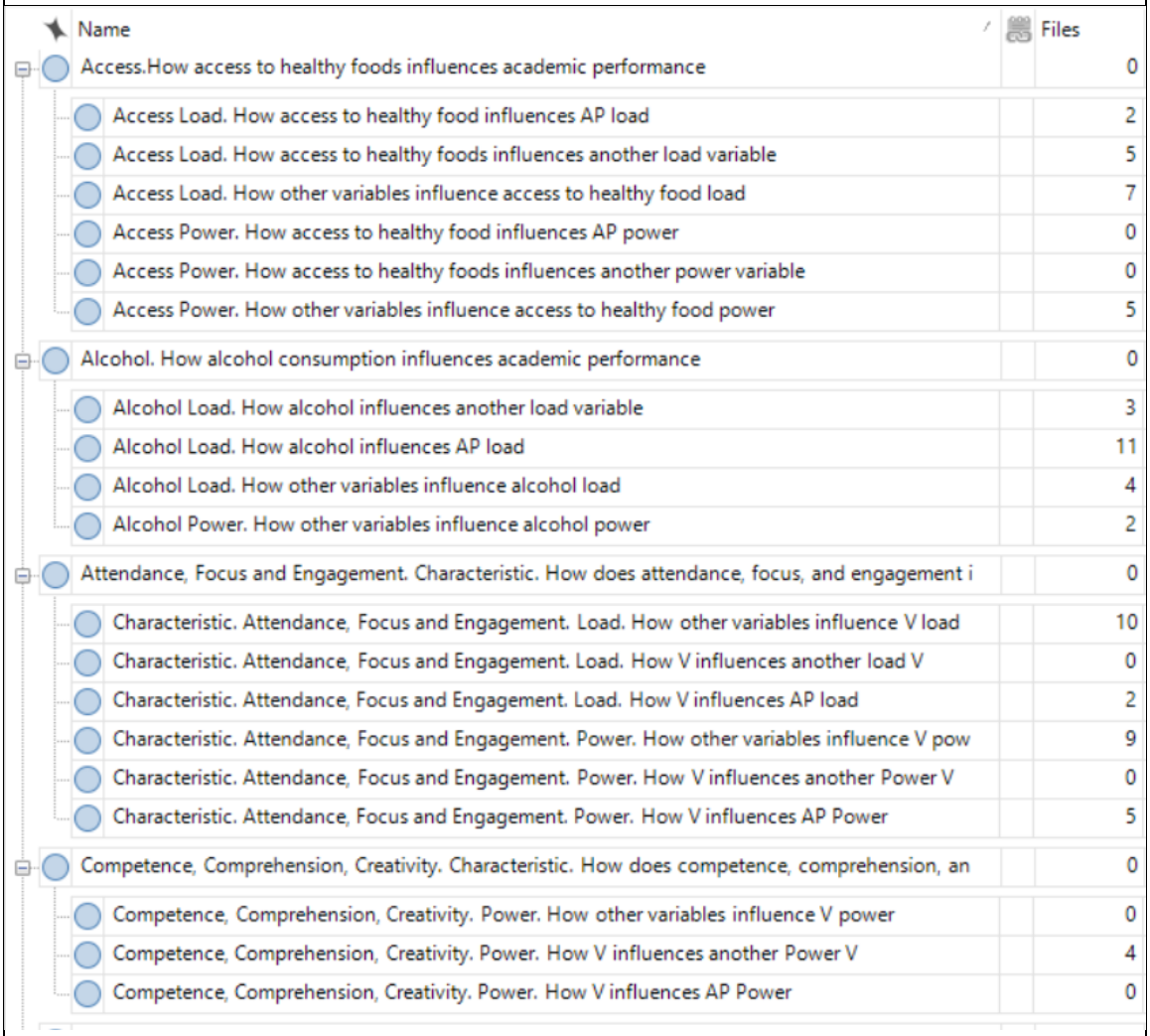
Note. This figure only shows a portion of the structure as an example.

Advanced Coding. During the advanced coding stage, codes and categories were integrated into hypotheses and a theoretical structure began to emerge as this phase transitioned into theoretical coding. While reorganizing and recoding data, new themes related to the variables with the greatest influences on AP were developed. Sub-themes were also developed to capture codes that described how some variables influenced

another variable. The sub-themes (level 1 sub-themes) were labeled as power and load to remain consistent with the PLM formula. Codes were moved from their influence categories into categories that defined the variable responsible for influencing another, and the variable that was being influenced. For example, a code explaining stress leads to lack of focus on school was moved from the “Influences on grades (Overall) – Influences load – Stress” category into the new “Stress and Mental Health:. How Stress and Mental Health influence academic performance” (theme); “Stress and Mental Health Load. How stress and Mental Health influences AP load” (sub-theme); and the “Stress and Mental Health. How Stress and Mental Health influence academic performance” (theme). Once all codes were recategorized and no new themes emerged, the data were used to inform the substantive theory. The theory was shared with participants during the respondent validation phase of the study. After receiving feedback and additional interview data, the researcher revisited the qualitative data and added additional layers to the theoretical coding phase. Figure 8, below, shows a screenshot of the advanced coding thematic structure.

Figure 8

Advanced Coding Structure: NVivo Screenshot



Name	Files
Access.How access to healthy foods influences academic performance	0
Access Load. How access to healthy food influences AP load	2
Access Load. How access to healthy foods influences another load variable	5
Access Load. How other variables influence access to healthy food load	7
Access Power. How access to healthy food influences AP power	0
Access Power. How access to healthy foods influences another power variable	0
Access Power. How other variables influence access to healthy food power	5
Alcohol. How alcohol consumption influences academic performance	0
Alcohol Load. How alcohol influences another load variable	3
Alcohol Load. How alcohol influences AP load	11
Alcohol Load. How other variables influence alcohol load	4
Alcohol Power. How other variables influence alcohol power	2
Attendance, Focus and Engagement. Characteristic. How does attendance, focus, and engagement i	0
Characteristic. Attendance, Focus and Engagement. Load. How other variables influence V load	10
Characteristic. Attendance, Focus and Engagement. Load. How V influences another load V	0
Characteristic. Attendance, Focus and Engagement. Load. How V influences AP load	2
Characteristic. Attendance, Focus and Engagement. Power. How other variables influence V pow	9
Characteristic. Attendance, Focus and Engagement. Power. How V influences another Power V	0
Characteristic. Attendance, Focus and Engagement. Power. How V influences AP Power	5
Competence, Comprehension, Creativity. Characteristic. How does competence, comprehension, an	0
Competence, Comprehension, Creativity. Power. How other variables influence V power	0
Competence, Comprehension, Creativity. Power. How V influences another Power V	4
Competence, Comprehension, Creativity. Power. How V influences AP Power	0

Note. This figure only shows a portion of the structure as an example.

Theoretical coding. During theoretical coding, themes were refined into theoretical constructs and sub-themes were refined into level 1 sub-themes which related to variable categories such as exercise-related factors with a power influence on academic performance. These level 1 sub-themes were then reorganized and labeled as independent variables (IV), mediating variables (MedV), moderating variables (ModV), and

dependent variables (DV). These level 1 sub-themes were labeled as power or load and divided into level 2 sub-themes based on how a variable influenced another variable. Variables were categorized into themes and subthemes based on the category of the variable (sleep, nutrition, motivation, etc.); their ability to function as a power or load variable; their direct, mediating, or moderating influences; and the variables they influenced.

Power themes included variables that improve academic performance or increase another variable's ability to improve academic performance. Load themes included variables that hinder academic performance or decrease another variable's ability to improve academic performance. Independent variables and MedVs were identified as those that had a direct impact on academic performance. Independent variables could also directly impact a MedV, which contributed to the MedV's direct influence on academic performance behaviors. Moderating variables were identified as those which did not directly influence a MedV or academic performance variable, but instead influenced the impact of one variable on another. All MedVs were found to potentially moderate the influence of all types of variables and, therefore, should be considered to function as both a MedV and ModV in this research study.

Themes and sub-themes were labeled with the following structure and coding system:

- Themes: Type of variable (IV, MedV, ModV, or DV); Influence (Power or Load)
    - Example: IV Load

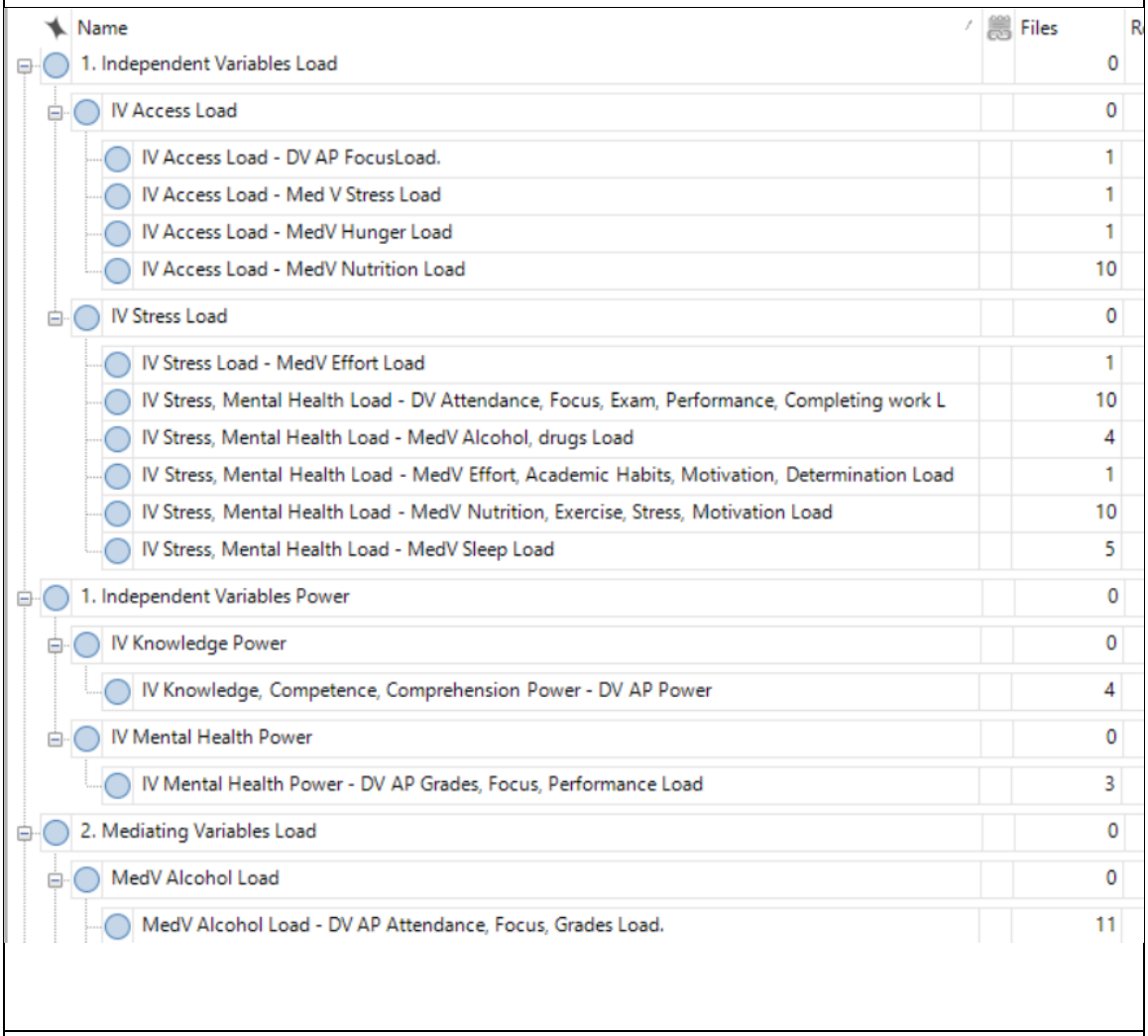
    - Explanation: Codes containing variables that hinder academic performance or hinder another variable's ability to improve academic performance.

- Level 1 sub-themes: Type of variable; Variable category; Influence
    - Example: IV Access Load
    - Explanation: Codes related to food security / access that are independent variables that hinder academic performance or hinder another variable's ability to improve academic performance.
- Level 2 sub-themes: Type of variable; Variable category; Influence - Type of variable being influenced; Variable category; Overall influence
    - Example: IV Access Load – MedV Hunger Load
    - Explanation: Codes related to food security / access that are independent variables that hinder exacerbate hunger's hindering influence on academic performance.

See Figure 9, below, for a screenshot of the final theoretical structure created in NVivo (QSR, 2020) which was used to organize quantitative data into a thematic framework.

Figure 9

Theoretical Coding Structure: NVivo Screenshot



Note. This figure only shows a portion of the structure as an example.

The thematic structure and feedback from respondent validation were used to confirm and refine components of the substantive theory into grounded theory that is supported by literature, quantitative data, and qualitative data. The grounded theory model is provided and discussed in the discussion section of this dissertation.

Results

This mixed methods study utilized SPSS for quantitative data analysis and NVivo (QSR, 2020) for qualitative data analysis. The results of the study are provided below according to each research question. For each research question, the quantitative and qualitative results are presented. Additional findings are presented after the results related to the research questions. The additional findings refer to meaningful findings that are related to the research questions but not directly connected. Before discussing the results for each research question, it is necessary to discuss the theoretical coding and grounded theory development that occurred during qualitative data analysis. This will provide the reader with context for the qualitative results sections.

During qualitative analysis, the power / load and IV / MedV / ModV thematic structure became part of the emergent grounded theory. The primary outcome associated with academic performance remained GPA, however several other forms of academic performance emerged and were considered academic performance behaviors. Academic performance behaviors were identified as outcomes by participants during interviews. The academic performance behaviors were those that mediated all other variables' ability to influence GPA such as attending class, being focused during class or on classwork, completing class assignments, and performing well on class assignments and exams.

Table 5, below, provides a summary of the academic performance behaviors identified from the interviews with the independent and mediating variables that had a direct influence on their outcomes.

Table 5

Thematic Variables from Student Interviews Reported to Directly Influence Academic Performance Behaviors

Thematic Variables	Academic Performance Behaviors	References	
		#	Examples
Independent Variables with a Load Influence (IV Load[a])			
Food Security, Access	Focus	1	"… this could cause stress or distraction (regarding lack of access to food)."
Stress, Mental Health	Focus, attendance, completing work, exams, performance	14	"Stress can cause a snowball, which worsens nutrition, leads to drinking alcohol, and decreases exercise frequency. All of this can decrease focus, cause more stress, and lead to skipping classes. This all leads to a decrease in motivation and grades."
Total number of IV Load references		15	
Mediating Variables with a Load Influence (MedV Load[b])			
Health Behaviors[e]	Focus, attendance, completing work, performance	21	"Sleep is related to attention and focus, if you don't sleep then you'll have a decreased ability to focus."
Hunger	Focus	9	"When I get hungry in class or before class my focus drops and I have less energy."
Motivation	Performance	1	"I usually get A's or B's but my motivation has dropped."
Total number of MedV Load references		31	(continued)

Table 5 (continued)

Thematic Variables from Student Interviews Reported to Directly Influence Academic Performance Behaviors

Thematic Variables	Academic Performance Behaviors	References	
		#	Examples
Independent Variables with a Power Influence (IV Power[c])			
Knowledge, Competence[c]	Completing work, exams, performance	4	"Learning and knowing the information is an influence and I have a high standard."
Mental Health[c]	Focus, completing work, performance	3	"…as an undergraduate student the most important influences were my emotional health and mental health (regarding influence on academic performance)."
Total number of IV Power references		7	
Mediating Variables with a Power Influence (MedV Power[d])			
Effort, Academic Habits	Focus, completing work, performance	25	"Hard working and push myself for A's. I'm determined. I try to have good attendance and get good rest."
Health Behaviors[e]	Focus, performance	22	"Exercise helps and makes her feel better. Exercise energizes her and helps her perform better at work and in class. (Field notes excerpt)"
Hunger	Focus	1	"Something small will just wear off so she needs something that makes her fuller for a longer time that gives her more focus. (Field notes excerpt)"
Motivation	Attendance, performance	7	"Personal motivation and preparing for tests have an influence (regarding positive influences on grades)."
Total number of MedV Power references		55	(continued)

Table 5 (continued)

Thematic Variables from Student Interviews Reported to Directly Influence Academic Performance Behaviors

Notes. This table provides results of theoretical coding through NVivo, in which interview responses were categorized into similar groups of influences, power and load themes, types of variables, and how the variables influence academic performance behaviors. Academic performance behaviors were identified as variables respondents identified as academic performance outcomes associated with being a successful college student.

[a] IV Load variables refer to those that hinder academic performance or a MedV directly. This table only reports on the IV Load variables' influences on academic performance.

[b] MedV Load variables refer to those that hinder academic performance directly or decrease another variable's ability to improve academic performance. This table only reports on the MedV Load variables' influences on academic performance.

[c] IV Power variables refer to those that improve academic performance or a MedV directly. This table only reports on the IV Power variables' influences on academic performance.

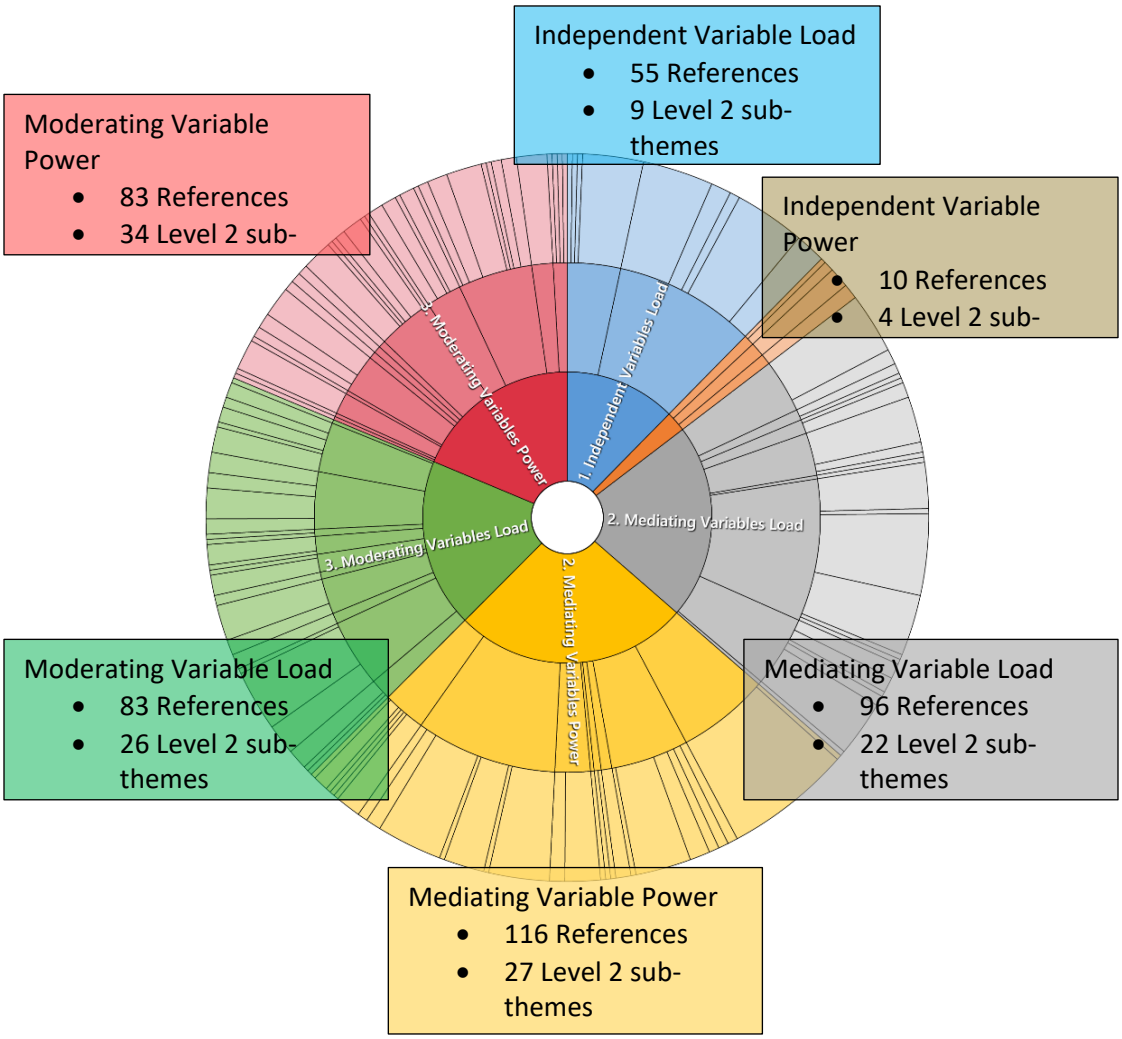
[d] MedV Power variables refer to those that improve academic performance directly or increase another variable's ability to improve academic performance. This table only reports on the MedV Power variables' influences on academic performance.

[e] Health Behaviors as reported in this table include exercise, nutrition, alcohol consumption, and sleep habits.

Figure 10 below shows overall theoretical coding structure with the total number of themes, level 1 sub-themes, and level 2 sub-themes. See Appendix N for a complete list and hierarchy of all themes identified in this research.

Figure 10

Theoretical Coding Structure, Themes, and Sub-Themes from the Qualitative Data Analysis



Note. References refer to codes from interviews categorized into the level 2 sub-themes.

Research Question 1

Is there a relationship between health-related behaviors and academic performance among college students at a Public Midwestern University?

Quantitative Results. To analyze this research question quantitatively, a Pearson correlation analyzed how the following independent variables correlated individually with fall 2021 grade point average (fa2021 GPA):

- Total diet quality score (DQS)
- Food Security (FS)
- Alcohol consumption
- Sleep Score (Sleep problems 2 score reverse coded)
- Physical activity category

The results of the correlation indicate a significant relationship exists between fa2021 GPA and the following variables:

Total Diet Quality Score. Total Diet Quality Score and fall 2021 GPA have a statistically significant linear relationship (r[541] =.156, $p < .001$). The direction of the relationship is positive, meaning that these variables tend to increase together: As DQS increases, fall 2021 GPA increases. The magnitude of the association is approximately small (Cohen, 1992).

Food Security. Food security (1 = food secure and 0 = food insecure) and fall 2021 GPA have a statistically significant linear relationship (r[552] = .205, $p < .001$). The direction of the relationship is positive, meaning that these variables tend to increase together: As food security increases, fall 2021 GPA increases. The magnitude of the association is approximately small (Cohen, 1992).

Sleep Score. Sleep score (Sleep Problems 2 score reverse coded) and fall 2021 GPA have a statistically significant linear relationship (r[559] = .100, p < .001). The direction of the relationship is positive, meaning that these variables tend to increase together: As sleep quality increases, fall 2021 GPA increases. The magnitude of the association is approximately small (Cohen, 1992).

Body Mass Index. Body Mass Index and fall 2021 GPA have a statistically significant linear relationship (r[542] = -.173, p < .001). The direction of the relationship is negative, meaning that these variables tend to vary in opposite directions: As BMI increases, fall 2021 GPA decreases. The magnitude of the association is approximately small (Cohen, 1992).

Table 6 summarizes the results of the fall 2021 GPA correlations, below.

Table 6

Correlations Between Fall 2021 GPA and Health Behaviors

Variable	*n*	1	2	3	4	5	6	7
1. Fa2021GPA[a]	561	-						
2. DQS[b]	543	.156**	-					
3. FS[c]	554	.205**	.046	-				
4. Sleep Score[d]	561	.100*	.144**	.180**	-			
5. PA Category[e]	426	.002	.149**	-.002	.049	-		
6. Alc. Drinks[f]	561	.002	-.030	.053	-.021	.109*	-	
7. BMI[g]	544	-.173**	-.147**	-.069	-.162**	-.151**	-.066	-

(Continued)

Table 6 (continued)

Correlations Between Fall 2021 GPA and Health Behaviors

Note. This table provides the results of a Pearson Correlation matrix which included fall 2021 grade point average as the dependent variables, and all other variables as independent variables. All variables are defined in Table 1 Definition of Key Terms.
[a]Fa2021GPA refers to fall 2021 semester grade point average.
[b]DQS refers to Short Healthy Eating Index diet quality score (Colby et al., 2020).
[c]FS refers to food security status (Hager, 2010).
[d]Sleep Score refers to reverse coded sleep problems 2 score from MOS sleep scale survey (Hays & Stewart, 1992).
[e]PA Category refers to physical activity category (Craig et al., 2003).
[f]Alc. Drinks refers to the total number of alcoholic drinks consumed per year as estimated from responses to the NIAAA three-item questionnaire (2021).
[g]BMI refers to body mass index as calculated from reported height and weight.
** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

The relationship between these independent variables and fall 2021 GPA were simultaneously analyzed with a regression analysis. When looking at the predictors collectively, DQS, FS, and BMI were found to be significant predictors of cumulative GPA. For every unit increase in DQS, a .009 increase in fall 2021 GPA was predicted, when holding all other variables constant. For food secure students, fall 2021 GPA was predicted to be .211 points higher, when holding all other variables constant. For every unit increase in BMI, a .012 decrease in fall 2021 GPA was predicted, when holding all other variables constant. Table 7 summarizes the results of the fall 2021 GPA regression, below.

Table 7

Linear Regression of How Health Related Behaviors Predict Fall 2021 Grade Point Average

Variable	Beta	*SE*	95% CI		β	*p*
			LL	*UL*		
DQS[a]	.009	.003	.004	.015	.175	<.001
FS[b]	.211	.059	.095	.327	.172	<.001
Sleep Score[c]	.001	.001	-.002	.004	.025	.612
PA Category[d]	-.024	.035	-.094	.046	-.033	.501
Alc. Drinks[e]	-2.533E-5	.000	.000	.000	-.017	.720
BMI[f]	-.012	.003	-.019	-.005	-.167	<.001

Note. This table provides the results of a linear regression which included fall 2021 grade point average as the dependent variables, and all other variables as independent variables. *N* = 408. All variables are defined in Definition of Key Terms. *SE* = standard error; *CI* = confidence interval; *LL* = lower limit; *UL* = upper limit.

[a]DQS refers to Short Healthy Eating Index diet quality score (Colby et al., 2020).

[b]FS refers to food security status (Hager, 2010).

[c]Sleep Score refers to reverse coded sleep problems 2 score from MOS sleep scale survey (Hays & Stewart, 1992).

[d]PA Category refers to physical activity category (Craig et al., 2003).

[e]Alc. Drinks refers to the total number of alcoholic drinks consumed per year as estimated from responses to the NIAAA three-item questionnaire (2021).

[f]BMI refers to body mass index as calculated from reported height and weight.

The same analyses (Pearson correlation and regression) were repeated with cumulative GPA as the dependent variable and the following independent variables:

- Total Diet Quality Score (DQS)
- Food Security (FS)
- Alcohol consumption
- Sleep problems score
- Physical activity category

The results indicate a significant positive correlation exists between cumulative GPA and the following variables:

Total Diet Quality Score. Total Diet Quality Score and cumulative GPA have a statistically significant linear relationship ($r[531] = .091$, $p < .05$). The direction of the relationship is positive, meaning that these variables tend to increase together: As DQS increases, cumulative GPA increases. The magnitude of the association is approximately less than small (Cohen, 1992).

Food Security. Food security score (1 = food secure and 0 = food insecure) and cumulative GPA have a statistically significant linear relationship ($r[543] = .163$, $p < .001$). The direction of the relationship is positive, meaning that these variables tend to increase together: As food security increases, cumulative GPA increases. The magnitude of the association is approximately small (Cohen, 1992).

Sleep Score. Sleep score (Sleep Problems 2 score reverse coded) and cumulative GPA have a statistically significant linear relationship ($r[549] = .121$, $p < .001$). The direction of the relationship is positive, meaning that these variables tend to increase together: As sleep quality increases, cumulative GPA increases. The magnitude of the association is approximately small (Cohen, 1992).

Body Mass Index. Body Mass Index and cumulative GPA have a statistically significant linear relationship ($r[532] = -.172$, $p < .001$). The direction of the relationship is negative, meaning that these variables tend to vary in opposite directions: As BMI increases, cumulative GPA decreases. The magnitude of the association is approximately small (Cohen, 1992).

Table 8 summarizes the results of the cumulative GPA correlations, below.

Table 8

Correlations Between Cumulative GPA and Health Behaviors

Variable	*n*	1	2	3	4	5	6	7
1. GPA[a]	551	-						
2. DQS[b]	533	.091*	-					
3. FS[c]	545	.163**	.046	-				
4. Sleep Score[d]	551	.121**	.144**	.180**	-			
5. PA Category[e]	418	.031	.149**	-.002	.049	-		
6. Alc. Drinks[f]	551	-.014	-.030	.053	-.021	.109*	-	
7. BMI[g]	534	-.172**	-.147**	-.069	-.162**	-.151**	-.066	-

(continued)

Table 8 (continued)

Correlations Between Cumulative GPA and Health Behaviors

Note. This table provides the results of a Pearson Correlation matrix.

[a]GPA refers to cumulative grade point average.

[b]DQS refers to Short Healthy Eating Index diet quality score (Colby et al., 2020).

[c]FS refers to food security status (Hager, 2010).

[d]Sleep Score refers to reverse coded sleep problems 2 score from MOS sleep scale survey (Hays & Stewart, 1992).

[e]PA Category refers to physical activity category (Craig et al., 2003).

[f]Alc. Drinks refers to the total number of alcoholic drinks consumed per year as estimated from responses to the NIAAA three-item questionnaire (2021).

[g]BMI refers to body mass index as calculated from reported height and weight.

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

* Correlation is significant at the 0.05 level (2-tailed).

The relationship between these independent variables and cumulative GPA were simultaneously analyzed with a regression analysis. When looking at the predictors collectively, only food security category and BMI were found to be significant predictors of cumulative GPA. For food secure students, cumulative GPA is predicted to be .182 points higher, when holding all other variables constant. For every unit increase in BMI, a .013 decrease in cumulative GPA is predicted, when holding all other variables constant. Table 9 summarizes the results of the cumulative GPA regression, below.

Table 9

Linear Regression of How Health Related Behaviors Predict Cumulative Grade Point Average

Variable			95% CI			
	Beta	*SE*	*LL*	*UL*	β	*p*
DQS[a]	.004	.003	-.001	.010	.077	.121
FS[b]	.182	.062	.061	.303	.146	.003
Sleep Score[c]	.002	.002	-.001	.005	.052	.306
PA Category[d]	.005	.037	-.067	.077	.006	.897
Alc. Drinks[e]	-5.878E-5	.000	.000	.000	-.039	.420
BMI[f]	-.013	.004	-.020	-.006	-.182	<.001

Note. This table provides the results of a linear regression which included fall 2021 grade point average as the dependent variables, and all other variables as independent variables. *N* = 408. All variables are defined in Table 1 Definition of Key Terms. *SE* = standard error; *CI* = confidence interval; *LL* = lower limit; *UL* = upper limit.

[a]DQS refers to Short Healthy Eating Index diet quality score (Colby et al., 2020).

[b]FS refers to food security status (Hager, 2010).

[c]Sleep Score refers to reverse coded sleep problems 2 score from MOS sleep scale survey (Hays & Stewart, 1992).

[d]PA Category refers to physical activity category (Craig et al., 2003).

[e]Alc. Drinks refers to the total number of alcoholic drinks consumed per year as estimated from responses to the NIAAA three-item questionnaire (2021).

[f]BMI refers to body mass index as calculated from reported height and weight.

Qualitative Results. Through the qualitative analysis, many health-related power and load themes emerged. Health-related behaviors included exercise habits, nutrition habits, sleep habits, and alcohol consumption habits. The categorization of the related codes followed the same Power and Load structure as previously mentioned. A summary of qualitative results related to these health-behaviors' Power and Load influences on academic performance is provided by Table 10 and Figure 11, below. Table 10 provides a summary of the health-related behaviors discussed in this study.

Table 10

Influence of Health Behavior Mediating Variable Sub-Themes on Academic Performance Behaviors with Examples from Student Interviews

Health Behavior Sub-Theme	Academic Performance Behaviors	References	
		#	Examples
Mediating Load Variables (MedV Load[a])			
Alcohol Consumption	Attendance, Focus, Performance, Grades	12	"I've seen people drink to cope, then miss class and miss assignments."
Health Behaviors (General)	Attendance, Focus, Grades	1	"Yes, missing class for poor health behaviors can cause stress, if stress gets too high you might just give up."

(continued)

Table 10 (continued)

Influence of Health Behavior Mediating Variable Sub-Themes on Academic Performance Behaviors with Examples from Student Interviews

Health Behavior Sub-Theme	Academic Performance Behaviors	References	
		#	Examples
Mediating Load Variables (MedV Load[a])			
Nutrition	Focus, Ability to work, Performance	9	"Overeating and undereating both make me tired and uncomfortable, which make it hard to focus in class."
Sleep	Focus, Complete work	11	"Sleep is related to attention and focus, if you don't sleep then you'll have a decreased ability to focus."
Total number of IV Load references		33	
Mediating Power Variables (MedV Power[b])			
Exercise	Focus, Class performance	2	"Exercise helps and makes her feel better. Exercise energizes her and helps her perform better at work and in class. (Excerpt from field notes)"
Nutrition	Focus, Performance	12	"Some days I can't focus. Fruits and vegetables make me feel better."
Sleep	Focus, Grades	5	"So I feel like when I get more sleep, I am more energized and ready to accomplish my school work."
Total number of MedV Load references		19	

[a] MedV Load variables refer to those that hinder academic performance directly or decrease another variable's ability to improve academic performance.

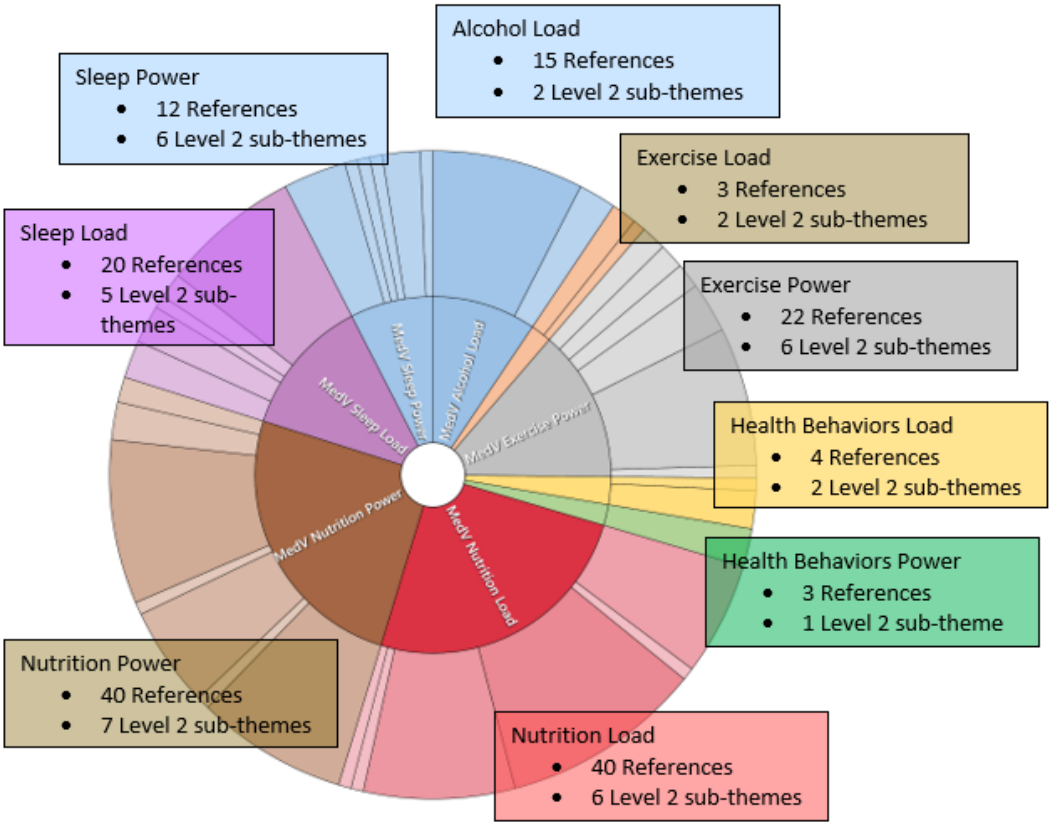
[b] MedV Power variables refer to those that improve academic performance directly or increase another variable's ability to improve academic performance.

This table only reports on the MedV variables' influences on academic performance.

Figure 11 provides the theoretical coding structure and total number of health behavior mediating variable sub-themes.

Figure 11

Health Behavior Theoretical Coding Structure and Sub-Themes



Note. References refer to codes from interviews categorized into the level 2 sub-themes.

The subsequent results sections will examine each research question and health behavior variable in more detail.

Research Question 1a

Is there a relationship between nutrition habits and academic performance among college students at a Public Midwestern University?

Quantitative Results. To analyze this research question quantitatively, the researcher focused on the Pearson correlations and regression components specific to

DQS and fall 2021 GPA, and DQS and cumulative GPA. The Pearson correlation analyses revealed DQS was significantly correlated with both fall 2021 (r[541] = .156, p < .001) and cumulative GPA (r[531] = .091, p = .035). The directions of the relationships are positive, meaning that these variables tend to increase together: As DQS increases, fall 2021 GPA and cumulative GPA increase. The magnitude of the association is approximately less than small for fall 2021 GPA and small for cumulative GPA (Cohen, 1992). The regression analysis revealed DQS was only a significant predictor of fall 2021 GPA. For every unit increase in DQS, a .009 increase in fall 2021 GPA was predicted, when holding all other variables constant.

Qualitative Results. To further investigate this research question, interview responses related to the influence of nutrition habits on academic performance were coded, analyzed, and categorized into power and load themes using NVivo (QSR, 2020).

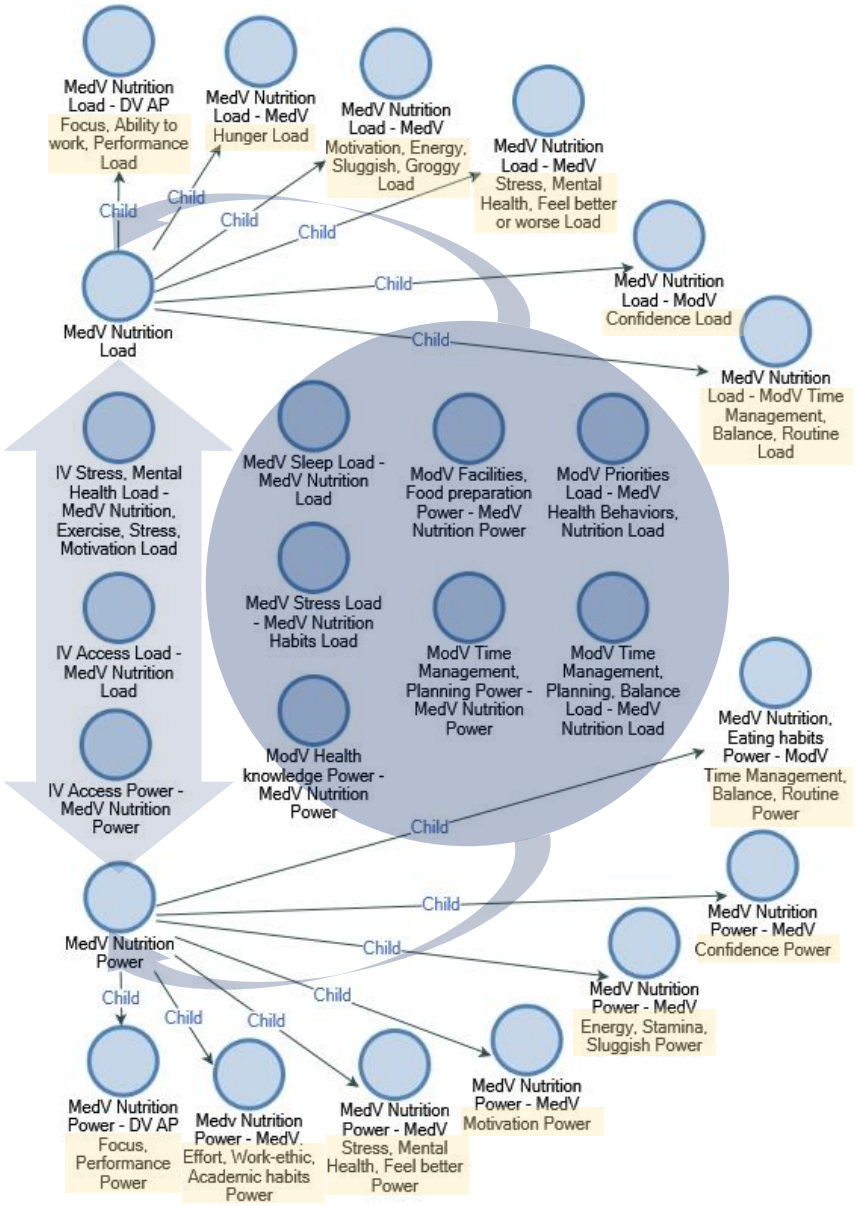
Figure 12 below summarizes the themes that emerged from the qualitative analysis. In this figure, Independent Variables (IV) act on Nutrition behaviors as power or load influences. Mediating (MedV) and Moderating Variables (ModV) influence the ability of the nutrition habits to influence the outcomes shown on the perimeter.

Figure 12

Influence of Nutrition-Related Variables on Academic Performance

Figure Key:

	Moderating variables that influence nutrition load or power
	Independent Variables that directly influence a nutrition behavior
	Outcomes: How nutrition behaviors influence academic performance



Notes. IV, MedV, and ModV refer to Independent, Mediating, and Moderating Variables, respectively.

Table 11 below provides the number of nutrition related sub-themes and references from the qualitative data analysis, corresponding to those shown in Figure 12, above.

Table 3

Nutrition-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Independent Load Variables			
Access	Nutrition	12	"There are not a lot of healthy foods nearby. That would make it easier." (Regarding healthy eating)
Stress, Mental health	Nutrition and other health behaviors	14	"I would say that it's kind of like a loop or a circle. You do bad in the class, which makes you eat like stress eat, which then makes you stress more, which then makes you not perform well So it's kind of just circle and it could go either way."
Independent Power Variables			
Access	Nutrition	2	"Feels better when eating at home and eating more fresh fruit and taking part in more self care."
Mediating Load Variables			
Nutrition	Focus, Performance	9	"Eats a lot of grab-and-go processed foods on campus. This makes it harder to focus and makes me cranky. Does not eat breakfast on most days." (Excerpt from field notes)
	Hunger	1	"She feels hungrier after eating processed foods." (Excerpt from field notes)

continued

Table 11 (continued)

Nutrition-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
		Mediating Load Variables	
	Motivation, Energy	16	"Explained that when she consumes a lot of sugar or drinks sugary coffee, she has a sugar crash." (Excerpt from field notes)
	Stress, Mental Health	12	"Very important, if you're not eating a lot it impacts physical and mental performance. And can cause anxiety and harm mental health."
	Confidence	1	"If she eats poorly, it makes her feel guilty and makes her feel down or bummed and damages her confidence." (Excerpt from field notes)
	Time Management, Routine	1	"When I skip a meal, it throws off my day."
Sleep	Nutrition	1	"When I don't eat well I feel depressed
Stress	Nutrition	1	which makes me more stressed and that also impacts my sleep which impacts my eating habits."
		Mediating Power Variables	
Nutrition	Focus, Performance	12	"I'm not a Big Breakfast person so eating early as a problem for me. When I get hungry in class or before class my focus drops and I have less energy."

continued

Table 11 (continued)

Nutrition-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Mediating Power Variables			
	Effort, Academic habits	2	"Overall it's just you feel better (regarding eating healthier) so you're able to work better."
	Stress, Mental Health	13	"Nutrition helps you focus. I feel like it's beneficial, it boosts my mood especially when I know it's healthy it's a win win."
	Motivation	1	"This (eating healthy) also impacts her motivation and organization." (Excerpt from field notes)
	Energy	8	"When I'm eating well I have better focus and stamina. I pay attention more."
	Confidence	1	"I would say that eating healthy exercising and getting enough sleep boost your confidence, which makes you want to get things done, which then in turn gets things done, so then you're successful."
	Time Management, Routine	3	"Proper nutrition helps with having a set diet, predictability, in structure."

continued

Table 11 (continued)

Nutrition-Related Thematic Hierarchy and Relevant Interview Excerpts

Variables Being Influenced		References	
		#	Examples
Moderating Load Variables			
Priorities	Nutrition	1	"Explained that food can be her last priority." (Excerpt from field notes)
Time Management	Nutrition	3	"if you can't manage your time then you don't have as much time to sleep or eat or take care of yourself and your GPA may drop."
Moderating Power Variables			
Facilities	Nutrition	6	"Reported noticing a difference between when cooking at home and eating healthier and how she feels." (Excerpt from field notes)
Time Management	Nutrition	2	"It's important to plan ahead and to pack food."

(continued)

Table 11 (continued)

Nutrition-Related Thematic Hierarchy and Relevant Interview Excerpts

Notes. This table provides results of theoretical coding through NVivo, in which interview responses were categorized into similar groups of influences, power and load themes, types of variables, and how the variables influence academic performance behaviors.
Independent load variables (IV Load) directly hinder academic performance or a MedV.
Independent power variables (IV Power) directly improve academic performance or a MedV.
Mediating load variables (MedV Load) directly hinder academic performance; and/or are directly influenced by independent variables.
Mediating power variables (MedV Power) directly improve academic performance; and/or are directly influenced by independent variables.
Moderating load variables (ModV Load) act on the influence of another variable by increasing another variable's load or decreasing another variable's power.
Moderating power variables (ModV Power) act on the influence of another variable by decreasing another variable's load or increasing another variable's power.
MedVs can also function as ModVs.

Research Question 1b

Is there a relationship between exercise habits and academic performance among college students at a Public Midwestern University?

Quantitative Results. To analyze this research question quantitatively, the researcher focused on the Pearson correlations and regression components specific to PA Category and fall 2021 GPA, and PA Category and cumulative GPA. The correlation analyses revealed PA Category was not significantly correlated with fall 2021 or cumulative GPA. Likewise, the regression analyses revealed PA Category is not a significant predictor of fall 2021 or cumulative GPA.

To further investigate this relationship, a One-Way ANOVA with Welch test revealed a significant difference exists between fall 2021 and cumulative GPA of the three PA categories. There was a significant difference between the mean fall 2021 GPA of participants in three physical activity categories at the $p < .05$ level [$F(2, 423) = 4.279$, $p = .014$]. Mean fall 2021 GPA differs significantly across PA categories, $F_{Welch}(2,183.66) = 5.01$, $p = .008$. Post hoc comparisons using the Games-Howell test indicated that the mean fall 2021 GPA for PA category two ($M = 3.64$, $SD = .46$) was significantly different than PA category one ($M = 3.42$, $SD = .70$, $p = .043$) and PA category three ($M = 3.48$, $SD = .55$, $p = .016$). However, the mean fall 2021 GPA of participants in PA category three was not significantly different than PA category one.

A One-Way ANOVA with Welch test revealed a significant difference exists between fall 2021 and cumulative GPA of the three PA categories. There was a significant difference between the mean cumulative GPA of participants in three physical activity categories at the $p < .05$ level [$F(2, 415) = 4.736$, $p = .009$]. Mean GPA differs significantly across PA categories, $F_{Welch}(2,171.473) = 4.50$, p = .013. Post hoc comparisons using the Games-Howell test indicated that the mean cumulative GPA for PA category two ($M = 3.56$, $SD = .49$) was significantly different than PA category one ($M = 3.31$, $SD = .75$, $p = .030$) and PA category three ($M = 3.42$, $SD = .52$, $p = .042$). However, the mean cumulative GPA of participants in PA category three was not significantly different than PA category one.

See summary of the ANOVA results in Table 12 below.

Table 12

One Way ANOVA Results Comparing Mean Fall 2021 and Cumulative Grade Point Average of Three Physical Activity Levels

Variable		PA Category 1			PA Category 2			PA Category 3		
	p	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
Fa2021 GPA[a]	.014	80	3.42[c]	.704	114	3.64 [c, d]	.457	232	3.48[d]	.553
GPA[b]	.009	78	3.31[e]	.749	112	3.56[e, f]	.494	228	3.42[f]	.519

Note. Table provides results of two ANOVAs.

[a] Fa2021GPA refers to fall 2021 semester grade point average. $F(2, 423) = 4.279$

[b] GPA refers to cumulative grade point average. $F(2, 415) = 4.736$

[c]Means sharing superscript [c] are significantly different from one another.

[d] Means sharing superscript [d] are significantly different from one another.

[e]Means sharing superscript [e] are significantly different from one another.

[f]Means sharing superscript [f] are significantly different from one another.

Qualitative Results. To further investigate this research question, interview responses related to the influence of physical activity and exercise habits on academic performance were coded, analyzed, and categorized into power and load themes using NVivo (QSR, 2020).

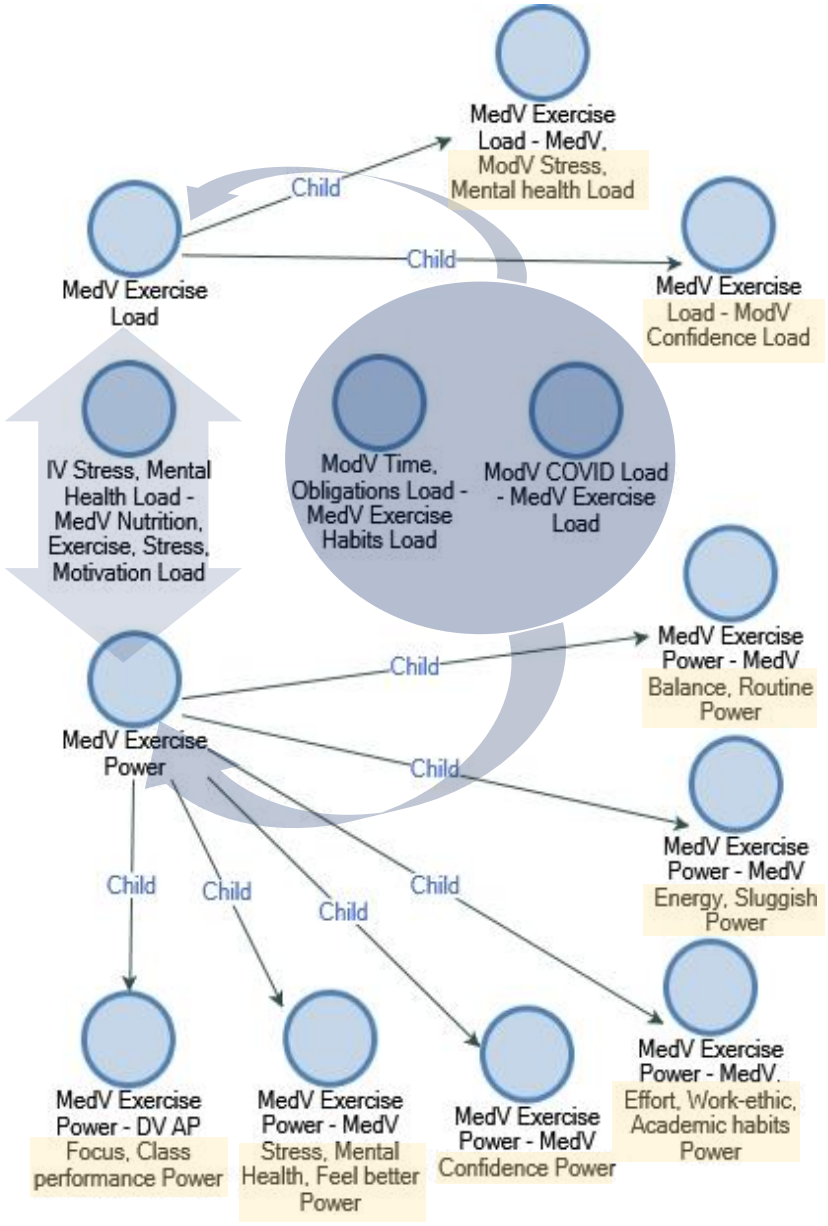
Figure 13 below, summarizes the themes that emerged from the qualitative analysis.

Figure 13

Influence of Exercise-Related Variables on Academic Performance

Figure Key:

	Moderating variables that influence exercise load or power
	Independent Variables that directly influence an exercise behavior
	Outcomes: How exercise behaviors influence academic performance



Notes. IV, MedV, and ModV refer to Independent, Mediating, and Moderating Variables, respectively.

Table 13 below provides the number of nutrition related sub-themes and references from the qualitative data analysis, corresponding to those shown in Figure 13 above.

Table 43

Exercise-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Independent Load Variables			
Stress	Exercise and health behaviors		"Explained the pieces were related, and parts can increase stress. When she prioritizes school and work there is less time to sleep and less time for herself. And she feels stress from trying to work out which could decrease her stress but then leads to her stressing about time."
Mediating Load Variables			
Exercise	Stress, Mental health Confidence		"She feels more stressed due to the lack of the yoga" (Excerpt from field notes) "(When I) don't workout I feel down and have less confidence"
Mediating Power Variables			
Exercise	Focus, Performance		"Exercise helps and makes her feel better. Exercise energizes her and helps her perform better at work and in class."
	Time management, Routine, Balance		"Exercising more frequently has helped, it has also helped to have a better routine"

continued

Table 13 (continued)

Exercise-Related Thematic Hierarchy and Relevant Interview Excerpts

	Energy	"Physical activity makes me feel better, gives me more energy and makes me feel more awake"

Sub-Theme	Variables Being Influenced	References	
		#	Examples
	Mediating Power Variables		
	Confidence		"Yeah it (exercise) definitely builds your confidence and makes getting work done a lot easier because you have the mindset that you can accomplish it."
	Stress, Mental health		"Physical activity can increase mood, focus, make you feel better overall."
	Effort, Academic habits		"I feel like better when I'm able to exercise and eat properly. It definitely makes studying easier because you don't feel so sluggish."
	Moderating Load Variables		
COVID-19	Exercise		"She does perform yoga to reduce her stress, but she has not done any yoga since COVID-19." (Excerpt from field notes)
Time, Obligations	Exercise		"It is hard to keep up with studying, social life, sleep, and exercise. Exercise goes first."

continued

Table 13 (continued)

Exercise-Related Thematic Hierarchy and Relevant Interview Excerpts

Notes. This table provides results of theoretical coding through NVivo, in which interview responses were categorized into similar groups of influences, power and load themes, types of variables, and how the variables influence academic performance behaviors.
Independent load variables (IV Load) directly hinder academic performance or a MedV.
Independent power variables (IV Power) directly improve academic performance or a MedV.
Mediating load variables (MedV Load) directly hinder academic performance; and/or are directly influenced by independent variables.
Mediating power variables (MedV Power) directly improve academic performance; and/or are directly influenced by independent variables.
Moderating load variables (ModV Load) act on the influence of another variable by increasing another variable's load or decreasing another variable's power.
Moderating power variables (ModV Power) act on the influence of another variable by decreasing another variable's load or increasing another variable's power.
MedVs can also function as ModVs.

Research Question 1c

Is there a relationship between sleep habits and academic performance among college students at a Public Midwestern University?

Quantitative Results. To analyze this research question quantitatively, the researcher focused on the Pearson correlations and regression components specific to the sleep score (Sleep Problems 2 score reverse coded) and fall 2021 GPA, and seep score and cumulative GPA. The Pearson correlation analyses revealed sleep score was significantly correlated with both fall 2021 (r[559] = .100, p < .001) and cumulative GPA (r[549] = .121, p < .001). The directions of the relationships are positive, meaning that

these variables tend to increase together: As sleep score increases, fall 2021 GPA and cumulative GPA increase. The magnitude of the association is approximately small for both fall 2021 and cumulative GPA (Cohen, 1992). The regression analyses revealed sleep score is not a significant predictor of fall 2021 or cumulative GPA.

Qualitative Results. To further investigate this research question, interview responses related to the influence of sleep on academic performance were coded, analyzed, and categorized into power and load themes using NVivo (QSR, 2020).

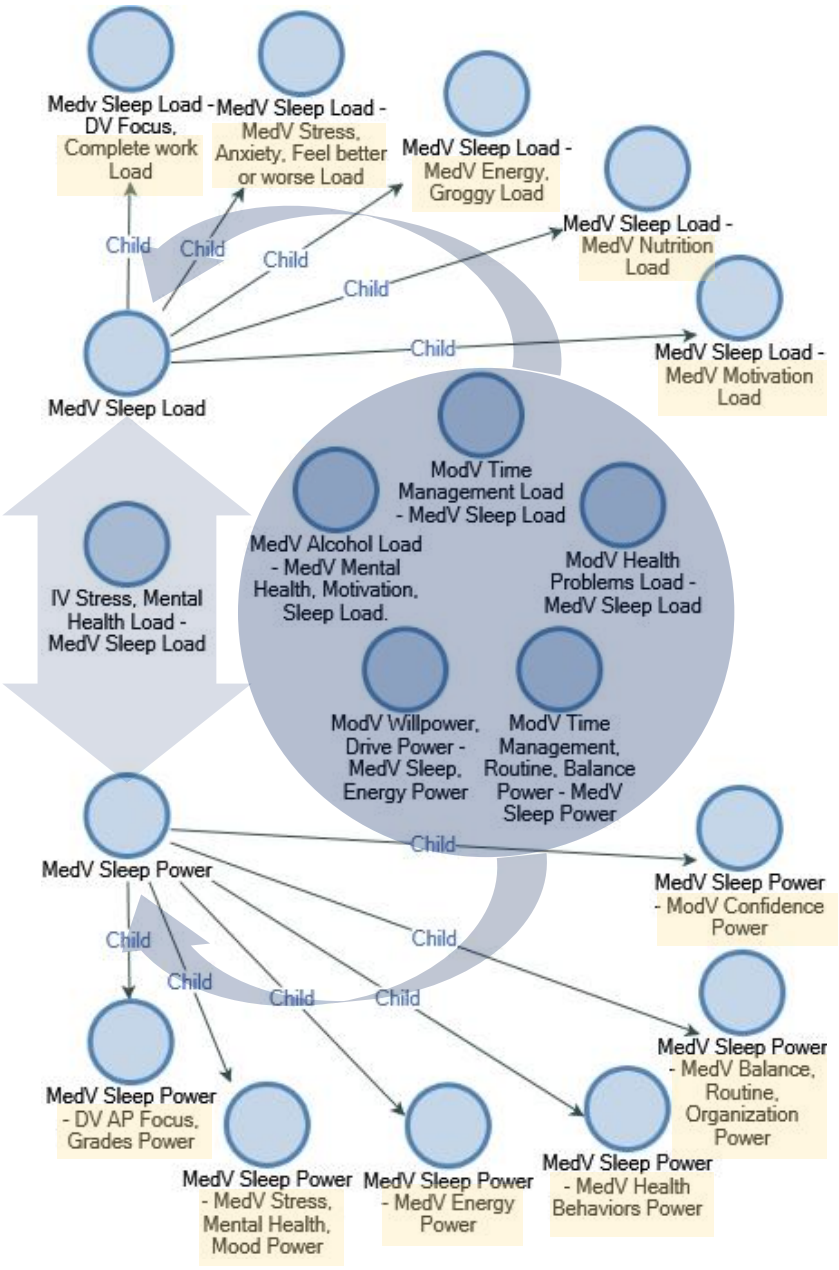
Figure 14 below, summarizes the themes that emerged from the qualitative analysis.

Figure 14

Influence of Sleep-Related Variables on Academic Performance

Figure Key:

	Moderating variables that influence sleep load or power
	Independent Variables that directly influence a sleep behavior
	Outcomes: How sleep behaviors influence academic performance



Notes. IV, MedV, and ModV refer to Independent, Mediating, and Moderating Variables, respectively.

Table 14 below provides the number of nutrition related sub-themes and references from the qualitative data analysis, corresponding to those shown in Figure 14 above.

Table 5

Sleep-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Independent Load Variables			
Stress, Mental Health	Sleep		"(Reported experiencing anxiety) …which leads to less sleep, which leads to freezing and not completing assignments even though the consequences are worse."
Mediating Load Variables			
Sleep	Focus		"Sleep is very important when I don't sleep well, I can't concentrate."
	Energy		"Lack of sleep can also make someone feel like they have less energy."
	Motivation	3	"When I don't sleep well my focus decreases and then I take more naps and I have less motivation."
	Nutrition	1	"When I don't eat well I feel depressed which makes me more stressed and that also impacts my sleep which impacts my eating habits."
	Stress, Anxiety	2	"Sleep and timing of sleep is a big influence. When I don't sleep enough anxiety increases in that exacerbates my anxiety."

continued

Table 14 (continued)

Sleep-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Mediating Load Variables			
Alcohol	Sleep		"Reported drinking more during a semester while in a bad relationship. This led to disturbed sleep and lower grades." (Excerpt from field notes)
Mediating Power Variables			
Sleep	Focus, Grades		"Sleeping really helps me to focus."
	Balance, Routine		"Better sleep habits can improve organization…"
	Energy		"So I feel like when I get more sleep, I am more energized and ready to accomplish my school work."
	Health behaviors		"Better sleep habits can improve organization, lead to healthier behaviors, and increase someone's mood"
	Stress, Mental health		"Sleep is a big positive factor. When I sleep nice stresses and worry is lowered (regarding influence on grades)"
	Confidence		"I would say that eating healthy exercising and getting enough sleep boost your confidence, which makes you want to get things done, which then in turn gets things done, so then you're successful."

continued

Table 14 (continued)

Sleep-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Moderating Load Variables			
Health problems	Sleep		"Also experiences gastroesophageal reflux disease, which interferes with sleep and eating." (Excerpt from field notes)
Time management	Sleep		"I think sleep is very important because when I have trouble with this because I procrastinate, and then my deadlines or 11:59 so I'm up until you know 12 to 12:15 PM, and then I have to wake up the next morning at 8:00 o'clock and so it kind of sets me in a tired mood where I just don't have the drive to complete anything."
Moderating Power Variables			
Time management	Sleep	1	"If you can manage your time you have time for healthier behaviors and sleep which can bring stress levels down"
Willpower, Drive	Sleep	1	"Willpower can override fatigue."

continued

Table 14 (continued)

Sleep-Related Thematic Hierarchy and Relevant Interview Excerpts

Notes. This table provides results of theoretical coding through NVivo, in which interview responses were categorized into similar groups of influences, power and load themes, types of variables, and how the variables influence academic performance behaviors.

Independent load variables (IV Load) directly hinder academic performance or a MedV.

Independent power variables (IV Power) directly improve academic performance or a MedV.

Mediating load variables (MedV Load) directly hinder academic performance; and/or are directly influenced by independent variables.

Mediating power variables (MedV Power) directly improve academic performance; and/or are directly influenced by independent variables.

Moderating load variables (ModV Load) act on the influence of another variable by increasing another variable's load or decreasing another variable's power.

Moderating power variables (ModV Power) act on the influence of another variable by decreasing another variable's load or increasing another variable's power.

MedVs can also function as ModVs.

Research Question 1d

Is there a relationship between alcohol use and academic performance among college students at a Public Midwestern University?

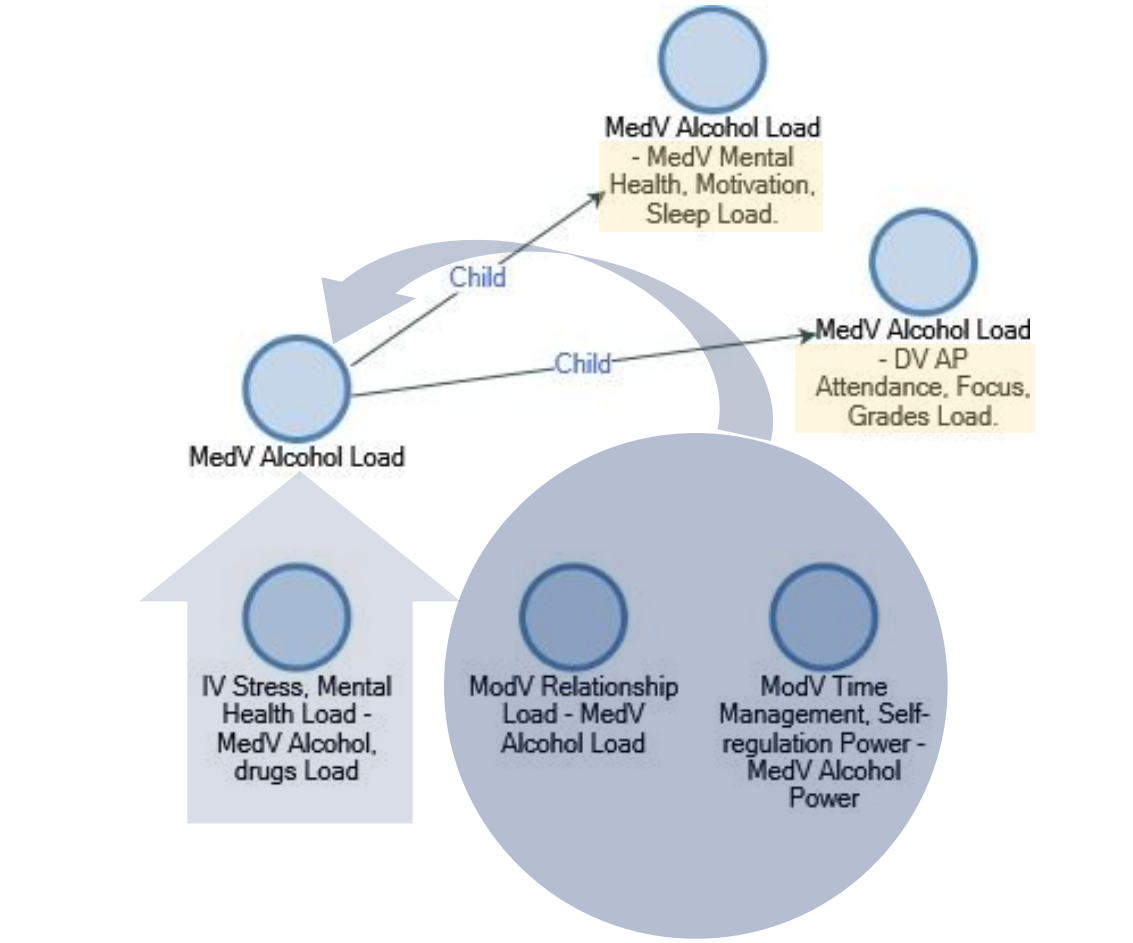
Quantitative Results. To analyze this research question quantitatively, the researcher focused on the Pearson correlations and regression components specific to the number of alcoholic drinks consumed in the past four weeks (Alc. Drinks) and fall 2021 GPA, and Alc. Drinks and cumulative GPA. The correlation analyses revealed Alc. Drinks were not significantly correlated with fall 2021 or cumulative GPA. Likewise, the regression analysis revealed Alc. Drinks is not a significant predictor of fall 2021 or cumulative GPA.

Qualitative Results. To further investigate this research question, interview responses related to the influence of ALC on academic performance were coded, analyzed, and categorized into power and load themes using NVivo (QSR, 2020).

Figure 15 below summarizes the themes that emerged from the qualitative analysis.

Figure 15

Influence of Alcohol-Related Variables on Academic Performance



Notes. IV, MedV, and ModV refer to Independent, Mediating, and Moderating Variables, respectively.

Table 15 below provides the number of nutrition related sub-themes and references from the qualitative data analysis, corresponding to those shown in Figure 15 above.

Table 6

Alcohol-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Independent Load Variables			
Stress, Mental health	Alcohol, Drugs	4	"Stress can cause a snowball, which worsens nutrition, leads to drinking alcohol, and decreases exercise frequency. All of this can decrease focus, cause more stress, and lead to skipping classes. This all leads to a decrease in motivation and grades."
Mediating Load Variables			
Alcohol	Attendance, Focus, Grades		"Reported going out and skipping class afterwards. Has observed others drinking and missing classes." (Excerpt from field notes)
	Mental health, Motivation, Sleep	3	"When having a poor diet or sleeping less or alcohol one can develop a negative mindset, which can decrease motivation, and make someone feel less energetic."
Moderating Load Variables			
Relationships	Alcohol	1	"Reported drinking more during a semester while in a bad relationship. This led to disturbed sleep and lower grades." (Excerpt from field notes)
Moderating Power Variables			
Time management, Self-regulation	Alcohol	3	"Does not drink on school nights." (Excerpt from field notes)

continued

Table 15 (continued)

Alcohol-Related Thematic Hierarchy and Relevant Interview Excerpts

Notes. This table provides results of theoretical coding through NVivo, in which interview responses were categorized into similar groups of influences, power and load themes, types of variables, and how the variables influence academic performance behaviors.
Independent load variables (IV Load) directly hinder academic performance or a MedV.
Independent power variables (IV Power) directly improve academic performance or a MedV.
Mediating load variables (MedV Load) directly hinder academic performance; and/or are directly influenced by independent variables.
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Moderating load variables (ModV Load) act on the influence of another variable by increasing another variable's load or decreasing another variable's power.
Moderating power variables (ModV Power) act on the influence of another variable by decreasing another variable's load or increasing another variable's power.
MedVs can also function as ModVs.

Research Question 2

Is there a significant difference in academic performance of food secure and food insecure college students at a Public Midwestern University?

Quantitative Results. To analyze this research question quantitatively, the researcher focused on multiple quantitative analyses specific to food security (FS) and fall 2021 GPA, and FS and cumulative GPA. The correlation analyses revealed FS was significantly correlated with both fall 2021 ($r[552] = .205$, $p < .001$) and cumulative GPA ($r[543] = .163$, $p < .001$). The directions of the relationships are positive, meaning that these variables tend to increase together: As food security increases, fall 2021 GPA and

cumulative GPA increase. The magnitude of the association is approximately small for both fall 2021 and cumulative GPA (Cohen, 1992).

The regression analysis revealed FS is a significant predictor of fall 2021 and cumulative GPA. For food secure students, fall 2021 GPA was predicted to be .211 points higher, when holding all other variables constant ($p < .001$). For food secure students, cumulative GPA is predicted to be .182 points higher, when holding all other variables constant ($p = .003$).

To directly address the research question, an independent samples *t*-test was conducted and revealed food secure participants had significantly higher fall 2021 and cumulative GPAs. There was a significant difference in mean fall 2021 GPA between food secure and food insecure students ($t[552] = -4.931$, $p < .001$). The average fall 2021 GPA for food insecure students ($M = 3.34$, $SD = .608$, $N = 185$) was -.2424 lower than the average fall 2021 GPA for food secure students ($M = 3.58$, $SD = .511$, $N = 369$). There was a significant difference in mean cumulative GPA between food secure and food insecure students ($t[543] = -3.851$, $p < .001$). The average cumulative GPA for food insecure students ($M = 3.28$, $SD = .564$, $N = 180$) was -.1997 lower than the average cumulative GPA for food secure students ($M = 3.48$, $SD = .572$, $N = 365$). See Table 16 below for a summary of the *t*-test results.

Table 7

Independent Samples t-test Results Comparing Mean Grade Point Average of Food Secure and Food Insecure College Students

Variable	Food Secure			Food Insecure					
	N	*M*	*SD*	*N*	*M*	*SD*	*t*	*p*	Cohen's *d*
Fa2021 GPA[a]	369	3.58	.511	185	3.34	.608	-4.93	<.001	.546
GPA[b]	365	3.48	.572	180	3.28	.564	-3.85	<.001	.569

Note. Table includes results of two independent samples t-tests.

[a] Fa2021GPA refers to fall 2021 semester grade point average.

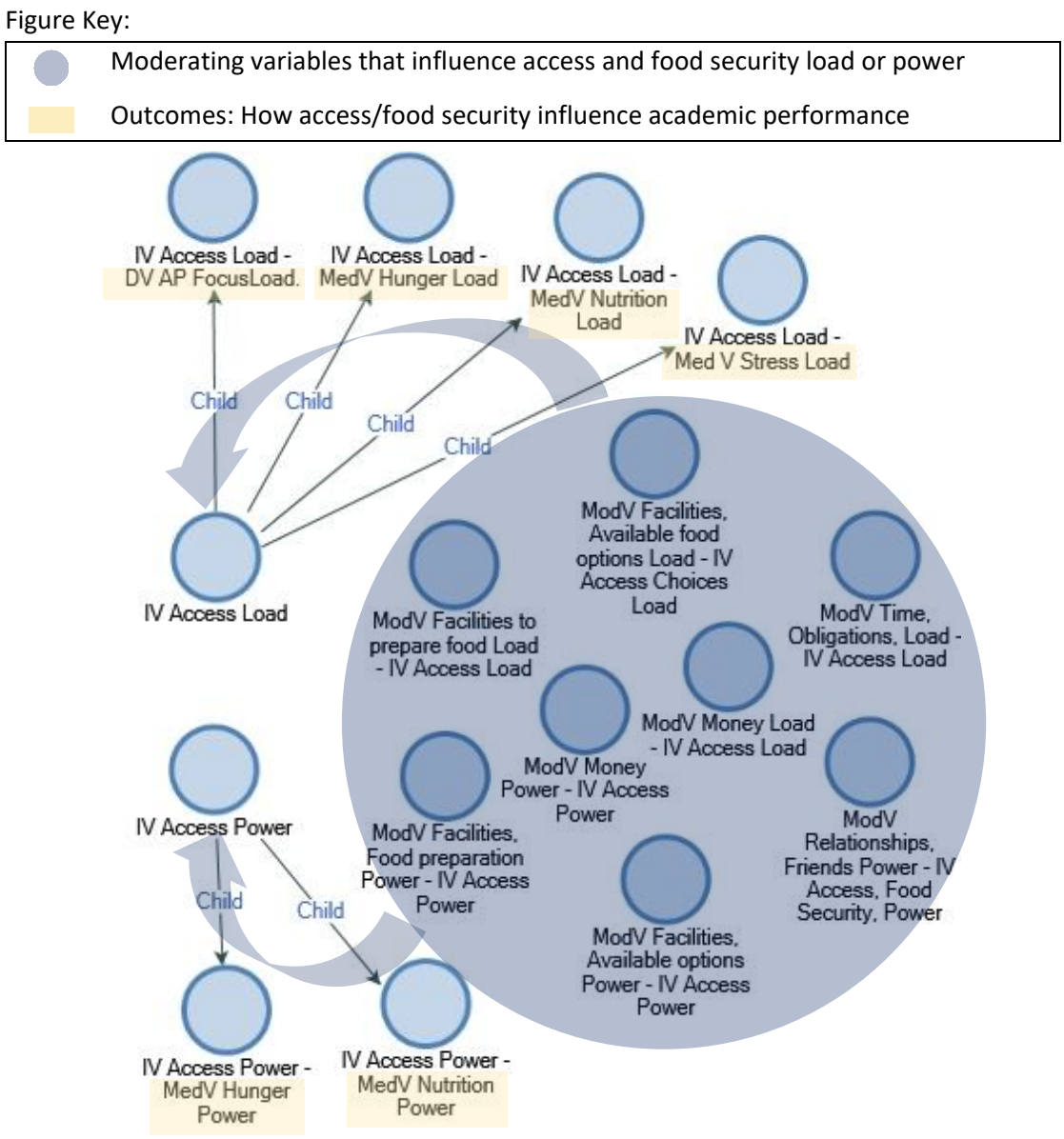
[b]GPA refers to cumulative grade point average.

Qualitative Results. To further investigate this research question, interview responses related to how access to adequate and healthy foods influenced academic performance were coded, analyzed, and categorized into power and load themes using NVivo (QSR, 2020).

Figure 16 below summarizes the themes that emerged from the qualitative analysis.

Figure 16

Influence of Access and Food Security-Related Variables on Academic Performance



Notes. IV, MedV, and ModV refer to Independent, Mediating, and Moderating Variables, respectively.

Table 17 below provides the number of nutrition related sub-themes and references from the qualitative data analysis, corresponding to those shown in Figure 16 above.

Table 8

Access and Hunger-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Independent Load Variables			
Access	Focus, Distraction	1	"For others who struggle to have access, this
	Stress	1	could cause stress or distraction. (Reported observing) … stress in a classmate who could not afford food."
	Hunger	1	"(Participant referred to Maslow's hierarchy, stating) … if you have no food you are missing basic needs."
	Nutrition		"There are not a lot of healthy foods nearby. That would make it easier."
Independent Power Variables			
Access	Hunger	1	"(Reported) having enough food but occasionally sacrificing quality for the sake of saving money on food." (Excerpt from field notes)
	Nutrition	2	"(Reported) Feels better when eating at home and eating more fresh fruit and taking part in more self care." (Excerpt from field notes)
Mediating Load Variables			
Hunger	Focus		"When I get hungry in class or before class my focus drops and I have less energy."

Continued

Table 17 (continued)

Access and Hunger-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Mediating Load Variables			
Hunger	Stress, Mental health	2	"Very important, if you're not eating a lot it impacts physical and mental performance. And can cause anxiety and harm mental health."
Hunger	Time management, Routine	1	"When I skip a meal, it throws off my day."
Nutrition	Hunger		"(Reported) She feels hungrier after eating processed foods." (Excerpt from field notes)
Mediating Power Variables			
Hunger	Focus	1	"(Reported) Something small will just wear off so she needs something that makes her fuller for a longer time that gives her more focus." (Excerpt from field notes)
	Motivation	1	"When I eat I feel more motivated."
Moderating Load Variables			
Facilities to prepare	Access	3	" …eating habits are much different at home than at campus. It is hard to get fresh fruit and vegetables on campus."
Facilities, Available options	Access	5	"Right now, experiencing a lack of access to fruits and vegetables. Most food eaten is at campus."

Continued

Table 17 (continued)

Access and Hunger-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Moderating Load Variables			
Money	Access	4	"Access may be an influence if you don't have money for fresh fruits and vegetables."
Time, Obligations	Access	4	"May not be able to eat and may have a lack of time to eat between classes."
Moderating Power Variables			
Facilities to prepare	Access		"I have food available and can cook shop and make food at home."
Facilities, Available options	Access		"As an undergrad student she had a meal plan and a scholarship."
Money	Access	2	"(Reported) having money so she never feels like she can't afford food." (Excerpt from field notes)
Relationships	Access	1	"My roommates help me eat."
Time management	Hunger	1	"It's important to plan ahead and to pack food. Otherwise, it'd be unable to eat."
Willpower, Drive	Hunger	1	"Because I have such a high standard and drive for getting work done I can push through hunger"

continued

Table 17 (continued)

Access and Hunger-Related Thematic Hierarchy and Relevant Interview Excerpts

Notes. This table provides results of theoretical coding through NVivo, in which interview responses were categorized into similar groups of influences, power and load themes, types of variables, and how the variables influence academic performance behaviors.
Independent load variables (IV Load) directly hinder academic performance or a MedV.
Independent power variables (IV Power) directly improve academic performance or a MedV.
Mediating load variables (MedV Load) directly hinder academic performance; and/or are directly influenced by independent variables.
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Moderating load variables (ModV Load) act on the influence of another variable by increasing another variable's load or decreasing another variable's power.
Moderating power variables (ModV Power) act on the influence of another variable by decreasing another variable's load or increasing another variable's power.
MedVs can also function as ModVs.

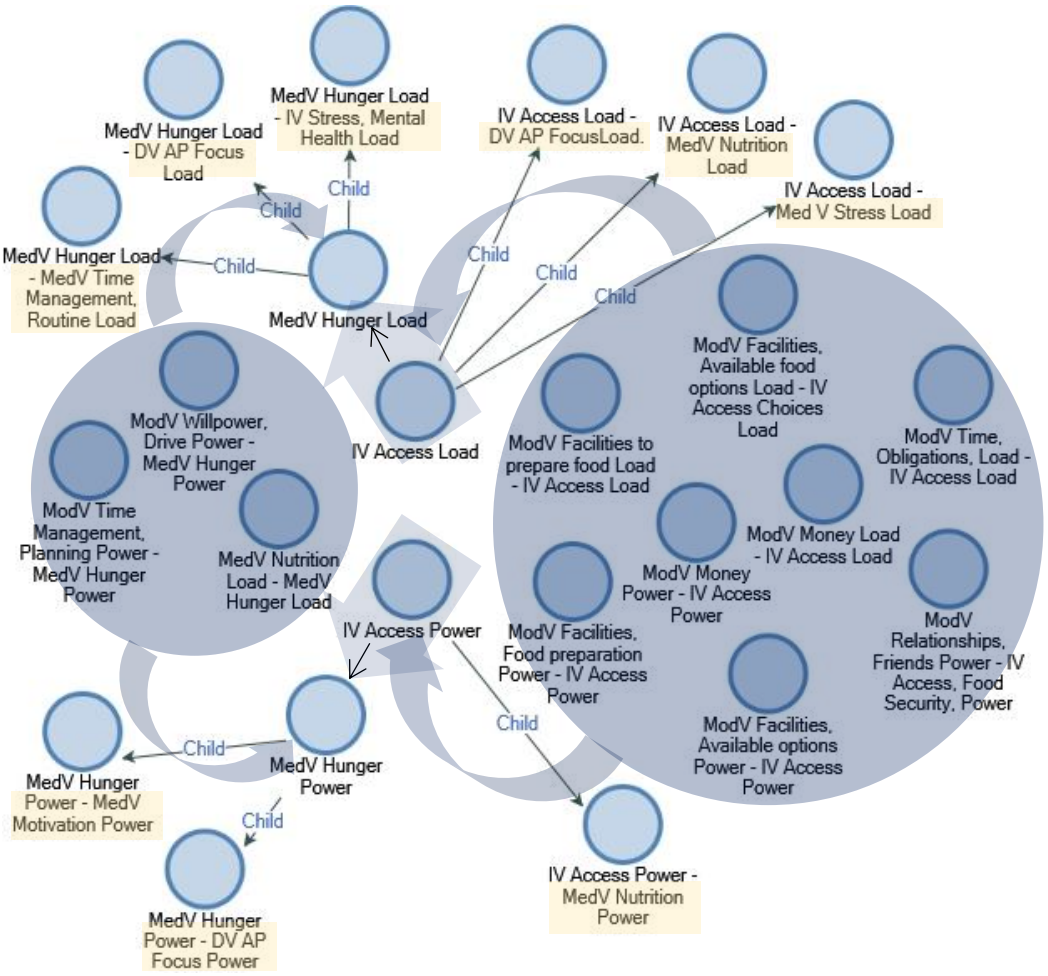
Access, Food Security, and Hunger are closely related and often discussed, synonymously, in food security literature. To further investigate this relationship, qualitative data related to these variables were analyzed together. See Figure 17 below.

Figure 17

Influence of Access, Food Security, and Hunger-Related Variables on Academic Performance

Figure Key:

	Moderating variables that influence access or hunger load or power
	Independent Variables that directly influence access or hunger
	Outcomes: How access/hunger influence academic performance



Notes. IV, MedV, and ModV refer to Independent, Mediating, and Moderating Variables, respectively.

Additional Findings

Body Mass Index is a general metric of health and health behaviors. Body Mass Index (BMI) was included in the correlation and regression analyses due to its relation to health. Throughout the first few interviews, the topics of stress and mental health recurred. The researcher included an additional question about stress and mental health in subsequent interviews.

Body Mass Index. The correlation analyses revealed BMI was significantly correlated with fall 2021($r[542] = -.173$, $p < .001$) and cumulative GPA ($r[532] = -.172$, $p < .001$). The direction of the relationship is negative, meaning that these variables tend to increase and decrease together: As BMI increases, cumulative GPA decreases. In addition to having a significant linear relationship with fall 2021 and cumulative GPA, BMI was found to have a significant negative correlation with several other variables including the following:

- Diet Quality Score: $r[531] = -.147$, $p < .001$
- Sleep Score: $r[542] = -.162$, $p < .001$
- Physical Activity Category: $r[417]$, $-.151$, $p < .002$

The magnitude of the association between BMI and the variables mentioned above is approximately small (Cohen, 1992). See Table 6 for a summary of how BMI is correlated with these variables.

The regression analysis revealed BMI is a significant predictor of fall 2021 and cumulative GPA. For every unit increase in BMI, a .012 decrease in fall 2021 GPA was predicted, when holding all other variables constant. For every unit increase in BMI, a

.013 decrease in cumulative GPA is predicted, when holding all other variables constant. See Table 9 for summaries of these regression results.

No specific BMI-related questions were asked during interviews, yet several responses indicated health and behavior factors related to maintaining a healthy bodyweight have a direct impact on academic performance or influence another variable, therefore indirectly influencing academic performance. When asked how nutrition influences academic performance, two interview participants mentioned body weight in their responses without being specifically asked.

One respondent explained, during the pandemic, she changed her eating habits and lost weight. As a result she experienced benefits related to academic performance:

> "Nutrition is a big influence. The pandemic rearranged my eating habits. When I'm eating well I have better focus and stamina. I pay attention more. I recently lost a lot of weight and noticed a big difference in these areas. When I eat a lot of carbohydrates and a lot of snack foods my energy drops. When I'm eating a lot of vegetables I feel much better. Water and proper hydration make a huge difference. When I'm eating healthier it helps with time management in keeping up with work."

Another respondent reported weight gain harming mental health. The passage below includes quotes from this interview with paraphrased excerpts from the interview notes in the researcher's field journal:

> "Proper nutrition helps with having a set diet, predictability, in structure. But I need a space and time to prepare. consistency is important for energy and clarity.

For me it's not as much about quality. It's more about consistency. The lack of structure (related to eating) can be negative."

Respondent reported the following:

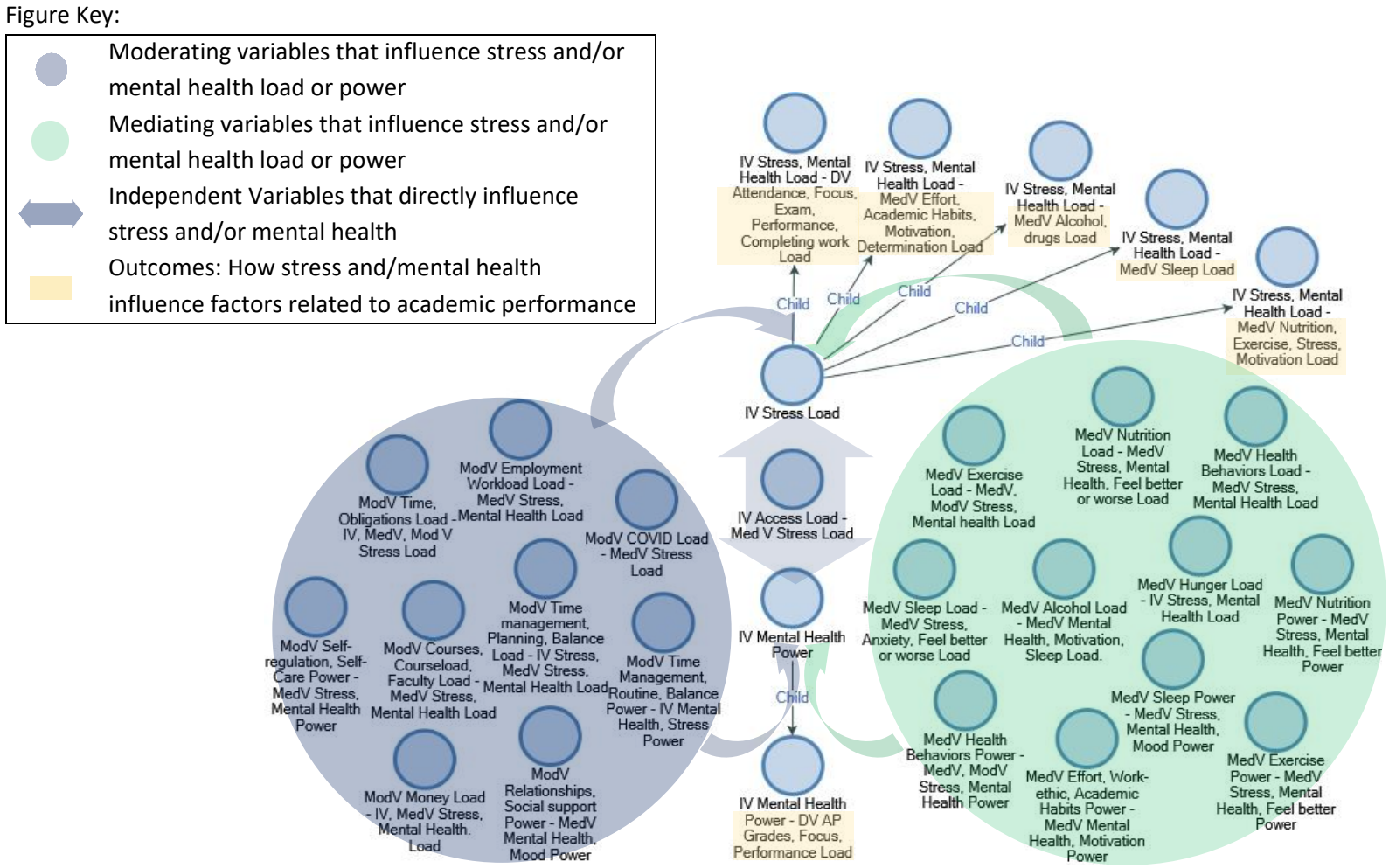
- Weight gain this semester harming mental health.
- Attributed weight gain to eating more fast food, eating out more often.
- Reported she feels better when eating at home, eating more fresh fruit and taking part in more self-care.

Stress and Mental Health. No specific questions related to stress and mental health were included in the survey instrument, therefore there is no quantitative discussion. Many interview responses indicated a relationship between stress / mental health and academic performance.

Figure 18 below summarizes the themes that emerged from the qualitative analysis.

Figure 18

Influence of Stress and Mental Health-Related Variables on Academic Performance



Notes. IV, MedV, and ModV refer to Independent, Mediating, and Moderating Variables, respectively.

Table 18 below provides the number of nutrition related sub-themes and references from the qualitative data analysis, corresponding to those shown in Figure 18 above.

Table 9

Stress-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Independent Load Variables			
Access	Acute stress	1	"For others who struggle to have access, this could cause stress or distraction. (Reported having) observed stress in a classmate who could not afford food."
Stress, Mental health	Attendance, Focus, Grades	14	"I would say that it's kind of like a loop or a circle. You do bad in the class, which makes you eat like stress eat, which then makes you stress more, which then makes you not perform well So it's kind of just circle and it could go either way"
	Alcohol, Drugs	4	
	Effort, Academic habits	2	"Stress can cause a snowball, which worsens nutrition, leads to drinking alcohol, and decreases exercise frequency. All of this can decrease focus, cause more stress, and lead to skipping classes. This all leads to a decrease in motivation and grades. Reported avoiding problems, and not being able to study or go to class."

continued

Table 18 (continued)

Stress-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Independent Load Variables			
	Nutrition and health behaviors	14	"Mental health may be the biggest influence. Could be driving sleep, diet, nutrition, alcohol, exercise."
	Sleep	6	"Sleep is important. (Reported fluctuating between mild insomnia and oversleeping.) Anxiety impairs sleep. Oversleeping leads to fatigue."
Mediating Load Variables			
Exercise	Stress, Mental health	2	"…don't workout I feel down and have less confidence."
Hunger	Stress, Mental health	2	"I feel full I do better (regarding focus and mood)"
Nutrition	Stress, Mental health	12	"I'll just start eating fast food and that definitely makes me feel disgusting. I would say it impacts my grades because it's just easy you can eat it and there's this feeling of like disgust almost."
Sleep	Stress, Mental health	2	"Sleep and timing of sleep is a big influence. When I don't sleep enough anxiety increases in that exacerbates my anxiety."

continued

Table 18 (continued)

Stress-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Mediating Load Variables			
Stress	Nutrition	1	"When I don't eat well I feel depressed which makes me more stressed and that also impacts my sleep which impacts my eating habits."
Alcohol	Mental health	3	"I also see people who drink alcohol or smoke weed have bad mental health which also leads to academic problems."
Mediating Power Variables			
Exercise	Stress, Mental health	11	"Physical activity is a big influence and can impact my chemical balance"
Health behaviors	Stress, Mental health	3	"Having good health behaviors can decrease stress."
Nutrition	Stress, Mood, Well-being	13	"Nutrition helps you focus. I feel like it's beneficial, it boosts my mood especially when I know it's healthy it's a win win."
Sleep	Stress, Mental health	3	"Sleep is a big positive factor. When I sleep nice stresses and worry is lowered (regarding influence on grades)"
Effort, Academic habits	Mental health	1	"Explains she feels better after making an attempt to be better because she gets personal satisfaction."

continued

Table 18 (continued)

Stress-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Moderating Load Variables			
Courses, Faculty	Stress, Mental health	12	"Have taken 15 to 18 credit hours in the past. 18 credit hours have not been good for mental health."
COVID-19	Stress, Mental health	4	"The pandemic brought so many unknowns, feel more invested in the outside world. This exacerbated stress levels."
Employment, Workload	Stress, Mental health	3	"It's been very stressful, I'm also a graduate assistant working 20 hours or more a week and going to school full time."
Money	Stress, Mental health	1	"Money is an influence. There is a stress with moving finances around and a lot of anxiety."
Time, Obligations	Stress, Mental health	6	"Explained the pieces were related, and parts can increase stress. When she prioritizes school and work there is less time to sleep and less time for herself. And she feels stress from trying to work out which could decrease her stress but then leads to her stressing about time." (Excerpt from field notes)
Time management	Stress, Mental health	3	"I feel like I'm always losing time. It's having an impact on my mental health and physical health."

continued

Table 18 (continued)

Stress-Related Thematic Hierarchy and Relevant Interview Excerpts

Sub-Theme	Variables Being Influenced	References	
		#	Examples
Moderating Power Variables			
Self-regulation, Self-care	Stress, Mental health	3	"…overall doing a little better with self-care. I've been meditating and journaling and eating a little better too. This has helped me get more focused and have more energy, and I'm feeling happier. I feel like I have a better sense of purpose which is helping my class work."
Time management, Routine	Stress, Mental health	4	"If you can manage your time you have time for healthier behaviors and sleep which can bring stress levels down"
Relationships	Mental Health	2	"Enjoys eating with friends it feels good to eat socially with friends and to spend time with her husband." (Excerpt from field notes)

Notes. This table provides results of theoretical coding through NVivo, in which interview responses were categorized into similar groups of influences, power and load themes.

Independent load variables (IV Load) directly hinder academic performance or a MedV.

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MedVs can also function as ModVs.

Discussion

Looking at these results collectively, the data reveal health-related behaviors and stress have direct, mediating, and moderating influences on academic performance. An additional, unexpected finding is that health and, particularly, stress and mental health influence health behaviors and stress in a circular manner.

Research Question 1

Do health related behaviors influence academic performance? The results of the regression analysis and interview confirm each health-related variable has some type of influence on Academic Performance. While the regression model did not find alcohol or exercise to be a significant predictor of fall 2021 or cumulative GPA, the interview responses convincingly confirmed these behaviors and habits have a large influence. These findings are consistent with many studies that have investigated these factors individually, however none have investigated them collectively as predictors of academic performance in this manner (Abbasi et al., 2021; Aimé et al., 2017; Burrows et al., 2017; Meyer & Larson, 2018; Nasui & Popescu, 2014; O'Neill & Maguire, 2017; Payne-Sturges et al., 2018; Reuter et al., 2020; Singleton & Wolfson, 2009; Taylor et al., 2013; Valladares et al., 2016; Wald et al., 2014). Of the health-related variables in the regression model, Diet Quality, Food Security, and Body Mass Index were the only significant predictors, with Food Security status having the largest effect on Grade Point

Average. When viewed collectively, through qualitative lens, it is apparent that many health-related behaviors have direct and mediating influences over key academic performance variables such as ability to focus during class, complete assignments, and attend classes.

Research Question 1a

Is there a relationship between nutrition habits and academic performance among college students at a Public Midwestern University? Both quantitative and qualitative results strongly indicate nutrition is a key factor in academic success. The correlation analysis shows a small influence, but the results were statistically significant. My interpretation is that nutrition is one piece of the greater puzzle when it comes to influences on academic performance. The interview responses revealed that, consistent with the findings of Richardson (2012), non-intellective power factors such as willpower, grit, motivation, and intellective factors such as intelligence can help a student push through and overcome many load-type influences such as poor nutrition. However, this study provides evidence that holding all other factors constant, healthier nutrition habits may help a student perform better academically by enhancing academic factors such as focus and supportive factors such as time management, well-being, motivation, or improved mood. As Figure 12 demonstrates, nutrition is highly interconnected to a multitude of variables that have an array of potential benefits for academic performance. These findings add to and provide potential explanations for previous research that found associations between healthy eating behaviors and better academic performance (Valladares et al., 2016; Wald et al., 2014). Perhaps, the most important nutrition-related step is simply the avoidance of foods commonly known to have unhealthy outcomes.

Multiple interview participants cited experiencing crashes from consuming sugary products prior to class. Many explained eating poorly led to a drop in energy levels. Several specifically used the word “sluggish” to describe how they feel after eating processed foods, and others explained eating fruits boosted their energy levels and mood.

While it is difficult to prove eating certain foods directly impacts one’s grades, many findings in this study support the notion that consistently eating healthier can contribute to improved academic performance. A growing body of literature demonstrates potential pathways for certain foods to influence the brain, neurochemistry, and mood (Borrows et al., 2017; Gomez-Pinilla, 2008; Zamroziewicz et al., 2018). Certainly, the impact of consuming sugar and highly processed foods is known and becoming more widely accepted as a detrimental factor for mood and overall cognitive function. The findings of this research support findings of previous researchers that indicate high sugar and processed foods negatively impact academic performance of college students (Chong et al., 2019; Freeman et al, 2018; Reuter et al., 2020; Wald et al., 2014).

Research Question 1b

Is there a relationship between exercise habits and academic performance among college students at a Public Midwestern University? When analyzed collectively, physical activity was not correlated with academic performance outcomes. However, the ANOVA and post hoc test revealed participants in each PA Category experienced different academic performance outcomes. This finding was consistent with the qualitative analysis, in which responses indicate participants benefit from moderate, consistent amounts of exercise, but excessive exercise may be a distraction and contribute

to stress or time management problems. The ANOVA results are compelling, in that consistent research on exercise has found benefits towards academic performance or acted as a moderating or mediating variable, which in combination with other factors helped improve an academic performance correlate (Abbasi et al., 2021; Gomez-Pinilla, 2008; Meyer & Lawson; 2018; Wald et al., 2014).

A likely explanation of why PA categories were not positively correlated with GPA is that PA category 3 is considered highly active and the minimum amount of moderate exercise that qualifies someone to be in this category is 1.5 to 2 hours of moderate physical activity per day. This amount of daily exercise may interfere with other academic behaviors such as studying and homework. In addition, some interview respondents explained that trying to find time to exercise can cause stress, while small amounts could relieve stress and boost one's focus and energy levels. It is reasonable to assume that students who are exercising for multiple hours per day are prioritizing exercise over other behaviors such as sleep, study, and classwork. The results of the ANOVA confirm this suspicion to some extent, as participants in PA category 1 had the lowest GPA, PA category 2 had the highest mean GPA, and PA category 3 had a mean GPA between that of group 1 and 2. These results suggest that an amount of physical activity that aligns to PA category 2 is beneficial. This equates to accumulating at least 30 minutes of moderate physical activity per day, 5 days per week. The statistically significant ANOVA results support this notion that moderate, regular physical activity at this level is more beneficial for academic performance than being sedentary or highly active.

Research Question 1c

Is there a relationship between sleep habits and academic performance among college students at a Public Midwestern University? Results of the quantitative analyses show that sleep score is positively correlated with GPA, but the regression shows it is not a significant predictor. The significant correlation results are supported by many previous studies and can perhaps be explained by the consistent interview feedback in which participants explained how sleep influences so many other factors that are related to academic performance and that many factors such as drive, willpower, grit, determination, etc. can override the detrimental effects of a poor night's sleep (Burrows et al., 2017; Singleton & Wolfson, 2008; Taylor et al., 2013). Additionally, as evidenced by the qualitative results in Figure 14 and Table 14, stress levels, mental health and sleep are highly connected which also could explain some of sleep's moderating and mediating effects on academic performance. Interview results also support Singleton and Wolfson's (2008) findings that alcohol consumption influences sleep and several other related factors.

Research Question 1d

Is there a relationship between alcohol use and academic performance among college students at a Public Midwestern University? Surprisingly, the quantitative results found no significant results related to alcohol and academic performance. Yet, literature provides consistent and compelling data to support alcohol as a hinderance to academic performance (Burrows et al., 2017; Singleton & Wolfson, 2008). There are several possible explanations for the inconsistent findings in this research study. Participants of this study generally, had high GPAs and alcohol may not have significantly impacted

their academic performance because they had other characteristics that helped them manage this behavior such as willpower, self-regulation skills, and time management. Interview participants' responses were consistent in that alcohol did not negatively impact their academic outcomes. However, most interview participants reported observing alcohol negatively impacting friends or acquaintances academically, in that alcohol led to missing classes, exams, or other activities that would traditionally lead to academic success. This finding is consistent with the literature which largely supports excessive alcohol consumption as being a predictor of academic problems.

Additionally, many of the interview participants reported self-regulatory behaviors such as abstaining from alcohol on a school night or prioritizing homework over going out with friends or partying. It is possible that the study sample that participated in the interview portion were more serious about school and less likely to consume alcohol in a manner that could be detrimental to academic performance. This notion is supported by the frequency with which interview respondents discussed alcohol from an observation of a friend and rarely discussed personal experiences. A few graduate student respondents explained that as undergraduate students, they had episodes of missing classes, assignments, and even exams from consuming excessive amounts of alcohol the night before. Collectively, the qualitative results show alcohol is an influencing factor of academic performance that has direct influences on academic performance and through mediating variables such as mental health, sleeping habits, and motivation, especially among undergraduate students.

Research Question 2

Is there a significant difference in academic performance of food secure and food insecure college students at a Public Midwestern University? Few interview participants personally experienced food insecurity but reported observations of others experiencing stress and difficulty focusing due to lack of food. More common was reporting of trouble focusing and low energy levels when hungry. Participants did not always frame discussions of going to class hungry as a food security issue, but the outcome is the same. Whether one has access to food or not, the effect of being hungry in class and when working on assignments is a lack of focus, decreased energy, and a poor mood. Considering this impact of hunger on learning and academic performance, the results of the quantitative analysis make sense. Food insecure students have significantly lower GPAs by as much as 0.211 grade points. This means that two students with the exact same set of non-intellective and intellective factors could have a significantly different GPA from food security issues. These results are highly compelling and practical, as increasing food security among college students is a realistic intervention with evidence-based benefits to their GPA. These results are supported by many studies and add to the body of evidence that shows how prevalent food insecurity is on college campuses. Considering this finding, the work of Nikolaus et al. (2020) is rather shocking, in which these researchers found 41% of college students included in 51 study samples met the criteria for food insecurity.

An additional, related finding from the interview portion of the study was that many students reported difficulty accessing healthy and convenient food options on campus. They explained this lack of access often led to them experiencing hunger in

class. Many also reported lack of healthy on-campus options in general as being a factor that contributed to poor diet choices during the semester. As demonstrated by Figure 16, access to healthy food and hunger have a dynamic relationship with academic performance. Many factors can contribute to the effects of hunger and lack of access, but it is clear that students who are experiencing hunger and food insecurity are at a disadvantage compared to those who have consistent access to healthy food options.

Additional Findings

The quantitative analyses reveal BMI is related to academic performance via negative significant relationships. In addition, BMI has a significant negative relationship to diet quality, sleep score, and physical activity levels. When combined with the themes that emerged throughout the interviews, it is reasonable to conclude that BMI or weight status influences how well a student performs academically though many possible routes. It is also reasonable to assume that students who are not doing well academically are more likely to experience some factors that place one at risk for a higher BMI such as stress, poor sleep, poor diet, and lack of exercise. One can assume that some of this influence is due to the many lifestyle habits that influence body weight status. If someone is not leading a healthy lifestyle, it is more likely that s/he will reach an unhealthy body weight. On the other hand, if someone is at an unhealthy body weight, it is more likely that s/he will be less likely to participate in healthy lifestyle habits. In addition, qualitative results indicate that when at an unhealthy body weight or when not living a healthy lifestyle, individuals' mental health suffers, which negatively affects academic performance in several ways. The significant negative relationships between BMI and GPA are supported by many studies with similar findings. Both Aimé et al. (2017) and

Wald et al. (2014) found the same negative association with BMI and academic performance.

Stress, mental health, and academic performance appear to be linked to academic performance in multiple ways. This relationship is well-documented as many researchers have found negative correlations between stress levels in students and academic performance (Meyer & Larson, 2018; Richardson et al., 2012; Saunders-Scott et al., 2018). Many students mentioned "Domino effect," "Cycle," or other relationship between mental health and the other health-related influences. When students experience events that harm mental health, they are less motivated, distracted, more likely to miss class and homework, and less likely to exercise, eat healthy, and sleep adequately. These outcomes lead to additional stress and further harm mental health, exacerbating the problem. Conversely, respondents explained academic performance improves when mental health is improved. Healthy behaviors improved motivation, confidence, and mental health. Figure 18 demonstrates this complex relationship, showing that stress can directly hinder academic performance and indirectly through many mediating variables. Additionally, there are multiple mediating variables and moderating variables that can increase or decrease stress's ability to hinder academic performance. Table 18 provides many quotes that indicate the dynamic relationship between stress and academic performance. Two of the most compelling are provided below:

> "I would say that it's kind of like a loop or a circle. You do bad in the class, which makes you eat like stress eat, which then makes you stress more, which then makes you not perform well So it's kind of just circle and it could go either way"

> "Stress can cause a snowball, which worsens nutrition, leads to drinking alcohol, and decreases exercise frequency. All of this can decrease focus, cause more stress, and lead to skipping classes. This all leads to a decrease in motivation and grades. Reported avoiding problems, and not being able to study or go to class."

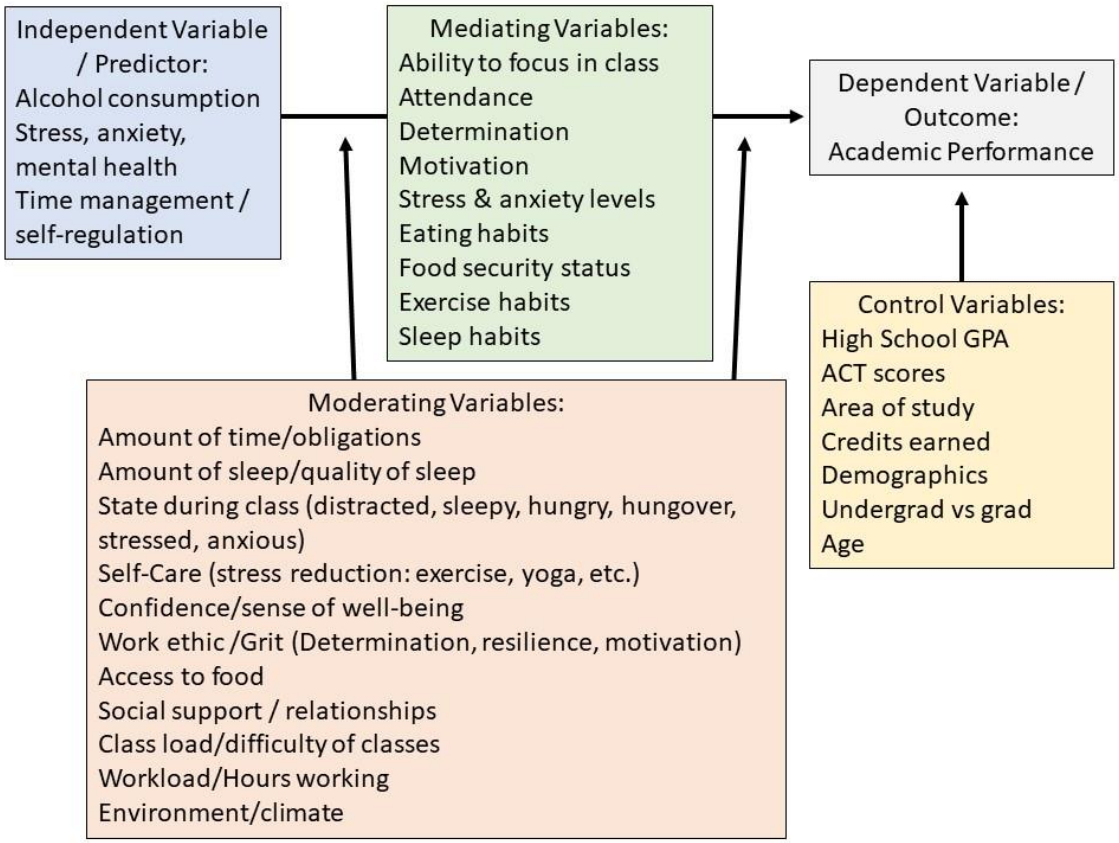
Quotes like these demonstrate how pervasive and detrimental stress can be to a student's success as a student. These findings provide further evidence for the necessity of stress and mental health interventions and mental health professionals to be available to college students.

Grounded Theory Discussion

As described in the data analysis section, theoretical coding led to the emergence of this grounded theory. The substantive theory shared with respondent validation interview participants is provided in Figure 19, below. This version was updated based on the results of respondent validation and final theoretical coding.

Figure 19

Substantive Theory Shared After Advanced Coding



Feedback obtained during the respondent validation phase of the study indicated the theory accurately represented participants' experiences. See Appendix O for emailed response validation from a student that confirmed the theory represents her experiences. Below are a few selected quotes from respondent validation participants:

- Participant 11.18.85: "I think it looks accurate to me, really. Also really it's also really good timing, because, I like using this to like look at like how I'm managing my stress it's like those reasons, make sense, as to why

like I'm like you know not sleeping or like. You know, like not managing my time so definitely does help."

- Participant 11.11.95: (In response to asking if he agreed with the model) "Yeah, I think it's spot on."

  "Certainly, I'm just looking at like examples and no matter what box I jumped to as long as I follow the arrow it correlates..."

- Participant 12.7.5: (In response to asking if she agreed with the model) "yeah okay um I would say, definitely. Like if it's like a chain reaction like Okay, I have high alcohol consumption, so that could lead to the distracted in class or I don't know I didn't sleep, because I went out or something and then that would lead to that. I can see those for all of that, for sure, and I can also see like if you just like. I don't know started with having no motivation and it can directly go straight to like low academic performance obviously too, but I can see it both ways for sure."

All respondent validation interview participants confirmed the majority of the substantive theory. Participants also related their experiences to the model, mapping out their choices and experiences according to the flow of the diagram. While talking through the components, each participant offered suggestions and feedback on the placement of the variables, how one variable could influence another, and the overall model. One interview in particular was informative and contributed to the final grounded theory model. Below are some excerpts from the interview with participant 11.15.10. Based on this interview, and the others to a lesser degree, I looked more deeply at some of the recurring codes within themes and identified additional power and load variables,

relationships, and added layers to the moderating and mediating variables. I attempted to clarify the dynamics to indicate how the moderating and mediating variables could influence the other variables. This effort was in part to show the high variability between how certain variables influence the outcome for individuals, while still communicating the consistent elements of how certain factors function for all individuals.

- “Well, I would say, like one thing that I was thinking was like. I do feel like that the independent variable categories like that they have an impact on maybe like. Some of my like moment to moment motivation like I don't know I would almost like differentiate between like the, like how I feel like motivation wise in the moment, and then like I feel like there's a kind of an outside source of motivation which might be related to like people's perceptions of me like well, I want to make sure that I get my crap together, so I can perform well so that people like think well me and continue to think that I'm a good student or might be just you know I'm really motivated to get the degree, so I know I need to like figure it out and put the work and even though I don't feel like it right now, or Even just like I know that like my faith, as a Christian like one of the things that you know, is an important part of my life is like working to the best of your ability and just trying to do a good job, even if you don't feel like it in the moment like you're putting your best effort into everything you do, and so, like those outside sources of motivation, sometimes help to override like maybe my lack of internal motivation like I might not feel motivated in the moment but those things are still able to drive me and kind of act in

place of that like feeling of motivation, if that makes sense. So like I feel like, even if the things in the first box like do impact, my feeling of motivation that like there's still like that other motivation that's not really impacted by those things as much and helps to kind of mediate, the effect of that impact."

    - The above passage contributed to clarifying acute stress as a mediating variable and adding values and faith as a moderating variable.

- "I almost wonder if it's just like here personal values like as long as you're able to maintain the things that are like the most valuable to you or the things that you feel like have the greatest impact like as long as those things are present. Then you're able to push through like if you're somebody who social supports like is the most important thing to you and lose those social supports then does that completely wreck like your ability to do well just because, like you value that so, then you believe that you need that to succeed, like maybe it's something like that, where it's just like what you value is what you're going to focus on, and like almost like a like a mental thing like maybe that's what allows you to do well because, like that is interesting that everybody is so different."
    - The above passage also contributed to the inclusion of values as a stand-alone moderating variable. The passage also contributed to adding priorities and self-regulatory skills as moderating variables.

- “I wondered if there was anything that you had found so far, or that people have mentioned about like the like the cyclical relationship of like Okay, so you have this academic performance and maybe like a history of academic performance and like How does that impact your confidence and sense of well-being because I feel like it almost like I mean. I’ve just been looking a lot I guess it's The self-efficacy theory and it's got me thinking like well. If you have certain beliefs about yourself and they're like in a and you have beliefs about your ability to perform, Like, how is that being influenced by your actual performance because, like it's shaped by like Okay, if I do well, then like maybe that helps me to feel better about myself, but if I do poorly like maybe that kind of makes me take a dip in self-confidence and if self confidence in my ability to do well academically if that's lower than that might end up causing like affecting the other variables, which would even influence academic performance more negatively, and then it's like almost like a downward spiral sometimes like I feel like my competence in my ability to do well does sometimes kind of like take a dip when I do as well, which, like doesn't really happen super often but I know, like Just from some people that I’ve talked to not even necessarily like classmates but even like at an earlier level, like some of the kids that I’ve had in therapy it's like if they just have this belief, about themselves that like I am a poor performing student like I’m just I’m not going to do well there's only a certain level that I’m going to be able to achieve and it's almost like self-limiting in that sense.”

    - This passage influenced the inclusion of self-efficacy, confidence, and knowledge to the model.

- “But I mean yeah I would say they're like for me at least I feel like eating habits tend to contribute more than anything, in just to yeah I don't know if I would say that my eating habits directly impact my academic performance but they for sure impact my ability to focus and I might not like do as well as I think that I should. But I mean like even the times, where I’ve been like hungry, you know going into a presentation, or something like I don't know that it really impacts it's weird because I wouldn't say that it impacts my ability to like do the thing that I need to do for academics, like, for example when I’m talking about the presentation like I remember being hungry once going into presentation and I’m like well. I don't think that it necessarily like impacted my presentation too much because I had already prepared for it beforehand, but it definitely impacted how I felt going into the presentation and like my confidence in my ability to focus on some things and like if it weren't for having reviewed the information over and over before and having like good notes on the slides like I probably.”
- “It would have probably impacted it more, but I feel like mostly it does just impact, like my confidence and focus rather than like the actual performance, because I think that the performance was fine like didn't really change.”

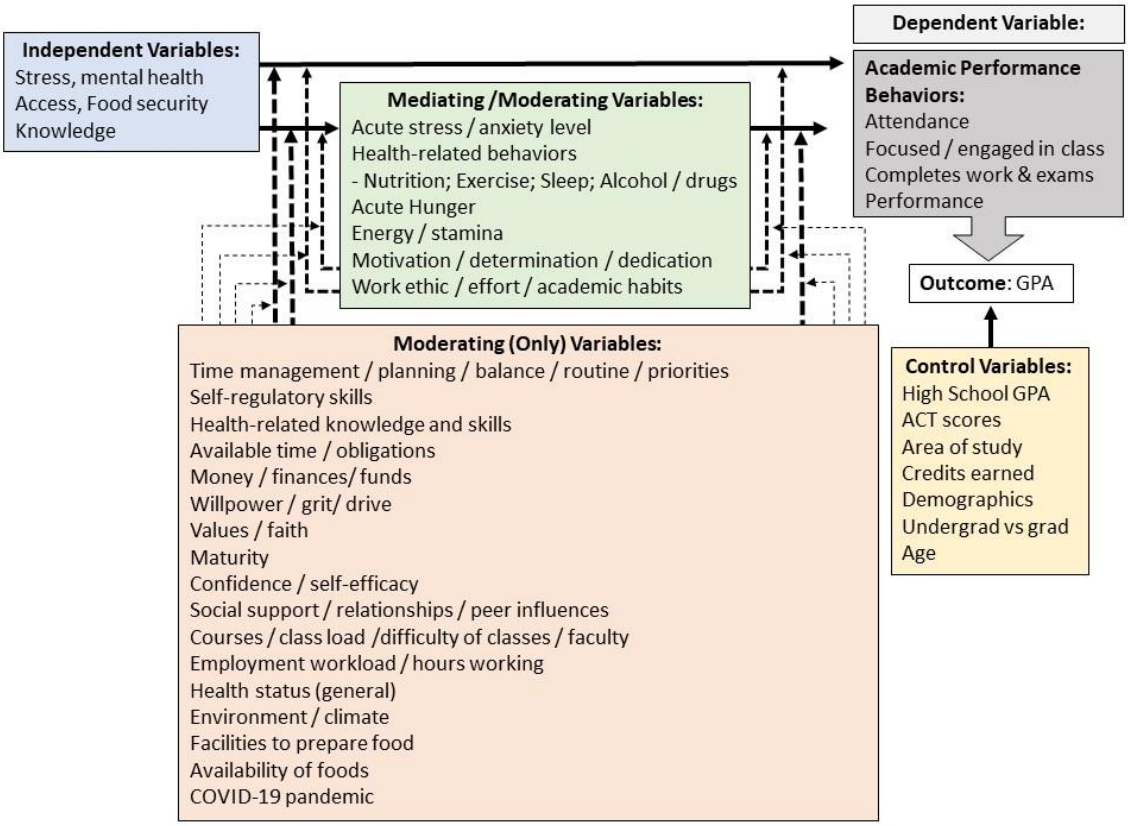
- “Now, like I’m just using that one specific example because that's, all I can think of, I mean I guess like going into a test. That could impact what your focus for that as well, but I think that, ultimately, like it didn't really influence like any of the decisions that I made during tests and things like that just more like again kind of just changed how I felt taking the test and like weirdly like it did impact my confidence because, like you can tell that you're not really thinking is clearly. So yeah I would definitely say like for me at least it's probably more in the moderating category, but I mean again that could be different for different people.”
    - These passages clearly communicate the participant’s focus was hindered due to hunger, yet her motivation and effort drove her to perform well despite the issue. This particular student is a high achieving student and these traits have helped her to excel throughout graduate school. It is reasonable to assume, a less motivated student who does not possess the same work-ethic would not persevere under the same circumstances. The participant’s ability to push through the distraction had a direct impact on her ability to focus. Using the language of the grounded theory model, her motivation and effort power increased her focus and performance power to a greater extent than her hunger load reduced her focus and performance power. The net margin for her situation was in favor of her focus and performance load, which contributed to her high grade.

After completing the respondent validation interviews, qualitative data were revisited and modified to show the dynamic relationship between variable types. When revisiting the data, it also became apparent that factors such as attendance, focus, completing work, and performance on work and exams were indicators of academic performance on their own. I labeled these variables as academic performance behaviors. While many of the factors in the model do not directly connect to grades, the model variables do connect to these academic performance behaviors which directly impact assignment and course grades.

Considering all of these analyses, a final theoretical model emerged that explains how traditional and health-related behaviors influence academic performance behaviors and other independent, mediating, and moderating variables. Figure 20, below, shows the final theoretical model, tentatively named the Stress-Health Behavior-Academic Performance Model.

Figure 20

The Stress-Health Behavior-Academic Performance Model



Note. This figure represents the final grounded theory which emerged from this study.

Figure Key

Control Variables: Non-modifiable factors that influence academic performance independent of the other variables on this model.

Independent Variables: Variables that have a direct impact on academic performance behaviors.

*Mediating Variables: May directly influence academic performance behaviors, mediate an independent variable's influence, or moderate an independent or mediating variable's influence on academic performance.

**Moderating (only) Variables may moderate an independent or mediating variable's influence on academic performance.

→ Represents a potential direct effect on another variable.

⇢ Represents a moderating effect on another variable's influence on another variable.

⇢ Represents a moderating effect on another moderating variable's effect.

The grounded theory demonstrates how variables can influence one another and lead to academic performance behaviors. There are many applications of this model. To

use the model, one can attempt to improve academic performance by choosing any of the independent, mediating, or moderating variables to improve. The base of the model is the PLM formula in the context of academic performance: Power of the model variables ÷ Load of the model variables = Margin. The higher the margin, the greater the potential academic performance. Each of these variables has the potential to improve the power in the overall equation. It is important to note that each person begins with a different amount of power and load for each variable. At this time, the power and load amounts are not quantified or correlated to a specific number, however this is a potential next step in the research process. Expanding the model to include scores that could be quantified and included as a predictive model would be extremely valuable for students and institutions attempting to improve academic performance.

Limitations

The researcher embarked on data collection and analysis during a global pandemic. The impact of the pandemic on response rates, responses, and outcomes is uncertain.

Potential study limitations included the following:

- Limited ability to recruit participants due to COVID-19 precautions and fewer students being on campus.
- Limited participation in Zoom interviews due to student burnout.
- Self-reported data may not be as accurate as using actual records and institutional data.
- Time constraints to collect data and administering the survey near the end of a semester may limit the number of interview participants and survey responses.

- Data collected in this study only represent the student population at City University. Follow-up studies may be required to confirm generalizability.
- The study is occurred during the COVID-19 pandemic. Current situations are not reflective of students' experiences prior to the pandemic.
- Constraints of the COVID-19 restrictions led to the use of Zoom recorded interviews which were initially housed on a cloud server instead of in-person interviews that could have been recorded using a physical recording device or more thorough hand-written notes.

Recommendations

The results of this study led to practical recommendations for City University and professional organizations such as the Academy of Nutrition and Dietetics (AND) and the Missouri Academy of Nutrition and Dietetics (MOAND). Importantly, the researcher acknowledges many traditionally considered academic intellective and non-intellective factors mentioned in this work (such as P-12 preparation, high school GPA, intelligence, personality traits, motivation, self-regulatory skills and abilities, academic self-efficacy, and others) have a greater impact on academic performance than health-related behaviors. The recommendations in this section are not implied to replace existing efforts and student success programs, but instead are intended to complement these efforts. The following recommendations provide guidance for how an institution could address health-related behaviors, access to food, and predominant non-intellective factors identified in this research to influence academic performance on some level in an effort to complement existing student success efforts. Based on the grounded theory that emerged from this research, health-related behaviors and other non-intellective factors found to

correlate with higher academic performance are contextualized within the power-load-margin framework in these recommendations. Recommendations, broadly, include guidance for how to enhance programming that contributes to academic power factors and to limit the influence of academic load factors.

Recommendations for City University

For City University, recommendations focus on actions that may improve the health of the students and contribute to improvements in academic performance. The most pertinent recommendation is to address the independent variables identified in this study through increased programming and resources that promote stress reduction activities and access to healthy foods. Through this study, many possible relationships were uncovered that demonstrate how stress and mental health could possibly influence academic performance and health and through a number of mediating variables. This study also discovered several ways in which impaired access to healthy and adequate amounts of food were negatively associated with academic performance. Data in this research suggests many possible direct and indirect pathways in which improving access to healthy and adequate foods, mental health, and physical health behaviors of students may contribute to an increase in the students' academic performance power margins, which may ultimately increase potential improvements in academic performance.

Secondary recommendations include targeting health-related modifiable mediating and moderating variables. These interventions include teaching students how to develop and maintain healthy nutrition habits, healthy physical activity habits, healthy sleep habits, alcohol moderation or abstinence strategies, and a healthy body weight. Though these strategies may not directly improve students' GPA, improvements in these

areas appear to contribute to the student's overall power margin towards academic performance.

Additional recommendations address moderating and mediating variables that are not directly related to health, but also appear to have a widespread impact on a student's ability to live a healthy lifestyle and improve their academic performance. The most important and modifiable of these variables appear to be time-management skills; organizational and planning skills; strategies for how to increase effort, class attendance, and engagement; and social skills for developing supporting relationships and avoiding or ending harmful or distracting relationship. Improvements in time-management would, theoretically, enhance the power of many other variables found to positively correlate with academic performance behaviors.

The following recommendations would enhance power variables found to improve academic performance behaviors through quantitative and qualitative analyses in this research:

- Require all students in their first year at CU to complete a short course related to stress and mental health that teaches the following:
    - Dangers of stress
    - Benefits of stress reduction
    - Proactive steps for stress reduction
        - Habits that decrease stress
        - Habits and experiences that increase stress
    - Early signs of stress
    - Strategies and activities that can reduce stress levels

    - How to monitor for stress and mental health concerns
    - Resources at CU and in the community for stress and mental health
- Require all students in their first year at CU to complete a short course related to health behaviors that teaches the following:
    - Risks associated with poor health behaviors
    - Benefits of healthy eating, exercise, regular sleep, and alcohol abstinence
    - Basic healthy eating principles
    - How to obtain healthy food at CU and in the community
    - Basic exercise principles
    - How and where to exercise at CU and in the community
    - Sleep requirements
    - Strategies for obtaining consistent, undisturbed sleep
    - How to establish a regular bedtime routine
    - Strategies to relieve insomnia
    - Strategies and resources for students living on CU's campus to receive assistance from sleep disturbances
    - Alcohol intake recommendations, CU's alcohol rules, and laws for underage drinking
    - Strategies and support for alcohol abstinence
    - Strategies to consume alcohol safely, in moderation
    - Strategies to consume alcohol without interfering with coursework
    - Resources and help for alcohol abuse

- Post resources and information around the CU campus that reinforce the information from these courses and remind students of these healthy habits
- Provide resources and trainings for students to receive mental health assistance
- Increase number and availability of trained professionals to help students proactively avoid excessive stress and to treat mental health problems
- Increase stress-reducing programming such as additional recreation facilities that are focused on physical activity for stress reduction and mental health improvement
- Increase dorm and campuswide food options, food storage, food pantries, and cooking facilities
- Normalize the use of campus food pantries by changing the name (Outposts, stores, etc.) and description to reduce the stigma and potential embarrassment associated with their use
- Investigate grants related to funding food insecurity and hunger programs for students

Recommendations for Professional Practice

Professional dietetic organizations, such as AND and MOAND, have the ability to reach a wide audience of nutrition professionals who could apply the most practical findings of this study. After providing findings in a report or presentation to their leaders, I would make several recommendations. Recommendations for these organizations are as follows:

- Communicate the broad findings related to how food security influences academic performance

- Educate members on the influence of nutrition on stress and mental health
- Educate members on the cyclical nature of stress and mental health influencing health behaviors, and how health behaviors influence stress and mental health
- Utilize a simplified model of the theory developed in this study to communicate the relationships between food security, stress, mental health, health behaviors, and academic performance
- Offer continuing education modules or presentations related to the following topics:
    - Strategies for increasing food security on college campuses
    - Strategies to improve stress and mental health through dietary interventions and programming
- Offer grants to practitioners for developing food security programs at college campuses

Implications for Future Research

This study uncovered many significant findings related to influences on academic performance of college students. Though the scope was limited, these findings were promising and added to the body of literature on this topic. Future research in this area would be beneficial to expand on these initial findings by combining the health-related variables included in this study with more traditional academic and student characteristics from previous research in this field. The following recommendations would provide an expanded investigation of the topic:

- Collect data from multiple institutions in survey format.

- Combine the health-related variables from this study, stress and mental health indicators, academic performance behaviors identified in this study, and the variables identified in the meta-analysis conducted by Richardson et al. (2012) in one survey.
- Analyze survey results with regression analyses that include academic performance behaviors as dependent variables.
- Analyze, through regression, the ability of academic performance behaviors to predict GPA.
- Analyze, through an experimental design, the impact of these recommended programs on control groups and experimental groups of university students' GPAs.

Additionally, I recommend for future research to utilize and test the theory developed in this study through Factor Analysis and Structural Equation Modeling. The most logical setting to test this theory is a college or university campus. If a model that utilizes the power vs. load structure can be quantified, it may help predict performance of students and allow institutions to identify ways to intervene and help students succeed. Refining and building on this theory, however, would be beneficial beyond college settings, as the final dependent variable can be replaced with a suitable outcome specific to any work setting.

Lastly, this research could be used to investigate college retention rates. Academic performance is noted to be a strong predictor of retention (Richardson, 2012). If universities could use this theoretical model as a means to identify students at risk of

low or worsening academic performance, they may be able to intervene with the intent to retain at-risk students.

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SECTION FIVE

CONTRIBUTION TO SCHOLARSHIP

Contribution to Scholarship

The following section's content provides the dissemination plan for the research outcomes of this study. These plans include a presentation at the Food and Nutrition Conference Expo (FNCE), the annual national conference of the Academy of Nutrition and Dietetics (AND), and publication in the Journal of the Academy of Nutrition and Dietetics (JAND).

Presentation Options

Due to the heightened focus on nutrition in this study, the first conferences sought will be related to nutrition. The Food and Nutrition Conference Expo (FNCE) is the largest national conference in the field of nutrition and dietetics (Academy of Nutrition and Dietetics, 2022b). Presentation submissions are due in November of the year prior to the conference. Presentation topics must align with one or more performance indicators, which are housed in topic categories called spheres (Commission on Dietetic Registration [CDR], 2014). The spheres include many performance indicators related to learning, physical activity, wellness, nutrition, research, and food security (CDR, 2014).

The most specific, immediate audience is dietetic educators. Nutrition and Dietetic Educators and Preceptors (NDEP) consists of many university educators who would be interested in the topical findings of the research and the methodology of the research. Annually, NDEP regions meet for a multiple day conference. Typically, presentation proposal submissions are due in December and the conferences are held in April of the following year.

Another possible platform to reach local nutrition and health professionals is a presentation through the Missouri Academy of Nutrition and Dietetics (MOAND)

regional meetings. Each region meets at least two times per year and includes some form of education for continuing education credit at the meetings for members. In addition, MOAND has an annual statewide meeting that is well attended by dietitians in Missouri (MOAND, 2021). Many are educators who would be especially interested in the content of this research. Being a member and past MOAND President, the researcher would likely begin with a presentation of findings at this level. Submissions to present are not as formal for MOAND presentations as they are for NDEP and FNCE. It is likely that a presentation could be arranged by directly contacting a regional director. Presenting at the annual conference is limited by relevance of the annual conference theme, and therefore may not be as likely.

Presentation Topics

Many relevant presentation topics could emerge from this research study:

1. Influence of nutrition and health-related behaviors on academic performance in college or university students.
2. Impact of food security/food insecurity on academic performance.
3. Promotion of the grounded theory (GT) developed in this study.
4. Promotion and instruction of using GT and mixed methods grounded theory (MMGT) in nutrition-related research.

Influence of Nutrition and Health-Related Behaviors on Academic Performance

Nutrition professionals at nutrition and dietetics conferences will be interested in findings that further the understanding of how nutrition and health are related to academic performance and cognitive function. The relationship of nutrition to cognitive function is an area of expanding interest in dietetics. Across all age ranges and

circumstances, there are applications and interests. The recent focus on neuroscience has heightened the focus of nutrition's role in brain health and cognition. This research, though not particularly focusing on nutritional neuroscience, has implications on how nutrition influences learning and cognition. Practitioners interested in this emerging field of study would benefit from this study's findings. Applying to present findings regarding the relationship of nutrition and health behaviors to academic performance and cognition at FNCE will be the highest priority for dissemination of findings to nutrition professionals.

Impact of Food Insecurity on Academic Performance

Food insecurity is a consistent concern for Registered Dietitians and other health professionals. Being the focus of many studies, publications, and initiatives, food insecurity continues to draw interest. The most common investigations, however, have been related to prevalence of food insecurity, health outcomes of food insecure individuals, and the consequences of food insecurity in children. A study such as this, that focuses on academic performance outcomes in adults due to or related to food insecurity is somewhat novel and may be a desirable conference topic.

Promotion of this Grounded Theory

A GT that considers multiple factors like the one developed in this study, could provide a more holistic framework for practitioners in an academic setting. This would contribute to an area of research in the nutrition field that is lacking. Though not abundant, there is more research on how physical activity, alcohol and substance use, sleep habits, stress, and emotional health impact academic performance than food security and nutritional adequacy in college/university students. A theory that includes

nutrition into a holistic approach with other health behaviors and more recognized predictors of academic performance would be of value to the field of nutrition and dietetics. This theory and the resultant findings of the study could also contribute to the growing interest in interdisciplinary research and collaboration. To this point, nutrition's role in student success is often seen as a minimal factor, unrelated to other more directly observable factors. A theory that places nutrition on a similar level to more well-known non-intellective influences would expand perspectives on the importance of nutrition.

Promotion of Grounded Theory and Mixed Methods in Nutrition

Nutrition counseling and behavioral research is frequently theory-based, however, many of the popular theories originate in non-nutrition fields such as psychology, counseling, business/marketing, consumer research, and others. While these theories are valuable, they usually do not include a specific nutrition focus. Since nutrition is so closely tied to human behavior, theoretical approaches are necessary, but when nutrition is left out of the theories used to investigate a topic, their utility is limited. Nutrition researchers would benefit from new theories, developed to specifically include nutrition and food behaviors and outcomes. Grounded theory, specifically MMGT, could be highly applicable and beneficial because of the approach's inclusion of qualitative data that can be used to consider unique differences between subjects, and the quantitative data that can be used to statistically test for significant differences and relationships. Mixed-methods grounded theory provides a unique approach that would allow for new theories to emerge from new empirical data.

Target Presentation

My target presentation will be the FNCE annual conference that is planned for October 7th – 11th in Denver, CO (AND, 2022a). Proposals for FNCE presentations are generally accepted from September through November. The proposal form requires completion of several sections that are provided in the proposal plan below.

Proposed Session Title

The Stress-Health Behavior-Academic Performance Cycle in College Academic Performance

Session Format

Lecture

Session Track

Nutrition in Higher Education

Session Duration

90 minutes

Session CPE Level

Level 2 - Intermediate

Verification that Information will not be Presented Prior to FNCE 2023

I agree

Session Description

This lecture style presentation will help to unravel how college students' mental health, health behaviors, and academic performance relate. We will discuss the Stress and Health Behavior Cycle observed in recent mixed-methods grounded theory research conducted at a public university. By the end of the session, you will have drafted a plan for at least

one way to intervene in the Stress-Health Behavior-Academic Performance Cycle to improve academic performance of college students.

Learning Objectives

(1) During this presentation, the attendee will examine several health-related factors that influence college students' academic performance.

(2) After this presentation, the attendee will be able to define the Stress and Health Behavior Cycle.

(3) After this presentation, the attendee will be able to plan an intervention to the Stress-Health Behavior-Academic Performance Cycle to improve academic performance of college students.

References

The primary source of these data is my original dissertation research. Survey data were collected from October through November 2021. Interview data were collected from November 2021 through April 2022.

Ramdial, J. (2022). *Influence of Nutrition and Health Behaviors on Academic Performance of Students at a Public Midwestern University* [Dissertation]. University of Missouri.

Speaker Outline

1. Key Points:
    a. Overview of study design:
        i. Mixed methods grounded theory, explanatory sequential design
        ii. Quantitative data collected through a survey
        iii. Qualitative data collected through interviews

iv. Second round of interviews for respondent validation and feedback on grounded theory

v. Finalize grounded theory

b. Purpose of the study

c. Major findings:

i. Stress-Health Behavior-Academic Performance Cycle

ii. Influence of health behaviors on academic performance

iii. Comparison of academic performance between food secure and food insecure students

d. Strategies to intervene in the Stress-Health Behavior-Academic Performance Cycle to improve students' academic performance

e. Other practical applications for using nutrition to improve academic performance

2. Teaching Methods:

a. Lecture

b. Group live polling and interactive slides

c. Diagrams and visuals

d. Brainstorming and group sharing of ideas

3. Parallels to the Session's Learning Objectives:

a. During this presentation, the attendee will examine several health-related factors that influence college students' academic performance: We will examine the results of my research study in which mental health, nutrition,

food security, exercise habits, sleep habits, and alcohol consumption were investigated in relation to academic performance and each other.

b. After this presentation, the attendee will be able to define the Stress-Health Behavior-Academic Performance Cycle: I will show the cycle as a visual and explain each step to the attendees, while citing evidence obtained from my research.

c. After this presentation, the attendee will be able to plan an intervention to the Stress-Health Behavior-Academic Performance Cycle to improve academic performance of college students: Towards the end of the presentation, I will ask attendees to submit an electronic response using a phone, tablet, or laptop that provides an idea for one way to intervene in the cycle to improve academic performance of college students.

4. New and/or Significant Contributions

a. My findings related to how food insecurity is related to academic performance are novel. Few studies have investigated this exact topic in college students. Several have found food insecurity in P – 12^{th} grade students to be detrimental to academic performance and many studies have found high rates of food insecure students at colleges, however none to my knowledge have investigated how food insecurity influences academic performance as I did in this study.

b. The Stress-Health Behavior-Academic Performance Cycle is the theory I created through this grounded theory study. It does not exist elsewhere.

Target Journal

Upon completion of this research study, several journals will be considered for submission. Since the topic is relevant to many fields, several journals may be relevant. Potentially, articles could be submitted to journals focused on higher education, academic success, higher education, student wellness, sleep, stress and mental health, substance abuse, exercise, physical activity, nutrition, mixed methods research, and more. Each of the previously listed areas have many journal options available. The researcher will submit the article for publication to peer-reviewed, Journal of the Academy of Nutrition and Dietetics (JAND).

All members of the Academy of Nutrition and Dietetics (AND), the "world's largest organization of food and nutrition professionals" (AND, 2021), receive JAND. The journal has a five-year impact factor of 4.909 (JAND, 2021a). In addition to widespread reach, JAND accepts multiple types of publication submissions and provides detailed guidance for each type of submission. This research study is most applicable to the categories of Research Paper or Research Brief and could have components submitted as Narrative Review or Commentary.

Guidelines for a Research Article submission to JAND are available on the journal's webpage in the manuscript preparation section. In addition, the journal provides several resources and checklists to help authors prepare publication submissions. Submissions are required to adhere to the AMA Manual of Style, 11th ed., utilize 12-pt Times New Roman font, double-spaced format with page numbers (JAND, 2021b). The general outline for basic elements included in the submission is as follows:

- Cover letter: Provides an informal introduction.

- Title page: Provides title in a manner that conveys findings, authors' names, and some additional information.
- Research Snapshot: Provides research question and key findings, not to exceed 75 – 100 words.
- Structured Abstract: Provides an overview of the study's design and results, not to exceed 300 words.
- Introduction: Provides the purpose, relevance, hypotheses and study design.
- Materials and Methods: Provides information about the sample, instruments, quality control measures and statistical methods.
- Results: Report the results in order of the methods.
- Discussion: Discuss findings and compare to current literature. Discuss implications for future research, strengths, and limitations of the research.
- Conclusions: Draw conclusions from the reported results.
- References: Provides references.
- Tables and Figures: Provides any tables and figures needed to clarify the article.
- Acknowledgements: Acknowledge anyone who made a substantial contribution to the manuscript.

  (JAND, 2021b)

The manuscript will be submitted to the following link as instructed on the webpage: https://www.editorialmanager.com/jandjrl (JAND, 2022). The planned submission is provided below in the submission ready article using APA 7th edition formatting. Formatting will be modified to AMA 11th edition prior to submitting to the journal.

Submission Ready Article

How Health Behaviors Influence Academic Performance

Cover Letter

This research study investigated the influence of health-related behaviors on academic performance in college students. The research followed a mixed-methods grounded theory design in which university students completed a survey instrument and interviews to investigate the relationship between health behaviors and academic performance. The study found several significant results, including a significant positive correlation between diet quality score, food security, sleep score and grade point average. The study also found a significant negative correlation between BMI and grade point average.

Title Page

Joel Ramdial

How Health Behaviors Influence Academic Performance

Research Snapshot

This mixed-methods study sought to answer the question: Is there a relationship between health-related behaviors and academic performance among college students at a Public Midwestern University? The research question was answered through a correlation and regression analyses. The results indicated that, yes, there is a significant positive relationship between diet quality score and academic performance, food security and academic performance, and sleep score and academic performance. Qualitative findings support these correlations and demonstrate how these variables interact with many other factors to influence academic performance behaviors.

Structured Abstract

This mixed-methods, grounded theory study investigated the relationship between health behaviors and academic performance among university students. The survey instrument was comprised of five validated scales related to healthy eating habits, food security, physical activity levels, alcohol consumption, and sleep quality. The survey also included questions to assess academic performance and demographics. The survey sample consisted of 561 participants, who were invited to an interview. Quantitative data analysis revealed several significant findings. Notably, diet quality and food security were consistently found to be significant positive correlates to academic performance, while body mass index was found to be a significant negative correlate. Twenty participants completed interviews, in which they were asked about these health behaviors and how they might influence academic performance. Interview data analysis revealed many themes that contributed to the development of the grounded theory. Survey data, interview data, and extant literature were used to develop a substantive theory that proposed an explanation of how health behaviors influence academic performance. Five students participated in respondent validation interviews to provide feedback on the substantive theory. Following respondent validation, a final grounded theory emerged that explains how independent, mediating, and moderating variables related to health behaviors influence academic performance behaviors. In the final model, access to food and stress were determined to be independent variables and nutrition, exercise, sleep, and alcohol were found to be mediating variables that could influence academic performance.

Introduction

The most widely used models for predicting academic performance and retention of college students account slightly for aspects of mental health and psychosocial factors, but do not account for the influence of physical health (Kerby, 2015; Richardson et al., 2012; Tinto, 1975). If nutrition and health behaviors are uncovered as an influence of academic performance in college students, institutions of higher education can focus on this additional factor to improve students' performance in the classroom. Consistently high rates of overweight/ obese individuals and food insecure households, coupled with declining health outcomes in America may suggest college students are at risk of consuming nutritionally inadequate diets and leading less healthy lives in general, which may negatively impact their ability to perform well in the classroom and be retained as students (Boersma et al., 2018; Burrows et al., 2017; Cady, 2014; Glick, 2020; Nikolaus et al., 2020; O'Neill & Maguire, 2017; Reuter et al., 2020; Wald et al., 2014). Since academic performance is consistently found to a be a major predictor of student retention, student health could be a potential moderator of retention and enrollment numbers at universities across the country if found to correlate to academic performance.

This study investigated influences of academic performance, with a specific focus on nutrition and health related behaviors of students at a public four-year Midwestern university. The purpose of the study was to determine the influence of nutrition and health related behaviors on academic performance of university students.

The research question addressed by this study and hypotheses are as follows:

Is there a relationship between health-related behaviors and academic performance among college students at a Public Midwestern University?

a. $H_{1:}$ A significant positive relationship exists between healthy behaviors and academic performance among students at the university.

a. $H_{0:}$ No relationship exists between healthy behaviors and academic achievement among students at the university.

This explanatory mixed-methods (MM) grounded theory (GT) research, began with a quantitative survey and was followed by a series of interviews, development of a substantive theory, second series of interviews for respondent validation, and concluded with development of the final grounded theory.

Materials and Methods

Data and existing survey instruments found through the review of literature were used to develop a survey instrument that asked participants about several health-related behaviors, academic performance metrics, and demographic information. Data from the review of literature and quantitative analysis of survey data informed a qualitative interview protocol which asked participants about influences of academic performance. Concurrent analysis of data from the review of literature, interviews, and survey were used iteratively to develop a theory grounded in the data (Guetterman et al., 2019; Merriam & Tisdell, 2016; Tie et al., 2019).

This research study utilized an online Qualtrics survey and recorded remote Zoom interviews. The research took place at a public, four-year university, referred to in this study as City University (CU). City University enrollment is approximately 10,000 students, with close to 9,000 undergraduates and 1,000 graduates (City University, 2020). Institutional Review Board (IRB) approval was obtained in October 2022.

Of the 8,592 CU students emailed the survey recruitment invitations, 788 began the survey and 561 completed the survey. The response rate was 9.17 % (788 ÷ 8592). The completion rate was 71.19% (561 ÷ 788). The survey provided instructions participants could follow to schedule an interview. Twenty students scheduled and completed an interview. The review of literature, survey data analysis, and qualitative data analysis were used to answer the research questions and contributed to the formation of the grounded theory that emerged from this study.

Five validated subscales were used to develop the survey instrument. These subscales are listed below.

- The Short Health Eating Index (Colby et al., 2020) was used to evaluate quality of nutrition and eating habits.
- The Vital Signs 2 Question Screening tool (Hager et al., 2010) was used to evaluate food security status.
- The International Physical Activity Questionnaire (IPAQ) – Short Form (Craig, 2003) was used to evaluate exercise and physical activity habits.
- The Medical Outcomes Study (MOS) Sleep Scale, developed by Stewart and Ware, (Hays and Stewart, 1992) was used to evaluate sleep duration and quality.
- The National Institute on Alcohol Abuse and Alcoholism's (2021) three-question Alcohol Consumption Assessment was used to evaluate alcohol consumption habits.
- Demographic questions were modeled after recommendations of Fernandez et al. (2016).

- Academic performance questions were developed by the researcher and asked questions such as:
    - How many college credit hours have you earned?
    - Are you an undergraduate student or graduate student?
    - What is your current cumulative grade point average (GPA)? This is your total GPA as a college student
    - To the best of your ability, estimate your current fall 2021 GPA including all your classes. This is what you believe to be your current GPA when averaging all your fall 2021 classes.

Survey data was analyzed using correlation and regression analyses using SPSS.

The qualitative interview protocol included questions regarding influences of academic performance and how health behaviors such as nutrition, access to food, exercise, sleep, alcohol consumption, and stress management influence academic performance. Qualitative data was analyzed using NVivo (QSR, 2020) for four levels of coding: Initial open coding, Intermediate coding, Advanced coding, and Theoretical coding.

A second series of interviews was conducted with five participants to verify findings, interpretations, and substantive theory represented their experiences. Following the respondent validation phase of the study, theoretical coding led to the final grounded theory.

Results

To analyze this research question quantitatively, a Pearson correlation analyzed how the following independent variables correlated individually with GPA:

- Total diet quality score (DQS)
- Food Security (FS)
- Alcohol consumption
- Sleep score (Sleep problems 2 score reverse coded)
- Physical activity category

The results of the correlation indicate a significant relationship exists between fall 2021 GPA and the following variables:

- Total Diet Quality Score (DQS)
- Food Security (FS)
- Alcohol consumption
- Sleep problems score
- Physical activity category

The results of the correlation indicate a significant positive correlation exists between cumulative GPA and the following variables:

Total Diet Quality Score. Total Diet Quality Score and cumulative GPA have a statistically significant linear relationship ($r[531] = .091$, $p < .05$). The direction of the relationship is positive, meaning that these variables tend to increase together: As DQS increases, cumulative GPA increases. The magnitude of the association is approximately less than small (Cohen, 1992).

Food Security. Food security score (1 = food secure and 0 = food insecure) and cumulative GPA have a statistically significant linear relationship ($r[543] = .163$, $p < .001$). The direction of the relationship is positive, meaning that these variables tend to increase together: As food security increases, cumulative GPA increases. The magnitude of the association is approximately small (Cohen, 1992).

Sleep Score. Sleep score (Sleep Problems 2 score reverse coded) and cumulative GPA have a statistically significant linear relationship ($r[549] = .121$, $p < .001$). The direction of the relationship is positive, meaning that these variables tend to increase together: As sleep quality increases, cumulative GPA increases. The magnitude of the association is approximately small (Cohen, 1992).

Body Mass Index. Body Mass Index and cumulative GPA have a statistically significant linear relationship ($r[532] = -.172$, $p < .001$). The direction of the relationship is negative, meaning that these variables tend to vary in opposite directions: As BMI increases, cumulative GPA decreases. The magnitude of the association is approximately small (Cohen, 1992). Table 8 summarizes the results of the cumulative GPA correlations.

Table 8

Correlations Between Cumulative GPA and Health Behaviors

Variable	*n*	1	2	3	4	5	6	7
1. GPA[a]	551	-						
2. DQS[b]	533	.091*	-					
3. FS[c]	545	.163**	.046	-				
4. Sleep Score[d]	551	.121**	.144**	.180**	-			
5. PA Category[e]	418	.031	.149**	-.002	.049	-		
6. Alc. Drinks[f]	551	-.014	-.030	.053	-.021	.109*	-	
7. BMI[g]	534	-.172**	-.147**	-.069	-.162**	-.151**	-.066	-

continued

Table 8 (continued)

Correlations Between Cumulative GPA and Health Behaviors

Note. This table provides the results of a Pearson Correlation matrix which included fall 2021 grade point average as the dependent variables, and all other variables as independent variables. All variables are defined in Table 1 Definition of Key Terms.

[a]GPA refers to cumulative grade point average.

[b]DQS refers to Short Healthy Eating Index diet quality score (Colby et al., 2020).

[c]FS refers to food security status (Hager, 2010).

[d]Sleep Score refers to reverse coded sleep problems 2 score from MOS sleep scale survey (Hays & Stewart, 1992).

[e]PA Category refers to physical activity category (Craig et al., 2003).

[f]Alc. Drinks refers to the total number of alcoholic drinks consumed per year as estimated from responses to the NIAAA three-item questionnaire (2021).

[g]BMI refers to body mass index as calculated from reported height and weight.

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

* Correlation is significant at the 0.05 level (2-tailed).

The relationship between these independent variables and cumulative GPA were simultaneously analyzed with a regression analysis. When looking at the predictors collectively, only food security category and BMI were found to be significant predictors of cumulative GPA. For food secure students, cumulative GPA is predicted to be .182 points higher, when holding all other variables constant. For every unit increase in BMI, a .013 decrease in cumulative GPA is predicted, when holding all other variables constant. Table 9 summarizes the results of the cumulative GPA regression, below.

Table 9

Linear Regression of How Health Related Behaviors Predict Cumulative Grade Point Average

Variable			95% CI			
	Beta	*SE*	*LL*	*UL*	β	*p*
DQS[a]	.004	.003	-.001	.010	.077	.121
FS[b]	.182	.062	.061	.303	.146	.003
Sleep Score[c]	.002	.002	-.001	.005	.052	.306
PA Category[d]	.005	.037	-.067	.077	.006	.897
Alc. Drinks[e]	-5.878E-5	.000	.000	.000	-.039	.420
BMI[f]	-.013	.004	-.020	-.006	-.182	<.001

Note. This table provides the results of a linear regression which included fall 2021 grade point average as the dependent variables, and all other variables as independent variables. *N* = 408. All variables are defined in Table 1 Definition of Key Terms. *SE* = standard error; *CI* = confidence interval; *LL* = lower limit; *UL* = upper limit.

[a]DQS refers to Short Healthy Eating Index diet quality score (Colby et al., 2020).

[b]FS refers to food security status (Hager, 2010).

[c]Sleep Score refers to reverse coded sleep problems 2 score from MOS sleep scale survey (Hays & Stewart, 1992).

[d]PA Category refers to physical activity category (Craig et al., 2003).

[e]Alc. Drinks refers to the total number of alcoholic drinks consumed per year as estimated from responses to the NIAAA three-item questionnaire (2021).

[f]BMI refers to body mass index as calculated from reported height and weight.

Qualitative Results. Through the qualitative analysis, many health-related power and load themes emerged. Health-related behaviors included exercise habits, nutrition habits, sleep habits, and alcohol consumption habits. The categorization of the related codes followed the same Power and Load structure as previously mentioned. A summary of qualitative results related to these health-behaviors' Power and Load influences on academic performance are provided by Table 10 and Figure 11, below. Table 10 provides a summary of the health-related behaviors discussed in this study.

Table 10

Influence of Health Behavior Mediating Variable Sub-Themes on Academic Performance Behaviors with Examples from Student Interviews

Health Behavior Sub-Theme	Academic Performance Behaviors	References	
		#	Examples
	Mediating Load Variables (MedV Load[a])		
Alcohol Consumption	Attendance, Focus, Performance, Grades	12	"I've seen people drink to cope, then miss class and miss assignments."
Health Behaviors (General)	Attendance, Focus, Grades	1	"Yes, missing class for poor health behaviors can cause stress, if stress gets too high you might just give up."
Nutrition	Focus, Ability to work, Performance	9	"Overeating and undereating both make me tired and uncomfortable, which make it hard to focus in class."

continued

Table 10 (continued)

Influence of Health Behavior Mediating Variable Sub-Themes on Academic Performance Behaviors with Examples from Student Interviews

Health Behavior Sub-Theme	Academic Performance Behaviors	References	
		#	Examples
Mediating Load Variables (MedV Load[a])			
Sleep	Focus, Complete work	11	"Sleep is related to attention and focus, if you don't sleep then you'll have a decreased ability to focus."
Total number of IV Load references		33	
Mediating Power Variables (MedV Power[b])			
Exercise	Focus, Class performance	2	"Exercise helps and makes her feel better. Exercise energizes her and helps her perform better at work and in class. (Excerpt from field notes)"
Nutrition	Focus, Performance	12	"Some days I can't focus. Fruits and vegetables make me feel better."
Sleep	Focus, Grades	5	"So I feel like when I get more sleep, I am more energized and ready to accomplish my school work."
Total number of MedV Load references		19	

continued

Table 10 (continued)

Influence of Health Behavior Mediating Variable Sub-Themes on Academic Performance Behaviors with Examples from Student Interviews

Notes. This table demonstrates how health behavior variables influence academic performance behaviors. Academic performance behaviors were identified as variables respondents identified as academic performance outcomes associated with being a successful college student.

[a] MedV Load variables refer to those that hinder academic performance directly or decrease another variable's ability to improve academic performance.

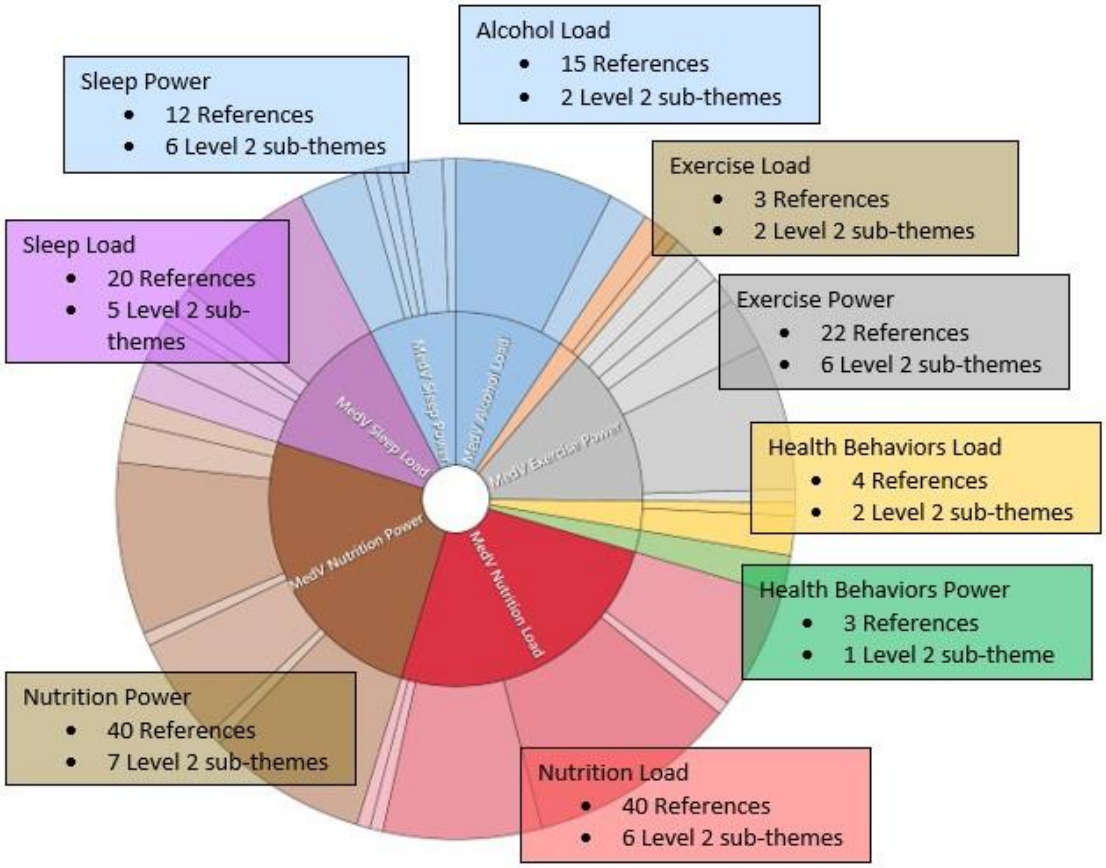
[b] MedV Power variables refer to those that improve academic performance directly or increase another variable's ability to improve academic performance.

This table only reports on the MedV variables' influences on academic performance.

Figure 11 provides the theoretical coding structure and total number of health behavior mediating variable sub-themes.

Figure 11

Health Behavior Theoretical Coding Structure and Sub-Themes



Note. References refer to codes from interviews categorized into the level 2 sub-themes.

Discussion

Do health related behaviors influence academic performance? The results of the regression analysis and interview confirm each health-related variable has some type of influence on Academic Performance. While the regression model did not find alcohol or exercise to be a significant predictor of cumulative GPA, the interview responses convincingly confirmed these behaviors and habits have a large influence. These findings

are consistent with many studies that have investigated these factors individually, however none have investigated them collectively as predictors of academic performance in this manner (Abbasi et al., 2021; Aimé et al., 2017; Burrows et al., 2017; Meyer & Larson, 2018; Nasui & Popescu, 2014; O'Neill & Maguire, 2017; Payne-Sturges et al., 2018; Reuter et al., 2020; Singleton & Wolfson, 2009; Taylor et al., 2013; Valladares et al., 2016; Wald et al., 2014).

Potential study limitations included the following:

- Limited ability to recruit participants dur to COVID-19 precautions and fewer students being on campus.
- Limited participation in Zoom interviews due to student burnout.
- Self-reported data may not be as accurate as using actual records and institutional data.
- Time constraints to collect data and administering the survey near the end of a semester may limit the number of interview participants and survey responses.
- Data collected in this study only represents the student population at City University. Follow up studies may be required to confirm generalizability.
- The study is occurring during the COVID-19 pandemic. Current situations are not reflective of students' experiences prior to the pandemic.

This study uncovered many significant findings related to influences of academic performance of college students. Though the scope was limited, these findings were promising and added to the body of literature on this topic. Future research in this area would be beneficial to expand on these initial findings by combining the health-related variables included in this study with more traditional academic and student characteristics

from previous research in this field. The following recommendations would provide an expanded investigation of the topic:

- Collect data from multiple institutions in survey format.
- Combine the health-related variables from this study, stress and mental health indicators, academic performance behaviors identified in this study, and the variables identified in the meta-analysis conducted by Richardson et al. (2012) in one survey.
- Analyze survey results with regression analyses that include academic performance behaviors as dependent variables.
- Analyze, through regression, the ability of academic performance behaviors to predict GPA.
- Analyze, through an experimental design, the impact of these recommended programs on control groups and experimental groups of university students' GPAs.

Conclusions

Of the health-related variables in the regression model, Diet Quality, Food Security, and Body Mass Index were the only significant predictors, with Food Security status having the largest effect on Grade Point Average. When viewed collectively, through qualitative lens, it is apparent that many health-related behaviors have direct and mediating influences over key academic performance variables such as ability to focus during class, complete assignments, and attend classes.

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SECTION SIX

SCHOLARLY PRACTITIONER REFLECTION

Scholarly Practitioner Reflection

The EdD program inspired and changed my trajectory in many positive ways. Just as a theoretical framework guides a dissertation, this program provided a constant framework that guided my work and homelife over the last five years.

Influence on Practice as an Educational Leader

Prior to the ELPA program, I experienced imposter syndrome, felt out of place, and hid my differences as if they were weaknesses anytime I was thrust into a leadership role. Through a series of circumstances and opportunities, I changed. Several major changes accelerated my leadership journey toward effective leadership. Throughout the program, I learned how to develop, improve, and apply leadership skills and strategies. I learned to embrace my reflective, inquisitive personality and leaned into my inclination to solve problems. I now take on leadership opportunities willingly and feel that what once I thought of as weaknesses, I embrace as unique qualities that help me be a more effective leader.

In summer, 2017, I became the Director of the Dietetic Internship program (DI) at my university and began coursework for the coordinated Educational Leadership and Policy Analysis (ELPA) doctoral program through the University of Missouri-Columbia (MIZZOU) and SE. Simultaneously completing ELPA coursework and directing the DI (while learning to direct this program) set the stage for practical application of course content and extreme professional growth. Much of this growth occurred gradually, but one epiphany triggered a change that empowered me to trust myself, make decisions, and act.

This epiphany occurred early in the ELPA program when I accepted the results of my CliftonStrengths analysis during the initial self-assessment and reflection assignment. At that moment I realized I was different in a unique, valuable manner. I no longer felt the need to hide my differences as weaknesses, but to relish in my different way of thinking and problem-solving as strengths. My dominant strengths include being futuristic, a learner, an achiever, analytical, and strategic, which imply I constantly visualize the future and work hard to achieve a vision (GALLUP, 2017). Seeing myself in this light gave me the justification I needed to believe in my ability to lead. This self-perception was corroborated later in the program when I was identified as an Introverted-Intuitive-Thinking-Judging (INTJ) Myers-Brigg Type Indicator (MBTI). The CliftonStrengths and MBTI results indicate I possess many traits and skills associated with successful leadership, such as being intelligent, visionary, strategic, and capable of accomplishing challenging tasks (GALLUP, 2017; 16Personalities, 2019). This new self-perception served as a lens through which I began to view the theories and concepts in the ELPA program and to enact short- and long-term changes that would improve the DI program. Ultimately, this evolution led to developing a new graduate degree program to replace the DI. This new program opened in May 2021 with a cohort of 18 students set to graduate in August 2022. In addition, I embraced leadership opportunities at the state level of my professional organization, Missouri Academy of Nutrition and Dietetics (MOAND), and have progressed from Southeast Regional Director to President-Elect. I will be the MOAND president for the 2022-2023 fiscal year which begins on June 1, 2022. Knowledge and skills gained from the ELPA program helped to pave the way for these accomplishments.

At times, the influence of the ELPA coursework was so subtle that I subconsciously applied concepts to professional life. At other times, the content was so applicable and valuable that I purposefully implemented what I had just learned in class or read in our textbooks. I have a long way to go before I reach my leadership goals, but I have made great progress as a result of the ELPA program and personal experiences over the past several years. As my understanding of the theories, skills, and strategies matured, I utilized aspects from many program resources to develop an evolving framework that will continue to guide my leadership style. The following components are among the most influential components I encountered, implemented, and plan to utilize as a leader.

Equifinality

One constant theme among the theories is the idea that many leadership approaches can be effective; there is no one best way to lead every type of group or follower, no leadership approach that works best in all situations, no required set of skills or traits to make an effective leader, no approach to leadership that is fail-safe, and no perfect leader (Ancona, Malone, Orlikowski, & Senge, 2007/2011; George, Sims, McLean, & Mayer, 2007/2011; Kotter, 1990/2011; Northouse, 2016). Understanding this equifinal definition of effective leadership and other theoretical components, helped me realize that an effective leader chooses to utilize certain components of various theories depending on the situation, relationships with followers, the type of setting, the emotional landscape of a situation, and historical factors. Borrowing from various theories and approaches, I have focused on developing legitimate dyadic relationships, building positive group dynamics, casting a vision, appealing to a higher moral purpose, and

applying situational leadership concepts with students, colleagues, and peers (Northouse, 2016).

One particular leadership theory that I have implemented many times is Blanchard, Zigarmi, & Zigarmi's (as cited in Northouse, 2016) Situational Leadership II model (SLII). The SLII model for situational leadership is highly applicable for higher education when students are expected to complete high-level projects and assignments. This model provided a framework for gradually increasing student responsibilities and switching from a directive to delegative leadership style throughout the Dietetic Internship and now Graduate Program as students become more capable and mature. I have ambitions to apply this same style as President of MOAND in 2022-2023.

Skills, Traits, and Behaviors

Many theories focus on the skills and traits of effective leaders. While the skill and trait approaches differ, they both suggest that everyone has some level of leadership potential that is innate, but modifiable with practice and experience. Referring back to the equifinal approach to leadership, the exact combination of leadership skills and traits is not as important as identifying individual skills and traits that are unique to a leader and improving on them. I have sought to improve many traits and skills synonymous with effective leadership that are within my authentic tool kit: Intellectual ability; self-confidence; motivation/determination; integrity/ethical grounding; empathetic social skills; self-awareness; self-control; strategic ability; ability to communicate a vison and motivate others; (Goffee & Jones, 2000/2011; Goleman, 1996/2011; Mumford, Zaccaro, Connelly, & Marks, 2000; Northouse, 2016). In addition, I strive to help those within my

leadership umbrella to identify and improve their leadership skills as well. One important tool for becoming a more effective leader is self-assessment.

Self-Assessment

Self-assessment is a vital step in many leadership theories (Collins, 2001/2011; George et al., 2007/2011; Goffee & Jones, 2000/2011; Goleman, 1996/2011; Katz, 1955; Kets de Vries, 2006; Rooke & Torbet, 2005/2011; Northouse, 2016). Leaders need to understand their traits, skills, strengths, weaknesses, and ethical perspectives to apply heuristic, leader-centered theories such as the trait approach, skills approach, and authentic leadership style (Northouse, 2016). Once a leader is self-aware, he or she can assess what needs to change based on the various theories, and work to improve skills and traits. I continuously assess myself to identify ways to improve. As an educator of future leaders and leader of leaders in Missouri dietetics, I implement self-assessments and reflections into curriculum and plan to implement them in meetings to help others improve their leadership potential and develop an authentic leadership style (George et al., 2007/2011).

Authentic Leadership

One benefit of completing leadership self-assessments is to uncover one's authentic leadership traits, ethical and moral positions, personal quirks that can advantageously be shared, and things that should not be shared. Applying this type of familiarity in a leadership role has many benefits. Revealing innocent weaknesses that do not show incompetence, and differences that do not alienate a leader from the group help build relationships as followers see the leader as more of a human (George et al.,

2007/2011; Goffee & Jones, 2000/2011). This authenticity has helped me build relationships, connect with followers, and motivate others.

A crucial aspect of being authentic is standing firm in one's ethical and moral positions. Self-assessments and reflections have helped me uncover my positions on many areas. Throughout my past, present, and future leadership practice I have been guided by a utilitarianist ethical philosophy; Striving to do the most good for the most people in my range of influence (Northouse, 2016). This philosophy integrates considerations for how to accommodate needs of many stakeholders and a diverse group of students. When weighing a decision, it has been helpful to consider the ramifications and compare them from multiple perspectives. If one outcome is better for more people, it is easy for me to justify.

One ethical or moral position I have recently made a priority is the concept of leaving something better than I found it. In practical terms, this manifests as a succession plan in an organization and thorough policies, procedures, and best practices so that whoever fills my position after I leave can pick up and move the operation forward. Similarly, I believe that one major responsibility of a leader is to develop other leaders and facilitate their growth so that the organization, operation, and field may prosper. It is my moral responsibility to set up a program, organization, or operation to succeed beyond where I was able to take it. Admittedly, putting these beliefs into practice among my peers and colleagues will be challenging, but I strive to reach this level of leadership that is characterized by humility and unwavering will.

Humility and Unwavering Will

Level 5 Leadership is considered the pinnacle of effective leadership (Collins, 2001/2011). The two hallmarks of this status are humility and will (Collins, 2001/2011). To demonstrate humility: remain calm; give credit to others when things go well; and take the blame when things go poorly (Collins, 2001/2011). To demonstrate will: have high standards; seek to achieve great outcomes and eliminate distractions; and help the company succeed by selecting the best successors. As Collins explains, the first step is to have the right people in the organization that can tolerate these standards and level of focus (2001/2011). A more realistic approach may be to develop in-groups within an organization that can tolerate such high standards and lofty goals with an understanding that reward will follow accomplishment (Levi, 2017; Northouse, 2016). Paradoxically, unwavering will implies one should never accept anything less than an envisioned outcome, while humility implies living with an understanding that not all goal will be met exactly as planned. To reconcile these differences, must be prepared to overcome adversity.

Adaptive Capacity

Bennis and Thomas (2002/2011), developed a four-skill model to predict how leaders overcome adversity. Within this model, adaptive capacity jumped out as applicable to many situations. Adaptive capacity is composed of the ability to grasp context and hardiness. Grasping context is akin to emotional intelligence in that it revolves around understanding people well enough to assess the situation and act accordingly (Bennis & Thomas, 2002/2011; Goleman, 1996/2011). In a practical sense, this could be as simple as word choice or a facial expression. Hardiness refers to fortitude and perseverance or

never giving up. I have used adaptive capacity as an educational leader by reading a room and inspiring, nurturing, consoling, or pushing as appropriate with the goal of moving past adversity and returning to productivity.

Diversity

The importance of diversity was not a new concept for me, however, the ELPA program threaded the importance of diversity throughout the program in ways I had not previously considered. It was not a surprise that diversity can take many shapes including physical, mental, spiritual, racial, gender, age, sexual orientation, experience, profession, skills, intelligences, and many others (Levi, 2017). However, the benefits of diversity and difficulties surrounding people in minority populations was embarrassingly new to me. I realized that growing up with a white mother and Indian father, I assumed I was not subjected to any prejudices or difficulties due to race or appearance. After reading and learning more about the topic, I realized that I had dismissed many instances of microaggressions and prejudice due to race and gender (being a male in a female dominated field). As I reflected deeply on this topic, I realistically processed my experiences, which were humiliating at times, but pale in comparison to what many others have experienced. Upon recognizing the impact some of these had on me and my self-worth, I began to develop an extreme empathy for other minorities and started to explore how I could increase diversity within my leadership capacity. I have joined the Diversity, Equity, and Inclusion (DEI) committee of the National Dietetics Educators and Preceptors practice group and am investigating strategies to improve DEI efforts in the graduate program I direct, as well as my professional organization.

There are several ground-level strategies that could enhance diversity, equity, and improvement in both the program I direct and professional organization. According to Levi (2017), setting up the group environment to be welcoming of minorities and new ideas, diversity is more likely to positively affect group dynamics. As a leader, I will strive for Pettigrew and Martin's suggestion of at least 20% of a group being populated by someone of a minority background (As cited in Levi, 2017). Not only will this bring new perspectives and solutions, but it will also help reduce the likelihood of other minority individuals being discriminated against (Levi, 2017). I have an ethical duty to lead and organize in a way that strives to create an inclusive environment, free of prejudice, that accepts and appreciates a diverse group of individuals. In addition, I will instill within any program or organization I lead a value for diversity, acceptance of differences, and collaborative environment. Facilitating and teaching inclusive approaches in communication and collaboration will not only help to build relationships among peers but will also lay the groundwork for future interaction with colleagues, followers, patients, and clients who are different (Johnson, 2018). This process can begin with self-assessments to reveal biases and stereotypes. Once individuals are aware of their biases, they can reflect and begin to work towards improving. Content and activities that educate and provides opportunities to apply knowledge of other religions and cultures' dietary and communication preferences will promote an appreciation for those of other backgrounds (Cohn & Mullennix, 2007).

Summary

Like many, I once believed leaders fit a stereotypical profile based on a combination of traits and skills that were primarily unobtainable by most people. In line

with the social identity theory, I pictured the naturally emerging leader of an organization or program to be the embodiment of all the virtues and characteristics of a group (Northouse, 2016). However, through self-assessments and application of the ELPA content, I realized my diverse background, strengths, and approach to leadership could help me be an effective leader. Considering all that has occurred in the five years since beginning the ELPA program, I can honestly state that I am a different person than when I began. The instructional content, assignments, experiences, and activities guided me in many directions. The leadership theory portion of the program provided a groundwork to guide practical application of leadership, but the organizational analysis provided the ability to analyze and navigate through academic bureaucracy to create a new graduate program at my place of employment. Along the way, I had many Gestalt moments that translated directly into my leadership practice. I continue to evolve as a leader through the residual effect of the program and the many literal and figurative doors that were opened as I learned more about myself and what it means to be an effective leader.

Influence on Scholarship

During the last five years, many life altering discoveries have changed the way I see and interact with life. Symbolic of Bolman and Deals' (2013) frames, it was if every so often, a new lens would be mysteriously placed in front of my face, while other lenses were being removed. In some regards, it is impossible to revert or see things the way they once appeared. Many aspects of the ELPA program, dissertation in practice process, and experiences outside of my student life sent me on a spiral of self-realization and expansion of perspectives. Prior to beginning this program, settled into a routine, I was satisfied with the day-to-day as an accepted reality. Becoming a doctoral student

contributed to a paradigm shift that changed my life. The concepts and topics covered in this program naturally called into question many things I accepted as my reality. Reflecting on social issues and leadership caused much personal growth, while experiences and opportunities in my professional life accelerated this growth by presenting opportunities to apply coursework. These lenses and epiphanies occurred in many areas, triggered by many events that had a cascade-like progression. The research-related coursework and dissertation, however, have had the greatest influence on my scholarship.

Theory

I have always appreciated theories, but prior to the ELPA program, the concept of theoretical frameworks and underpinnings in research were unknowns. It took a couple semesters for the concept of theoretical frameworks to make sense, but once it did, this became a new lens or filter through which I saw the world and taught my students. Much like a theoretical framework guides the structure and methodology of a dissertation, behavior and learning theories guide nutrition intervention in counseling, group education, and in development of educational materials. I was able to apply this approach while teaching and in my own research and scholarship. The importance of using existing, researched theories to support research positions is something I learned as a result of the ELPA program. One paradoxical counterpoint to this dependence on theory, was the realization that theory is just theory. It was startling to shift from a mindset that saw theory as truth and reliable, to one that now sees theory as an educated guess. I understand now that no one knows enough to know everything. The most well-

understood aspects of human psychology and physiology can be argued convincingly from multiple perspectives using equally convincing theories.

One related concept that was very enlightening was the Rashomon Effect, which centers around human beings lived experiences guiding unique perspectives. This was something that never dawned on me prior to hearing my professor explain and tie into research. Every person experiences the same thing differently. No two people have the same recollection or interpretation of a single experience because it is impossible to experience something from the exact same perspective with the exact same set of variables. This was a mind-blowing realization in research that has led me to understand research is not the end all be all.

I see research as one's best attempt to answer a question with the most possible controls in place to limit variability of experiences and data, with the understanding that it is impossible to control everything and impossible to remove all variability. We can use triangulation, strict methodologies, and proper inferential statistics to control for many differences, but in the end, no one can truly provide a precise answer that is universally true for all people. Good research can, however, yield results that can be generalized from a sample to a fitting population. That's as good as it gets. One way to ensure good research is good alignment.

Alignment

Alignment is something I appreciate in all areas of life. I also appreciate logic, justice, fairness, and consistency. Somehow, alignment seems related to these areas. The ELPA program and dissertation process helped with research alignment and understanding its importance when designing a study, completing research, presenting

findings, and developing a scholarly research agenda. This is another lens that was placed over my face in this program. I cannot unsee alignment and, more importantly, the lack of alignment. I can only imagine the frustration of my faculty when seeing misaligned research my peers and I would discuss and submit early in the program. This concept is such an understated skill in research and life. I feel as though it may be the most valuable concept that was subtly thread throughout each class and project. The need for direct alignment between research question, data collection method, and analysis method was something so painfully obvious, I was embarrassed I had not fully appreciated that before starting the program in the context of research. I had an appreciation for this concept prior to the program from various experiences (humbly, I must say I had a strong previous understanding of the concept), however, I lacked the research knowledge to proactively apply alignment when designing a study, considering theory, paradigms, research questions, and methodologies. Expanding my research skills and knowledge, enhanced my ability to "predict the future" in terms of imaging and planning a research study.

I am not entirely naïve and am aware of Dunning-Kruger Effect, and therefore must acknowledge I have only learned the tip of the iceberg when it comes to understanding the possible methodological approaches, qualitative techniques, and statistical analyses. I imagine there are many research concepts of which I am not yet aware. I am grateful to the ELPA program, dissertation advisor, and dissertation committee for helping me see many iceberg tips, which helped expand my research knowledge and skills. From these experiences and mentors, I humbly believe I have progressed from novice to a moderately skilled researcher. I acknowledge I have a long

way to go before reaching expert, but reflecting on my experiences in the ELPA program, my scholarly abilities have tremendously improved.

Research Skills

Through the program and dissertation process, I learned and applied several specific research skills and research-life lessons. Most of these skills and lessons came naturally and led to a greater appreciation. Prior to the start of the program, I knew and appreciated several quantitative methods. I was inclined to appreciate the cut and dry nature of well-controlled quantitative studies and the finality of inferential statistics. I learned to appreciate them more as I understood more of them. As I mentioned in a previous section, the more I learned, the more I realized they still cannot completely answer a question as there is always some shred of difference from person to person or confounding variable. I also became keenly aware that a biased, well-informed researcher can covertly set up any research to produce favorable outcomes in one direction or another. I also learned that a deceitful person can mislead a less-informed consumer base very easily with seemingly objective data. Not only did learning these concepts help me become a more skilled researcher, but also a more skeptical and savvy research analyst.

Prior to beginning the ELPA program, I was unfamiliar with qualitative research approaches. My skills in this area have greatly expanded, and I have come to appreciate the rigor of qualitative approaches to research and the benefits they provide beyond a solely quantitative approach for investigating unique differences and influences of a sample. Compared to quantitative methods, however, there is a higher potential for a researcher to allow bias to influence research outcomes and the entire direction of a study. I have a new appreciation for research ethics and transparency, as well as careful

record keeping to demonstrate methodology as a means to establish trust. Seeing the pros and cons of both methods while completing a mixed-methods study convinced me of the value of mixed-methods research. I learned that triangulation of data can help to reduce bias and errors when drawing conclusions in a study. Many factors can influence survey results and interview results. In this dissertation research, my conclusions would have been different had this been only quantitative or only qualitative. For example, the analysis of survey responses would lead one to believe that alcohol consumption does not impact academic performance, but when considering the interview responses that reported personal experiences and observations of roommates, friends, and classmates, it became clear that alcohol is an influence that is difficult to capture from analyzing frequency of drinks alone. Further analysis revealed that most survey respondents were studious enough and had other characteristics that prevented alcohol from being a major problem and that the students who were experiencing problems from alcohol did not likely participate in this study sample.

Another skill and lesson learned through this process is the application of grounded theory. Earlier I mentioned that theory is a well-educated guess that attempts to answer a question. Many researchers look to theories that were developed fifty to one-hundred years ago. In some ways, the world and humanity are the same as they once were, but in many ways things are evolving so rapidly that old theories no longer fully apply. There are new factors and variables that did not exist when many hallmark theories were developed. This is one reason I chose grounded theory for this dissertation's framework and simply modeled my theory after the structure of an existing theory. I believe research should largely operate in this manner, with similarly designed

theories feeding into a greater conglomerate of findings, leading to more universal theories. I have grown to appreciate the grounded theory method, and intend to continue using grounded theory when possible.

One lesson that did not come easy, was simplifying. I believe this naturally builds off of alignment, but while implementing and applying alignment came easily, simplifying and removing unnecessary components has been a tremendous challenge. I tend to overcomplicate things and add layers at first, then carve excessive pieces away as I realize I have took on to much. I have become better at removing extraneous or redundant research components, but I am still tempted to add when the components I am considering are valuable. I've always been aware of this temptation, but now see the value in saving time and energy from proactively removing unnecessary elements through thought exercises such as visualization, mind-mapping, and brainstorming. I believe there is a fine line between the right amount and too much. While I have improved in this area, I still struggle to identify the point at which I have stepped over this line. Proactively deciding what to include and not include, has been a huge help for me in this area.

This dissertation process reinforced the value of restricting commitments and quantity of work to complete a project in a timely manner while maintaining work-life balance. Completing this dissertation has also helped me become less of a perfectionist and provided practice with identifying and removing unnecessary or excessive elements. I have managed to retain the core of the project I had in mind, when I first began brainstorming on this topic, while also streamlining things a bit in a strategic manner. Ultimately, if I were to complete this dissertation again, I would be able to conduct a

satisfying study that did not involve as many layers. By the time I learned this lesson I was too far in to cut out any major components. That is not to say I want to have changed the outcome. I am deeply satisfied with how the dissertation evolved into the final product. The process and these lessons, however, have been the most satisfying outcome.

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Appendix A

Institutional Review Board Approval Letters: University of Missouri

Institutional Review Board
University of Missouri-Columbia
FWA Number: 00002876
IRB Registration Numbers: 00000731, 00009014

310 Jesse Hall
Columbia, MO 65211
573-882-3181
irb@missouri.edu

October 11, 2021

Principal Investigator: Joel Ramdial (MU-Student)
Department: Educational Leadership-EDD

Your IRB Application to project entitled Influence of Nutrition and Health Behaviors on Academic Performance of Students at a Public Midwestern University was reviewed and approved by the MU Institutional Review Board according to the terms and conditions described below:

IRB Project Number	2072362
IRB Review Number	340647
Initial Application Approval Date	October 11, 2021
IRB Expiration Date	October 11, 2022
Level of Review	Exempt
Project Status	Active - Exempt
Exempt Categories (Revised Common Rule)	45 CFR 46.104d(2)(i) 45 CFR 46.104d(2)(ii)
Risk Level	Minimal Risk
HIPAA Category	No HIPAA
Approved Documents	*Revised* Survey informed consent *Revised version 10/9/21* Survey with informed consent *Revised version* Informed consent for interview portion of the study. *Revised version* Interview questions *Revised version* Document containing classroom and email recruitment scripts for survey and interview portions of the study.

The principal investigator (PI) is responsible for all aspects and conduct of this study. The PI must comply with the following conditions of the approval:

- No subjects may be involved in any study procedure prior to the IRB approval date or after the expiration date.
- All changes must be IRB approved prior to implementation utilizing the Exempt Amendment Form.
- Major noncompliance deviations must be reported to the MU IRB on the Event Report within 5 business days of the research team becoming aware of the deviation. Major deviations result when research activities may affected the research subject's rights, safety, and/or welfare, or may have had the potential to impact even if no actual harm occurred. Please refer to the MU IRB Noncompliance policy for additional details.
- The Annual Exempt Form must be submitted to the IRB for review and approval at least 30 days prior to the project expiration date to keep the study active or to close it.
- Maintain all research records for a period of seven years from the project completion date.

Institutional Review Board Approval Letters: City University

SOUTHEAST MISSOURI
STATE UNIVERSITY · 1873

Memo to: Joel Ramdial, Principal Investigator

From: Jennifer Bengtson, Chair, IRB

Re: IRB proposal 20220013, "Influence of Nutrition and Health Behaviors on Academic Performance of Students at a Public Midwestern University"

Date: October 15, 2021

The IRB received the materials for proposal 20220013, "Influence of Nutrition and Health Behaviors on Academic Performance of Students at a Public Midwestern University," which was reviewed and determined to qualify for exemption (category 1) by the IRB at the University of Missouri. I have reviewed these materials and accept them in lieu of a separate submission and review by Southeast's IRB.

If any unforeseen events occur or if your research protocol changes in any way, you are obligated to contact the IRB immediately at irb@semo.edu. Please refer to the proposal number above in any communication regarding this research. Best wishes in your research endeavors.

Appendix B

Survey Recruitment Emails: First Survey Recruitment Email

Ramdial, Joel

From: Survey <survey-bounces@newlist.semo.edu> on behalf of University Survey <survey@newlist.semo.edu>
Sent: Tuesday, November 02, 2021 9:26 AM
To: survey@newlist.semo.edu
Subject: Invitation to Health Behaviors Survey

Hello Southeast Students! I am writing to ask for your help with my dissertation research. My name is Joel Ramdial. I have been teaching at SEMO since 2013 in the nutrition and dietetics programs. Here is a link to my faculty page.

I am completing a research study to investigate how health-related factors may impact academic performance.
I am contacting all students at Southeast Missouri State University and asking for you to complete an anonymous survey that asks about health behaviors and grade point average. You will also have an opportunity to sign up for an optional interview to help me investigate this topic in more depth.
By participating in the survey and/or interviews, you will be eligible to enter a raffle to win a $25 Amazon gift card! Information that could be used to identify you is not collected, and therefore not shared. If you choose to participate in the raffle, at the end of the survey, you will be directed to a separate survey and asked to provide contact information. Information provided on the raffle survey cannot be traced back to your original survey responses.

The survey is 61 questions and should take about 30 minutes to complete. You can pause and return to finish the survey if you use the same device and browser.

You can complete the survey by following this link: Click here to take the survey.

Should you have any questions or comments, please contact me, Joel Ramdial, the primary investigator jramdial@semo.edu or 573-651-2919. I really appreciate your time and help with this study.

P.s. You will get a couple reminders over the next week or so. I don't want to bug you, but this is really important for my research. If you take the survey, please disregard the extra reminders. If you don't take the survey now, please think about it and look for those reminders. Have a great day!
Thank you!

/ **Joel Ramdial, MA, RD, LD**
Instructor
Director: MS Applied Nutrition
Kinesiology, Nutrition, and Recreation
https://semo.edu/people-directory/faculty-staff/ramdial-joel.html

Survey Recruitment Emails: Survey Reminder

Ramdial, Joel

From: Survey <survey-bounces@newlist.semo.edu> on behalf of University Survey <survey@newlist.semo.edu>
Sent: Friday, November 05, 2021 8:33 AM
To: survey@newlist.semo.edu
Subject: Health Behaviors Survey Invitation Reminder

Hello again!

You may recall my email from a few days ago asking you to take a survey for my dissertation research about how health-related factors may impact academic performance. If you have already participated, thank you so much! I really appreciate you completing the survey. 188 students have already completed the survey, but I need 500. The survey will close on November 16th.

If you have not yet participated, please consider completing the survey. It will be very helpful for my research and provide valuable information about how nutrition, exercise, sleep, and alcohol use influence academic performance of university students.

By completing the survey, you will be eligible to enter a raffle to win one of the two remaining $25 Amazon gift cards! You can complete the survey by following this link: Click here to take the survey.

Should you have any questions or comments, please contact me, Joel Ramdial, the primary investigator jramdial@semo.edu or 573-651-2919. I really appreciate your time and help with this study.
p.s. I'll just send one more reminder.

Thank you!

/ **Joel Ramdial, MA, RD, LD**
Instructor
Director: MS Applied Nutrition
Kinesiology, Nutrition, and Recreation
T (573) 651-2919
jramdial@semo.edu
msan@semo.edu

SOUTHEAST MISSOURI
STATE UNIVERSITY · 1873®

MASTER ADVISOR

Survey Recruitment Emails: Second Email Survey Reminder

Ramdial, Joel

From: Survey <survey-bounces@newlist.semo.edu> on behalf of University Survey <survey@newlist.semo.edu>
Sent: Monday, November 08, 2021 8:16 AM
To: survey@newlist.semo.edu
Subject: Health Behavior Survey Invitation (Last Reminder)

Hello Southeast students!

Recently, I sent you a couple emails asking you to complete a survey about how health behaviors influence students' academic performance.

If you have already completed the survey, I thank you very much. I truly appreciate your help! If you have not yet answered the survey, please consider it.

So far, the average time it has taken participants to complete the survey from start to finish is around 15 minutes.

By completing the survey, you will be eligible to enter a raffle to win one of the two remaining $25 Amazon gift cards! You can complete the survey by following this link: Click here to take the survey.

I still need about 150 students to take the survey and it closes on November 16th. I would really appreciate your help with this research. Thank you for your participation and considering this invitation. This is the last email reminder I'll send for the survey.

Thank you!

/ **Joel Ramdial, MA, RD, LD**
Instructor
Director: MS Applied Nutrition
Kinesiology, Nutrition, and Recreation
https://semo.edu/knr/faculty/ramdial.html
T (573) 651-2919
jramdial@semo.edu
msan@semo.edu

Appendix C

Informed Consent and Survey Instrument

Influence of Nutrition and Health Behaviors on Academic Performance of Students

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Start of Block: Informed Consent

Study Summary Investigator's Name: Joel Ramdial
Project IRB#: 207362
Study Title: Influence of Nutrition and Health Behaviors on Academic Performance of Students at a Public Midwestern University

Study Summary
I would like to invite you to take part in a research study that is investigating how health behaviors such as nutrition, exercise, sleep, and alcohol consumption influence university students' academic performance. This study includes two parts: The first part is a survey conducted through Qualtrics that can be completed on any electronic device with an internet connection; The second part is an interview conducted through Zoom. You may participate in both parts or either part of this study. If you are interested, please keep reading for an explanation of what will happen if you join the study. If there is anything in this form that you do not understand, please email Joel Ramdial at jramdial@semo.edu for an explanation. If you decide to take part in this study, we recommend that you print a copy of this form.

Taking part in a research study is voluntary. You are free to say yes or no, and you can stop taking part at any time, without giving us a reason. There will be no penalty to you or loss of benefits.

This invitation is for the survey portion of the study. The purpose of the survey portion of this study is to determine how health related behaviors influence academic performance. We are inviting you to take part in this research because you are a student at this university. We will only include you in the study if you first give us your permission. At the end of the survey, you will be asked if you would like to participate in an optional interview portion of the study.

We are asking about 500 people to take part in the survey portion of this study. Joel Ramdial in the Department of Kinesiology, Nutrition, and Recreation is the Principal Investigator.

Study Details What Am I Being Asked To Do?

If you decide to take part in the survey portion of this study, we will ask you to complete an electronic survey using a phone, tablet, or computer.

How Long Will I Be In The Study?

The survey portion of this study requires completion of a single survey that will take approximately 30 to 45 minutes to complete and will contain 61 questions.

Can I Stop Being In The Study?

Yes, you can stop being in the study at any time without giving a reason. Just tell the researcher or study staff right away if you wish to stop taking part.

Are There Any Risks To Taking Part In This Study?

There are risks to taking part in any research study. There may be problems caused by the study that we do not know about yet. Some discomforts from being in this study include psychological distress from interview and survey questions about health, lifestyle behaviors, academic records, and demographics. Risks are minimized by asking questions using sensitive language and delivery and providing an option to stop participating at any time without repercussions. If we learn about new important risks, we will tell you. We will tell you about any new information we learn that may affect your decision to continue taking part in the study.

What Other Choices Do I Have If I Don't Take Part?

You may choose to participate in both portions of this study (Interview and Survey), or either portion of this study (Interview or Survey).

Will Information About Me Be Kept Private?

The researcher will only need identifiable information if you volunteer to participate in the interview portion of the study. This information comes from collecting your contact information needed to arrange the interview. The researcher is committed to respecting your privacy and to keeping your personal information confidential. The study team will make every effort to protect your information and keep it confidential to the extent allowed by law. However, it is possible that an unauthorized person will see it.

Study data will be kept confidential by taking several steps in both portions of the study.

The survey is anonymous and does not collect the names or email addresses of participants. No information is collected in the survey that could be used to identify a participant. In addition, through Qualtrics' settings, IP addresses and any other personal data will not be collected.

At the end of the survey, you can enter a raffle to win a $25 Amazon gift card. If you elect to

enter the raffle, you will be directed to second survey on which you are asked to provide your name and email address. Your name and email address provided at this second survey are not connected to the original survey, therefore your data cannot be connected to your email address. Your email address will be coded with numbers. After the survey closes, the True Random Number Generator at www.random.org will be used to generate two random numbers to pick winners of the $25 Amazon gift card incentive prize. After the gift cards are given to the winners, the coded list of email addresses will be deleted. When the survey portion of the study is complete, any remaining identifying information will be deleted.

Are There Any Benefits To Me From Taking Part In This Study?
We hope that by taking part, you will benefit from helping us learn more about factors that influence academic performance, which may help students in the future.

Will it Cost Me Anything To Take Part In This Study?
There is no cost to you for taking part in this study.

Will I Be Paid For Taking Part In This Study?
You will not be paid for taking part in this study, however, if you take part in this study you have the option to enter a raffle to win one of the $25 Amazon gift cards.

What Are My Rights as a Study Participant?
Taking part in this study is voluntary. If you do decide to take part, you have the right to change your mind and drop out of the study at any time. Whatever your decision, there will be no penalty to you in any way.

If the study investigator decides to take you off the study, he must explain the reasons.
We will tell you about any new information discovered during this study that might affect your health, welfare, or change your mind about taking part.

Contact Information Who Can I Call If I Have Questions, Concerns, Or Complaints?
If you have more questions about this study at any time, you can call/email Joel Ramdial at (573) 651-2919 / jramdial@semo.edu.
You may contact the University of Missouri Institutional Review Board (IRB) if you: Have any questions about your rights as a study participant; Want to report any problems or complaints; or Feel under any pressure to take part or stay in this study.
The IRB is a group of people who review research studies to make sure the rights of participants are protected. Their phone number is 573- 882-3181.

If you want to talk privately about your rights or any issues related to your participation in this study, you can contact University of Missouri Research Participant Advocacy by calling 888-280-5002 (a free call), or emailing MUResearchRPA@missouri.edu.

If you have any questions right now, please call/email Joel Ramdial at (573) 651-2919 / jramdial@semo.edu.

Informed Consent **Do you wish to provide consent and continue to participate in this study?**

- ○ Yes (1)
- ○ No (2)

End of Block: Informed Consent

Start of Block: Exit Confirmation

Display This Question:

If Do you wish to provide consent and continue to participate in this study? = No

Exit Confirmation Thank you for your time. I just want to make sure you meant to exit without completing the survey. If you exited by mistake or changed your mind, you may return and complete the study. If you have any questions please call/email Joel Ramdial at (573) 651-2919 / jramdial@semo.edu. Please choose from the options below:

- ○ Exit this survey (1)
- ○ Provide consent and participate in this study (2)

End of Block: Exit Confirmation

Start of Block: Eating Habits

Overview **Overview**

This study is investigating how certain behaviors influence college students' academic performance. Throughout the survey you will be asked about your academic performance, nutrition and health habits, and several questions over areas of life that may have some influence on academic performance.

Eating Habits **Eating Habits**

In this section you will be asked about your eating habits. Please take your time and answer to the best of your ability

1. Fruit On average, how many servings of fruit (not including juice) do eat per day?
Example: 1 serving fruit = 1/2 cup cut-up fruit, 1/2 a banana, or one small piece of whole fruit (apple, orange, pear, etc.) One small piece of whole fruit is the size of a baseball. 1/2 cup cut-up fruit is the size of a computer mouse.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

2. Fruit Juice On average, how many servings of 100% fruit juice do you drink per day?
NOTE: Do not include fruit flavored drinks such as Hi-C, Tang, Sunny-D, etc.

Example: 1 serving juice = 1/2 cup 100% fruit juice (apple, grape, orange, etc.), 1 cup of juice = juice box.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

Page Break

3. Vegetables Now, think about all of the vegetables you eat in a day. On average, how many servings of vegetables do you eat per day?
NOTE: Any vegetable or 100% vegetable juice counts as a member of the vegetable group.
Example: 1 serving = 1 cup raw vegetables, 1 cup of salad, 1/2 cup cooked vegetables, or 1/2 cup 100% vegetable juice. One cup raw vegetables is the size of a baseball. 1/2 cup cooked vegetables is the size of a computer mouse.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

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4. Green Vegetables Now, think about just the green vegetables you eat in a day like spinach, green beans, kale, broccoli, zucchini, or other mostly green vegetables. On average, how many servings of green vegetables do you eat per day?
NOTE: Do not include starchy vegetables like green peas.

Example: 1 serving = 1 cup raw vegetables or 1/2 cup cooked vegetables. 1 cup raw vegetables is the size of a baseball. 1/2 cup cooked vegetables is the size of a computer mouse.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

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5. Starchy Vegetable Now, think about just the starchy vegetables you eat in a day like corn, green peas, or potatoes. On average, how many servings of starchy vegetables do you eat per day?

Examples: 1 serving = 1 cup raw vegetable or 1/2 cup cook vegetables. 1 cup raw vegetables is the size of a computer mouse.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

Page Break

6. Grains On average, how many servings of grains do you eat per day?
Examples: 1 serving = 1 slice of bread; 1/2 cup grits, 1 cup of ready-to-eat cereal, 1/2 cup oatmeal, 1 small tortilla, 1/2 cup cooked rice, or 1/2 cup pasta. 1 cup ready-to-eat cereal is the size of a baseball.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

Page Break

Display This Question:

If On average, how many servings of grains do you eat per day? Examples: 1 serving = 1 slice of brea... = Less than 1

6a. Grain frequency On average, how often do you eat grains?
Examples: 1 serving = 1 slice of bread; 1/2 cup grits, 1 cup of ready-to-eat cereal, 1/2 cup oatmeal, 1 small tortilla, 1/2 cup cooked rice, or 1/2 cup pasta.

- ○ A couple times per week (1)
- ○ A couple times per month (2)
- ○ A couple times per year (3)
- ○ Almost never (4)
- ○ Never (5)
- ○ Choose not to answer (6)

Page Break

7. Whole Grains Now, just think about whole grains you eat like whole wheat bread, whole grain crackers, brown rice, or oatmeal. On average, how many servings of whole grains do you eat per day? Examples: 1 serving = 1 slice whole wheat bread, 5–6 whole grain crackers, 3 cups popcorn, 1/2 cup cooked brown rice, or 1/2 cup oatmeal.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

Page Break

Display This Question:

If Now, just think about whole grains you eat like whole wheat bread, whole grain crackers, brown ri... = Less than 1

7a. WG Frequency On average, how often do you eat whole grains?
Examples: 1 serving = 1 slice whole wheat bread, 5–6 whole grain crackers, 3 cups popcorn, 1/2 cup cooked brown rice, or 1/2 cup oatmeal.

- ○ A couple times per week (1)
- ○ A couple times per month (2)
- ○ A couple times per year (3)
- ○ Almost never (4)
- ○ Never (5)
- ○ Choose not to answer (6)

Page Break

8. Milk On average, how many servings of milk do you eat or drink per day?
Examples: 1 serving = 1 cup of milk, 1 cup of yogurt, 1.5 ounces of natural cheese, or 2 ounces of processed cheese. 1 cup of milk is the size of a carton of milk. 1 serving of cheese is the size of your index finger.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

Page Break

Display This Question:

If On average, how many servings of milk do you eat or drink per day? Examples: 1 serving = 1 cup of... = Less than 1

8a. Milk frequency On average, how often do you drink or eat milk products? Examples: 1 serving = 1 cup of milk, 1 cup of yogurt, 1.5 ounces of natural cheese, or 2 ounces of processed cheese.

- ○ A couple times per week (1)
- ○ A couple times per month (2)
- ○ A couple times per year (3)
- ○ Almost never (4)
- ○ Never (5)
- ○ Choose not to answer (6)

Page Break

9. LF Milk Now, just think about the milk products you eat per day. On average, how many servings of low-fat milk products do you eat per day?
Examples: 1 serving = 1 cup of skim milk, 1 cup of low fat yogurt, or 1.5 ounces of low-fat cheese. 1 cup of milk is the size of a milk carton. 1 serving of cheese is the size of your index finger.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

Page Break

Display This Question:

If Now, just think about the milk products you eat per day. On average, how many servings of low-fat... = Less than 1

9a. LF Milk Frequenc On average, how often do you drink or eat low-fat milk products? Examples: 1 serving = 1 cup of skim milk, 1 cup of low fat yogurt, or 1.5 ounces of low-fat cheese.

- ○ A couple times per week (1)
- ○ A couple times per month (2)
- ○ A couple times per year (3)
- ○ Almost never (4)
- ○ Never (5)
- ○ Choose not to answer (6)

Page Break

10. Legumes On average, how many servings of beans (legumes) do you eat per day?
NOTE: all foods made from dry beans, canned beans, peas, and lentils are considered part of this group.
Examples: 1 serving= 1/2 cup cooked beans. 1/2 cup cooked beans is the size of a computer mouse.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

11. Nuts or Seeds On average, how many servings of nuts or seeds do you eat per day?
NOTE: 1 serving = 1 tbsp of peanut butter; 1/2 ounces of nuts or seeds. 1 tbsp of peanut butter is the size of the tip of your thumb.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

12. Seafood On average, how many servings of seafood do you eat per day?
NOTE: All foods made of fish, shrimp, crab, and shellfish are considered part of this group.
Examples: 1 serving = 3 ounces of fish. 3 ounces of fish is the size of a deck of cards.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

Page Break

Display This Question:

If On average, how many servings of seafood do you eat per day? NOTE: All foods made of fish, shrimp... = Less than 1

12a. Seafd Frequency On average, how often do you eat seafood?
NOTE: All foods made of fish, shrimp, crab, and shellfish are considered part of this group.
Examples: 1 serving = 3 ounce of fish.

- ○ A couple times per week (1)
- ○ A couple times per month (2)
- ○ A couple times per year (3)
- ○ Almost never (4)
- ○ Never (5)
- ○ Choose not to answer (6)

Page Break

13. Sugary Drinks On average, how many sugar-sweetened beverages do you drink per day? Examples: 12 oz of soft drinks/soda, fruit flavored drinks, sweetened coffee, and sweet tea. Do not include milk or 100% fruit juice. 12 oz of soda is the size of one can.

- ○ Less than 1 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ 6 or more (7)
- ○ Choose not to answer (8)

Page Break

Display This Question:

If On average, how many sugar-sweetened beverages do you drink per day? Examples: 12 oz of soft drin... = Less than 1

13a. Sgr Bev Frequen On average, how often do you drink sugar-sweetened beverages? Examples: 12 oz of soft drinks/soda, fruit flavored drinks, sweetened coffee, and sweet tea. Do not include milk or 100% fruit juice.

- ○ A couple times per week (1)
- ○ A couple times per month (2)
- ○ A couple times per year (3)
- ○ Almost never (4)
- ○ Never (5)
- ○ Choose not to answer (6)

Page Break

14. Added Sugars On average, how much added sugars do you consume per day?
NOTE: Added sugars are often in foods such as breads, cakes, candy, sweet tea, jam, ice cream, or sugar added to food at the table. Do not include naturally occurring sugars such as lactose in milk or fructose in fruits.
Examples: white sugar, brown sugar, raw sugar, corn syrup, corn-syrup solids, high-fructose corn syrup, malt syrup, maple syrup, pancake syrup, fructose sweetener, liquid fructose, honey, molasses, and dextrose.

- ○ None / almost none (1)
- ○ Some (2)
- ○ A lot (3)
- ○ Choose not to answer (4)

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15. Saturated Fat How many servings of saturated fat do you consume on average per day?
NOTE: Saturated fats for these purposes should be considered to be solid fats. Solid fats are fats that are solid at room temperature.
Examples: butter, cakes, cookies, Crisco, coconut oil, beef fat (tallow, suet), chicken fat (lard), stick margarine, and shortening.

- ○ None / almost none (1)
- ○ Some (2)
- ○ A lot (3)
- ○ Choose not to answer (4)

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16. Water On average, how much water do you drink per day?

- ○ None / almost none (1)
- ○ Some (2)
- ○ A lot (3)
- ○ Choose not to answer (4)

End of Block: Eating Habits

Start of Block: Food Security

Food Security Food Security
These next two questions are about the food eaten in your household in the last 12 months, since November of last year and whether you were able to afford the food you need. Please read the statements below and answer how often the statement was true in the last 12 months.

17. FS Food Supply "Within the last 12 months we worried whether our food would run out before we got money to buy more." Was that often, sometimes, or never true for you/your household in the last 12 months?

- ○ Often true (1)
- ○ Sometimes true (2)
- ○ Never true (3)
- ○ Don't know (4)

18. FS $ Supply “Within the past 12 months the food we bought just didn’t last and we didn’t have money to get more.” Was that often, sometimes, or never true for you/your household in the last 12 months?

- ○ Often true (1)
- ○ Sometimes true (2)
- ○ Never true (3)
- ○ Don't know (4)

End of Block: Food Security

Start of Block: Exercise Habits

Exercise Habits Exercise Habits 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.

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19. Vig Ex Frequency 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.

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

- ○ No vigorous physical activities in the past 7 days (1)
- ○ 1 day per week (2)
- ○ 2 days per week (3)
- ○ 3 days per week (4)
- ○ 4 days per week (5)
- ○ 5 days per week (6)
- ○ 6 days per week (7)
- ○ 7 days per week (8)

Skip To: 21. Mod Ex Frequency If Think about all the vigorous activities that you did in the last 7 days. Vigorous physical activi... = No vigorous physical activities in the past 7 days

Page Break

20. Vig Ex Duration How much time did you usually spend doing vigorous physical activities on one of those days? (If answering in hours, provide the number of hours in the box. If answering in minutes, provide the number of minutes in the box.)

○ ___ hours per day (1) _____

○ ___ minutes per day (2) _____

○ Don't know / not sure (3)

Page Break

21. Mod Ex Frequency 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.
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.

- ○ No moderate physical activities in the past 7 days (1)
- ○ 1 day per week (2)
- ○ 2 days per week (3)
- ○ 3 days per week (4)
- ○ 4 days per week (5)
- ○ 5 days per week (6)
- ○ 6 days per week (7)
- ○ 7 days per week (8)

Skip To: 23. Walk Frequency If Think about all the moderate activities that you did in the last 7 days. Moderate activities refe... = No moderate physical activities in the past 7 days

Page Break

22. Mod Ex Duration How much time did you usually spend doing moderate physical activities on one of those days? (If answering in hours, provide the number of hours in the box. If answering in minutes, provide the number of minutes in the box.)

○ ___ hours per day (1) _____

○ ___ minutes per day (2) _____

○ Don't know / not sure (3)

Page Break

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

- ○ No walking in the past 7 days (1)
- ○ 1 day per week (2)
- ○ 2 days per week (3)
- ○ 3 days per week (4)
- ○ 4 days per week (5)
- ○ 5 days per week (6)
- ○ 6 days per week (7)
- ○ 7 days per week (8)

Skip To: 25. Sit Duration If Think about the time you spent walking in the last 7 days. This includes at work and at home, wal... = No walking in the past 7 days

Page Break

24. Walk Duration How much time did you normally spend walking on one of those days? (If answering in hours, provide the number of hours in the box. If answering in minutes, provide the number of minutes in the box.)

○ ___ hours per day (1) _____

○ ___ minutes per day (2) _____

○ Don't know / not sure (3)

Page Break

25. Sit Duration The last question in this section 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.
During the last 7 days, how much time did you spend sitting on a week day?

- ___ hours per day (1) _____
- ___ minutes per day (2) _____
- Don't know / not sure (3)

End of Block: Exercise Habits

Start of Block: Sleep Habits

Sleep Habits Sleep Habits
This section asks about the amount and quality of sleep you get.

26. Time to Sleep How long did it usually take for you to fall asleep during the past 4 weeks?

- 0 - 15 minutes (1)
- 16 - 30 minutes (2)
- 31 - 45 minutes (3)
- 46 - 60 minutes (4)
- More than 60 minutes (5)

27. Sleep Duration On the average, how many hours did you sleep each night during the past 4 weeks? Slide the bar to indicate your average hours of sleep per night:

0 1 2 3 4 5 6 7 8 9 10 11 12

Hours of sleep ()	

28. Restless sleep How often during the past 4 weeks did you feel that your sleep was not quiet (moving restlessly, feeling tense, speaking, etc., while sleeping)?

- ○ All of the time (1)
- ○ Most of the time (2)
- ○ A good bit of the time (3)
- ○ Some of the time (4)
- ○ A little of the time (5)
- ○ None of the time (6)

29. Rested sleep How often during the past 4 weeks did you get enough sleep to feel rested upon waking in the morning?

- ○ All of the time (1)
- ○ Most of the time (2)
- ○ A good bit of the time (3)
- ○ Some of the time (4)
- ○ A little of the time (5)
- ○ None of the time (6)

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30. Wake from sleep How often during the past 4 weeks did you awaken short of breath or with a headache?

- ○ All of the time (1)
- ○ Most of the time (2)
- ○ A good bit of the time (3)
- ○ Some of the time (4)
- ○ A little of the time (5)
- ○ None of the time (6)

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31. Drowsy or sleepy How often during the past 4 weeks did you feel drowsy or sleepy during the day?

- ○ All of the time (1)
- ○ Most of the time (2)
- ○ A good bit of the time (3)
- ○ Some of the time (4)
- ○ A little of the time (5)
- ○ None of the time (6)

---

32. Falling asleep How often during the past 4 weeks did you have trouble falling asleep?

- ○ All of the time (1)
- ○ Most of the time (2)
- ○ A good bit of the time (3)
- ○ Some of the time (4)
- ○ A little of the time (5)
- ○ None of the time (6)

---

33. Awaken sleep How often during the past 4 weeks did you awaken during your sleep time and have trouble falling asleep again?

- ○ All of the time (1)
- ○ Most of the time (2)
- ○ A good bit of the time (3)
- ○ Some of the time (4)
- ○ A little of the time (5)
- ○ None of the time (6)

34. Staying awake How often during the past 4 weeks did you have trouble staying awake during the day?

- ○ All of the time (1)
- ○ Most of the time (2)
- ○ A good bit of the time (3)
- ○ Some of the time (4)
- ○ A little of the time (5)
- ○ None of the time (6)

35. Snore sleep How often during the past 4 weeks did you snore during your sleep?

- ○ All of the time (1)
- ○ Most of the time (2)
- ○ A good bit of the time (3)
- ○ Some of the time (4)
- ○ A little of the time (5)
- ○ None of the time (6)

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36. Naps How often during the past 4 weeks did you take naps (5 minutes or longer) during the day?

- ○ All of the time (1)
- ○ Most of the time (2)
- ○ A good bit of the time (3)
- ○ Some of the time (4)
- ○ A little of the time (5)
- ○ None of the time (6)

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37. Amount of sleep How often during the past 4 weeks did you get the amount of sleep you needed?

- ○ All of the time (1)
- ○ Most of the time (2)
- ○ A good bit of the time (3)
- ○ Some of the time (4)
- ○ A little of the time (5)
- ○ None of the time (6)

End of Block: Sleep Habits

Start of Block: Alcohol Consumption Habits

Alcohol Consumption Alcohol Consumption Habits
This section asks about alcohol consumption habits.

38. Alcohol 12 month During the last 12 months, how often did you usually have any kind of drink containing alcohol?

By a drink we mean half an ounce of absolute alcohol (e.g. a 12 ounce can or glass of beer or cooler, a 5 ounce glass of wine, or a drink containing 1 shot of liquor).

- ○ Every day (1)
- ○ 5 to 6 times per week (2)
- ○ 3 to 4 times per week (3)
- ○ twice a week (4)
- ○ once a week (5)
- ○ 2 to 3 times a month (6)
- ○ once a month (7)
- ○ 3 to 11 times in the past year (8)
- ○ 1 or 2 times in the past year (9)
- ○ I did not drink any alcohol in the past year, but I did drink in the past (10)
- ○ I never drank alcohol in my life (11)

Skip To: 38a. Alcohol max 24h If During the last 12 months, how often did you usually have any kind of drink containing alcohol? B... = I did not drink any alcohol in the past year, but I did drink in the past

Skip To: 38b. No alcohol If During the last 12 months, how often did you usually have any kind of drink containing alcohol? B... = I never drank alcohol in my life

Page Break

39. Alcohol per day During the last 12 months, how many alcoholic drinks did you have on a typical day when you drank alcohol?

- ○ 25 or more drinks (1)
- ○ 19 to 24 drinks (2)
- ○ 16 to 18 drinks (3)
- ○ 12 to 15 drinks (4)
- ○ 9 to 11 drinks (5)
- ○ 7 to 8 drinks (6)
- ○ 5 to 6 drinks (7)
- ○ 3 to 4 drinks (8)
- ○ 2 drinks (9)
- ○ 1 drink (10)

40. Alcohol binge During the last 12 months, how often did you have 5 or more (males) or 4 or more (females) drinks containing any kind of alcohol in within a two-hour period?

- ○ Every day (1)
- ○ 5 to 6 times per week (2)
- ○ 3 to 4 times per week (3)
- ○ two days a week (4)
- ○ one day a week (5)
- ○ 2 to 3 days a month (6)
- ○ one day a month (7)
- ○ 3 to 11 times in the past year (8)
- ○ 1 or 2 times in the past year (9)
- ○ 0 times in the past year (10)

Page Break

Display This Question:

If During the last 12 months, how often did you usually have any kind of drink containing alcohol? B... = I did not drink any alcohol in the past year, but I did drink in the past

38a. Alcohol max 24h During your lifetime, what is the maximum number of drinks containing alcohol that you drank within a 24-hour period?

- ○ 36 drinks or more (1)
- ○ 24 to 35 drinks (2)
- ○ 18 to 23 drinks (3)
- ○ 12 to 17 drinks (4)
- ○ 8 to 11 drinks (5)
- ○ 5 to 7 drinks (6)
- ○ 4 drinks (7)
- ○ 3 drinks (8)
- ○ 2 drinks (9)
- ○ 1 drink (10)

Page Break

Display This Question:

If During the last 12 months, how often did you usually have any kind of drink containing alcohol? B... = I never drank alcohol in my life

38b. No alcohol So you never had a drink containing alcohol in your entire life?

- Yes, I never drank (1)
- No, I did drink (2)

End of Block: Alcohol Consumption Habits

Start of Block: Academic Performance

Academic Performance Academic Performance

In this section, you will be asked about college grade point average (GPA) and earned credit hours. If you cannot locate these, please answer to the best of your ability.

It may be beneficial for you to look at your transcript to locate your college GPA and credit hours. You can do this by opening a different web browsing window and navigating to portal.semo.edu. Login to your Southeast account, select the Student SS tab on the left side of the screen. Under the banner self-service menu, select the student folder, then select the student records folder, and open the link to view your unofficial transcripts.

41. College credits How many college credit hours have you earned? (Please enter a whole number in the box)

_____

42. Grad v undergrad Are you an undergraduate student or graduate student?

- ○ Undergraduate - Working on an associate or bachelor's degree. (1)
- ○ Graduate - Working on a master's or doctoral degree. (2)

43. Cumulative GPA What is your current cumulative grade point average (GPA)?
This is your total GPA as a college student. Slide the marker on the scale below to indicate your GPA:

0 0 1 1 1 1 2 2 2 2 3 3 3 3 4

Cumulative GPA ()	

44. 2021 Fall GPA To the best of your ability, estimate your current fall 2021 GPA including all your classes. This is what you believe to be your current GPA when averaging all your fall 2021 classes. Slide the marker on the scale below to indicate your GPA:

0 0 1 1 1 1 2 2 2 2 3 3 3 3 4

Fall 2021 GPA ()	

End of Block: Academic Performance

Start of Block: Demographics

Demographics Demographics
In this section, you will be asked about demographic characteristics that are related to this research topic. Please answer to the best of your ability

45. Age How old are you? (Answer in years)

_____

46. height How tall are you?

Feet (1)

Inches (2)

▼ 3 (1) ... 7 ~ 11 (65)

47. Weight How much do you weigh? (Answer in pounds)

_____

48. Meal plan Do you have a campus meal plan? (Redbucks)

○ Yes (1)

○ No (2)

49. Living Situation How would you describe your current living situation?

- ○ Live on campus in a dorm or other campus housing option alone (1)
- ○ Live on campus in a dorm or other campus housing option with one or more roommates (2)
- ○ Rent a home or apartment alone (3)
- ○ Rent a home or apartment with one or more roommates (4)
- ○ Own a home alone (5)
- ○ Own a home with one or more roommates (6)
- ○ Live with someone and do not pay rent (7)
- ○ Live with my parents or caretakers (8)
- ○ Homeless or stay with multiple people (9)
- ○ Other (please describe) (10) _____

50. Income How would you describe your family's income level?

- ○ Low income (1)
- ○ Lower-middle income (2)
- ○ Middle income (3)
- ○ Upper-middle income (4)
- ○ High income (5)
- ○ I prefer not to answer (6)

---

51. Gender How do you describe your gender identity? (Mark all that apply)

- ☐ Female (1)
- ☐ Male (2)
- ☐ Genderqueer (3)
- ☐ Agender (4)
- ☐ Transgender (5)
- ☐ Cisgender (6)
- ☐ A gender not listed (7) _____

---

52. Race/ethnicity With which racial and ethnic group(s) do you identify? (Mark all that apply)

- ☐ American Indian or Native Alaskan (1)
- ☐ Asian (2)
- ☐ Black or African American (3)
- ☐ Hispanic, Latino, or Spanish origin (4)
- ☐ Middle Eastern or North African (5)
- ☐ Native Hawaiian or Other Pacific Islander (6)
- ☐ White (7)
- ☐ Another race or ethnicity not listed (8)

_____

*

53. specific race Please provide your specific ethnicities in the space below. Examples of ethnicities include (for example): German, Korean, Midwesterner (American), Mexican American, Navajo Nation, Samoan, Puerto Rican, Southerner (American), Chinese, etc. Note, you may report more than one group.

_____

End of Block: Demographics

Start of Block: Conclusion, Interview Sign-up, and Raffle Entry Option

Conclusion, Interview Sign-up, and Raffle Entry Option

Thank you for completing this survey! I appreciate your time and participation in this investigation of an important topic. You now have a choice to sign up for a follow up interview

portion of this study and to enter a raffle for a chance to win one of two $25 Amazon gift cards. You may also decline the interview and still sign up for the raffle.

If you choose to participate in the interview or raffle, your survey will be submitted, and you will be directed to another page which provides further instructions for how to enter the raffle and / or schedule an interview.

Interview and raffle How would you like to proceed? Please choose one of the following options.

- ○ Sign up for an interview and enter the raffle for a chance to win a gift card. (1)
- ○ Enter the raffle for a chance to win a gift card without being interviewed. (2)
- ○ End the survey now. Do not enter the raffle and do not sign up for an interview. (3)

End of Block: Conclusion, Interview Sign-up, and Raffle Entry Option

Appendix D

End of the Survey: Interview Sign-up Option

If, on the last question of the survey, the participant chooses “Sign up for an interview and enter the raffle for a chance to win a gift card.”, s/he was directed to the following page. On this interview sign-up page, participants were able to choose the link to schedule the interview, which led them to an additional survey that included an informed consent for the interview, link to a scheduling page, and location to provide an email address. See Appendix E for the Interview Sign-up Page.

Interview Sign-up Page End of Survey

Thank you for participating in this study. I sincerely appreciate your time.

To sign up for an interview and enter the raffle for a chance to win a $25 Amazon gift card, please follow the link below which will lead you to a separate page.

Follow this link to schedule your interview and enter the raffle

This page contains an option to provide your contact information and schedule an interview. Your identity cannot be traced back to your survey responses. Once the interviews and raffle drawing are complete and the gift card has been claimed, all email addresses provided will be deleted.

If you have any questions about the study or survey, please email me at jramdial@semo.edu.

I understand that some of the topics or questions may have forced you to think about some uncomfortable things. In case you would like to speak with someone about any of these topics, I created a list of resources for programs and offices at Southeast that can help with food security, health, wellness, and academic study habits. You can download the list here: Health resources list

I want to thank you again for participating and helping me with my research. I believe

your input will help inform change at the university and possibly others that will help students in areas of health and wellness to improve academic performance.

As soon as the interviews have concluded, I will randomly select and notify the winners of the Amazon gift cards.

Appendix E

Qualitative Informed Consent and Interview Sign-up

Participants who followed the link in Appendix D to "schedule your interview and enter the raffle" were sent to following survey. The following page provides the informed consent for the qualitative interview portion, an option to provide an email address, and a link to Doodle scheduling poll to select an interview time. Providing an email address entered participants into a raffle for a $25 Amazon gift card and provided a means for the researcher to contact them for the interview.

Interview Sign-up and Raffle Entry Survey Health Behaviors

Start of Block: Overview and Informed Consent

Overview Thank you for choosing to sign up for an interview and enter the raffle. Please read the informed consent (below) and follow the instructions at the end of this page to schedule an interview and enter the raffle.

Study Overview Investigator's Name: Joel Ramdial
Project IRB #: 2072362
Study Title: Influence of Nutrition and Health Behaviors on Academic Performance of Students at a Public Midwestern University

Study Summary
I would like to invite you to take part in a research study that is investigating how health behaviors such as nutrition, exercise, sleep, and alcohol consumption influence university students' academic performance. This study includes two parts: The first part was a survey conducted through Qualtrics; The second part is an interview conducted through Zoom. You can participate in the interview if you did or did not participate in the survey. If you are interested,

please keep reading for an explanation of what will happen if you join the study. If there is anything in this form that you do not understand, please email Joel Ramdial at jramdial@semo.edu for an explanation. If you decide to take part in this study, we recommend that you print a copy of this form.

Taking part in a research study is voluntary. You are free to say yes or no, and you can stop taking part at any time, without giving us a reason. There will be no penalty to you or loss of benefits.

This invitation is for the interview portion of the study. The purpose of the interview portion of this study is to discuss what influences your academic performance.
We are inviting you to take part in this research because you are a student at this university. We will only include you in the study if you first give us your permission. If you agree to participate, you will be asked to provide your name and contact information and directed to a Doodle scheduling poll at which you can sign up for an interview time.

We are asking about 30 people to take part in the interview portion of this study. Joel Ramdial in the Department of Kinesiology, Nutrition, and Recreation is the Principal Investigator.

Study Details 1 What Am I Being Asked To Do?
If you decide to take part in the interview portion of this study, we will ask you to sign up for an interview through the Doodle scheduling poll link and participate in a Zoom interview with the Principal Investigator.

The Zoom interviews will be recorded so that responses can be documented and analyzed. You must give us permission to use the video recordings we take of you during the study. Information taken from the recordings will not contain anything that might identify you. These video recordings and any information that could be used to identify you will be stored in password protected USB drives.

How Long Will I Be In The Study?

The interview portion of this study will take approximately 30 to 60 minutes on one day. Participants may be asked to participate in one follow-up meeting to confirm the findings of the study.

Can I Stop Being In The Study?
Yes, you can stop being in the study at any time without giving a reason. Just tell the researcher or study staff right away if you wish to stop taking part.

Are There Any Risks To Taking Part In This Study?
There are risks to taking part in any research study. There may be problems caused by the study

that we do not know about yet. Some discomforts from being in this study include psychological distress from interview and survey questions about health, lifestyle behaviors, academic records, and demographics. Risks are minimized by asking questions using sensitive language and delivery and providing an option to stop participating at any time without repercussions. If we learn about new important risks, we will tell you. We will tell you about any new information we learn that may affect your decision to continue taking part in the study.

What Other Choices Do I Have If I Don't Take Part?

You may choose to participate in both portions of this study (Interview and Survey), or either portion of this study (Interview or Survey).

Study Details 2 Will Information About Me Be Kept Private?

The study team needs to use some of your personal information. This information comes from questions we ask you during the interview or the survey you complete. We are committed to respecting your privacy and to keeping your personal information confidential. The study team will make every effort to protect your information and keep it confidential to the extent allowed by law. However, it is possible that an unauthorized person will see it.

Study data will be kept confidential by taking several steps in both portions of the study.

During the interview portion of the study, your interviews will be recorded. Immediately after all interviews are recorded, the recordings and transcripts will be downloaded and saved to a password protected USB drive in a password protected file using codes instead of names that could identify participants. Once downloaded, the recordings and transcripts will be deleted from Zoom cloud storage. Downloaded Zoom transcripts and recordings will be used to create anonymized transcripts of the interviews in which participants names are replaced with aliases to protect identities. Downloaded Zoom transcripts and recordings must be saved for seven years per University of Missouri research requirements. After seven years, the recordings will be deleted.

Email communication between the Principal Investigator and participants will be permanently deleted after all interview data is collected and analyzed. After the interviews are completed, participants' email addresses will be coded with numbers. The True Random Number Generator at www.random.org will be used to generate two random numbers to pick winners of the $25 Amazon gift card incentive prize. After the gift cards are given to the winners, the coded list of email addresses will be deleted. When the interview portion of the study is complete, any remaining identifying information will be deleted, and data will be anonymized by using aliases.

Study Details 3 Are There Any Benefits To Me From Taking Part In This Study?

We hope that by taking part, you will benefit from helping us learn more about factors that influence academic performance, which may help students in the future.

Will it Cost Me Anything To Take Part In This Study?
There is no cost to you for taking part in this study.

Will I Be Paid For Taking Part In This Study?
You will not be paid for taking part in this study, however, if you take part in this study you have the option to enter a raffle to win one of the $25 Amazon gift cards.

What Are My Rights as a Study Participant?
Taking part in this study is voluntary. If you do decide to take part, you have the right to change your mind and drop out of the study at any time. Whatever your decision, there will be no penalty to you in any way.

If the study investigator decides to take you off the study, he must explain the reasons.
We will tell you about any new information discovered during this study that might affect your health, welfare, or change your mind about taking part.

Who Can I Call If I Have Questions, Concerns, Or Complaints?
If you have more questions about this study at any time, you can call/email Joel Ramdial at (573) 651-2919 / jramdial@semo.edu.
You may contact the University of Missouri Institutional Review Board (IRB if you: Have any questions about your rights as a study participant; Want to report any problems or complaints; or Feel under any pressure to take part or stay in this study.
The IRB is a group of people who review research studies to make sure the rights of participants are protected. Their phone number is 573- 882-3181.

If you want to talk privately about your rights or any issues related to your participation in this study, you can contact University of Missouri Research Participant Advocacy by calling 888-280-5002 (a free call), or emailing MUResearchRPA@missouri.edu.

If you have any questions right now, please call/email Joel Ramdial at (573) 651-2919 / jramdial@semo.edu.

Contact information Thank you for choosing to sign up for an interview and enter the raffle. Please provide your name and email address in the spaces below.
Note: By submitting this information, you are indicating you are willing to be interviewed as part of this research study, and are entering the raffle for a chance to win one of the $25 gift cards.
You will be given instructions for how to schedule an interview on the next page.

Prior to participating in the interview, you will have the opportunity to read

- First name (1) _____
- Last name (2) _____
- Email address (3) _____

End of Block: Overview and Informed Consent

Thank you for completing the survey and providing your contact information! **Please open this hyperlink to sign up for your interview time.** The link takes you to a Doodle scheduling poll that you can use to sign up for an interview. Please enter your name in the Doodle poll so I know who to contact to arrange the interview. If you sign up for an interview, I will email you with a zoom link and request to confirm your interview time within the next two weeks.

You are now entered into the gift card raffle. I sincerely appreciate your time. Once the survey has closed, Two winners will be randomly drawn using anonymous participant numbers. Winners will be contacted by email to arrange gift card pick up or delivery immediately after their numbers are drawn. Winners will be allowed one week to respond to the email and one week to retrieve the gift card. If a winner fails to respond to the email or pick up the card within the allotted time, another winner will be drawn using the same procedures as outlined above. All identifiable information will be deleted once the winners have claimed their gift cards.

If you have any questions about the study or survey, please email me

at jramdial@semo.edu. Once again, thank you so much for completing my survey and helping with this research.

Appendix F

End of Survey: Raffle-Only Sign-up Page

If, on the last question of the survey, the participant chooses “Enter the raffle for a chance to win a gift card without being interviewed.”, s/he was directed to the following page. On this page, participants were able to follow a link to a new survey that required email addresses to enter the raffle for a $25 Amazon gift card without scheduling an interview.

Raffle Only Sign-up Page End of Survey

Thank you for participating in this study. I sincerely appreciate your time.

To enter the raffle for a chance to win a $25 Amazon gift card, please follow the link below which will lead you to a separate page.

Follow this link to enter the raffle

This page contains an option to provide your contact information. Your identity cannot be traced back to your survey responses. Once the raffle drawing is complete and the gift card has been claimed, all email addresses provided will be deleted.

If you have any questions about the study or survey, please email me at jramdial@semo.edu.

I understand that some of the topics or questions may have forced you to think about some uncomfortable things. In case you would like to speak with someone about any of these topics, I created a list of resources for programs and offices at Southeast that can help with food security, health, wellness, and academic study habits. You can download the list here: Health resources list

I want to thank you again for participating and helping me with my research. I believe your input will help inform change at the university and possibly others that will help students in areas of health and wellness to improve academic performance.

As soon as the interviews have concluded, I will randomly select and notify the winners of the Amazon gift cards.

Appendix G

Raffle Entry Survey

Participants who followed the link in Appendix F to "Follow this link to enter the raffle." were sent to following survey page. The following page contains an option to provide an email address to enter to a raffle for a $25.

Raffle Entry Health Behaviors Survey

Start of Block: Raffle Entry

Hello and thank you for completing the survey! Provide your name and email address in the cells below.

After you have entered your contact information, click on the arrow to submit your information and enter a raffle for one of two $25 Amazon gift cards.

○ First Name (1) _____

○ Last Name (2) _____

○ Email Address (3) _____

End of Block: Raffle Entry

Thank you for participating in this study. You are now entered into the gift card raffle. I sincerely appreciate your time. Once the survey has closed, Two winners will be randomly drawn using anonymous participant numbers. Winners will be contacted by email to arrange gift card pick up or delivery immediately after their numbers are drawn. Winners will be allowed one week to respond to the email

and one week to retrieve the gift card. If a winner fails to respond to the email or pick up the card within the allotted time, another winner will be drawn using the same procedures as outlined above. All identifiable information will be deleted once the winners have claimed their gift cards.

If you have any questions about the study or survey, please email me at jramdial@semo.edu.

Appendix H

Interview Scheduling Email

Ramdial, Joel

From: Ramdial, Joel
Sent: Friday, November 05, 2021 6:13 PM
To: [redacted]
Subject: Health Behavior Research Interview Information

Hello [redacted]
Thank you for signing up for an interview in my research. I sincerely appreciate your participation. I am looking forward to our interview and wanted to share a few pertinent details about the Zoom format.

Topic: Interview Participant 11.8.8
Time: Nov 8, 2021 08:00 AM Central Time (US and Canada)

Join Zoom Meeting
https://umsystem.zoom.us/j/94518299656?pwd=T3dCUXlPS3o0QkFEZUNadUxHemxUUT09

Meeting ID: 945 1829 9656
Passcode: 11.8.8
One tap mobile
+16468769923,,94518299656# US (New York)
+13017158592,,94518299656# US (Washington DC)

You may be asked to provide a passcode to enter the meeting. The passcode is provided in the Zoom meeting information as well as in the calendar invitation I will send you. You will be in a waiting room when you first follow the zoom link. I will admit you to the meeting at our start time. The cameras will be turned on by default. I would appreciate you leaving the camera on to help with the transcription and interpretation of the interview data. The interview will be recorded to the Zoom cloud storage facilitated by the University of Missouri (MIZZOU). Once I download and save a copy of the video and transcript, I will delete the recording and transcript from the cloud storage.

The interview will take from 15 – 45 minutes, and will follow a semi-structured format. This means that I will ask you the same base questions that I ask all other participants, but the follow up questions I ask you may vary, depending on your answers.

Thank you again for completing the survey and signing up for an interview!
As a reminder, you are automatically entered into the survey gift card raffle. By completing the interview, you will be entered into a raffle for a second gift card.
If you have any questions or need any additional information, please don't hesitate to contact me.

Kind regards,

Appendix I

Respondent Validation Emails

Ramdial, Joel

From: Ramdial, Joel
Sent: Wednesday, April 20, 2022 6:20 PM
To: Ramdial, Joel
Subject: RE: Please Read - Update on Health Behaviors and Academic Performance Focus Group

Good evening!
I am emailing you to ask you to consider participating in a short interview with me to review my interpretations and the theory I developed based the series of interviews in which you participated last fall. If you would like to participate in this interview, please follow this link and book a time:
https://outlook.office365.com/owa/calendar/HealthBehaviorsandAcademicPerformanceInterview@semo.edu/bookings/s/gDbxlygERkCT37Hdh-N5pw2
Here are some details about the interview:

- The interview will be approximately 15 minutes in length.
- I will share a five minute overview of my interpretations and theory that emerged from the interviews I conducted in the fall.
- I will ask for the following:
    - To provide feedback on my interpretations
    - To confirm or add to my interpretations and theory
    - If time allows, to share any new insights you have on the topic since we last spoke

Please note, the interviews will occur through zoom and only you and I will be present.
If you cannot participate in on of these interviews, you can still provide feedback through email beginning Monday, 4/25. I will send a separate email Monday morning with a brief overview and request for feedback.

I really appreciate you all and how you've helped me with this research. Monday's email will be the last email I send out all participants.
Kind regards,

/ Joel Ramdial, MA, RD, LD
Instructor
Director: MS Applied Nutrition
Kinesiology, Nutrition, and Recreation
joel-ramdial (semo.edu)

T (573) 651-2919
jramdial@semo.edu
msan@semo.edu

Respondent Validation Interpretation and Request for Feedback (page 1 of 4)

Ramdial, Joel

From: Ramdial, Joel
Sent: Monday, April 25, 2022 12:30 PM
Subject: Health Behaviors Interview Findings and Interpretations - Request for Feedback

Hello!
I am emailing to share my findings, and am asking for feedback on my overall interpretations and preliminary theory. These findings emerged from the set of interviews in which you participated last fall.
I am primarily interested in making sure that my interpretations represent what you and the other interviewees have experienced.
These findings include aggregated (combined) results based on the most commonly expressed sentiments and themes collected from over 20 interviews.
If you would be so kind, please read through these findings and email me with answers to the questions below. You can provide this feedback anytime between now and the end of the semester (May, 13th).
If you signed up for the second interview, please provide brief feedback here and expand in the interview.

If you choose to provide feedback, please answer the following questions in an email to jramdial@semo.edu:

1. Do my interpretations and preliminary theory represent what you have experienced or observed in your peers?
2. If my interpretations and preliminary theory are different from what you've experienced or observed, please explain how.

Feel free to provide any other feedback or comments you would like to share.
I'd appreciate any feedback, even one short sentence would be appreciated.

Interpretations and summary of responses:

- The majority of interviewees explained or implied that there are two major components that influence academic performance: 1) The ability to focus in class, on homework, or on online class materials; 2) Having the time and ability to complete work, prepare for class, attend class, and to give self-care (proper nutrition, exercise, sleep, stress reduction practices, etc.)
- Majority of interviewees described health-related variables as having an influence on their academic performance.
- Most of the health-related behaviors influenced overall feelings of well-being, self-image, stress levels, and anxiety levels.
- The overall trend was that a healthier lifestyle improves well-being, self-image, stress levels, and anxiety levels, which positively contribute to academic performance; Lack of healthy behaviors contributes to increased stress and anxiety, which negatively contribute to academic performance.
- Many described a stress "domino effect" or "cycle" in which stressful events or excessively busy times can impair one's ability to attend class, focus in class, eat well, sleep well, or exercise frequently; all of which add more stress and further impair health behaviors and academic performance. In periods like this, when time is short and stress is high, finding time to exercise adds more stress because of

Respondent Validation Interpretation and Request for Feedback (page 2 of 4)

the time it takes to exercise; Cravings for "unhealthy" foods increase and lead to worse eating habits; and sleep is disturbed.

- Many reported feeling "sluggish" or bad about themselves after eating unhealthy food items/drinking sugary beverages.
- Many reported feeling a boost in mood, self-confidence, and motivation after eating healthy food and exercising.
- Many reported that lack of sleep or sleep disturbances interfered with motivation, energy levels, and/or the ability to focus in a class.
- Many reported social support having a positive influence on academic performance.
- Few reported personal experiences with alcohol interfering with academic performance.
- Nearly all reported knowing one or more people whose academic performance was impaired as a direct result of alcohol consumption.
- Many explained that having a manageable schedule and good time-management skills reduces stress and increases their ability to perform well in class, even in times of high stress.
- The impact of the COVID-19 pandemic was inconsistent in some ways, but the overall trend was that it had a positive influence if the interviewee was able to use that time to reduce time commitments and develop time-management skills/develop healthy self-care habits.
- The pandemic had a negative influence on academic performance if the interviewee felt isolated, if his/her professor or instructor was not accommodating or understanding during the pandemic, or if his/her social support system was damaged or changed during the pandemic or upon returning to classes.
- The shift in education from face-to-face to online to a mixed model contributed to stress in many interviewees.
- Many reported that high employment workload, high coursework load, and being a graduate student all add to stress.
- Several explained that determination, self-regulatory coping skills, motivation, or having something to prove can override the negative influence of stress on academic performance. Health and health behaviors may suffer, but with these attributes, students are able to push through the discomforts and experience high levels of academic performance.

Preliminary Theory:

My theory is based on McClusky's Power-Load-Margin Theory. In this theory, Power represents anything that gives a person the power to do a specific thing, while Load represents anything that could be a barrier to doing that specific thing. McClusky posits that people's ability to perform depends on having more power than load.

My theory categorized general and health-related factors as power and load variables. Factors that increase a student's ability to perform well academically are categorized as "Power Variables", and factors that decrease a student's ability to perform well academically as "Load Variables." Following McCluskey's model, my theory suggests that when a student's power variables are greater than load, s/he is more likely to experience academic success.

Respondent Validation Interpretation and Request for Feedback (page 3 of 4)

One interesting finding that I added into this theory, is that stress appears to both directly contribute to academic performance as a load variable, and mediates the ability of many health-related behaviors to contribute to power or load.
Here is the overview of my preliminary theory:
Power variables (Directly increases academic performance):

- Ability to focus in class
- Determination/motivation
- Having enough time to complete course requirements

Load variables (Directly decreases academic performance):

- High stress or anxiety
- Distracted, sleepy, or hungry in class
- Lack of time to complete course requirements
- Heavy alcohol consumption
- Lack of determination/motivation

Variables that increase the power variables' and/or decrease the load variables' influence on academic performance (indirectly increase academic performance):

- Well-rested, sleeping well
- Feeling low amounts of stress and anxiety
- Feeling healthy
- Feeling confident
- Healthy eating
- Consistent access to food
- Consistent exercise
- Social support (Classmates, teammates, friends, family, co-workers)
- Good time-management skills, self-discipline, self-regulation
- Having a manageable schedule

Variable that increase the load variables' and/or decrease the power variables' influence on academic performance (indirectly decrease academic performance):

- Lack of sleep and disturbed sleep
- Alcohol consumption the night before class, heavy alcohol consumption in general
- High amounts of stress and anxiety
- Feeling badly about oneself (lack of confidence, poor self-image, etc.)
- Eating / drinking highly processed, high sugar foods and beverages
- Consistent lack of food / feeling hungry in classes
- Lack of physical activity
- Lack of social support, negative relationships
- Poor time-management skills, lack of self-discipline, lack of self-regulation
- Excessively demanding schedule

If you send me feedback, I will save your response, replace your name and identifying information with an anonymous code, and use your response to update or confirm my findings and theory.
For those who signed up for an interview, you can email me feedback and provide additional detail when we speak. you will receive a reminder one day before the interview. We will look at the components of the theory in more detail.

Once again, thank you so much for participating in my research. I truly appreciate you and your time.
This will be the last email I send to all attendees.

Respondent Validation Interpretation and Request for Feedback (page 4 of 4)

If you need anything or have questions about this or the final results of the study, please contact me anytime.
Kind regards,

/ **Joel Ramdial, MA, RD, LD**
Instructor
Director: MS Applied Nutrition
Kinesiology, Nutrition, and Recreation
joel-ramdial (semo.edu)

T (573) 651-2919
jramdial@semo.edu
msan@semo.edu

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STATE UNIVERSITY · 1873®

Appendix J

Raffle Winner Email

Ramdial, Joel

From: Ramdial, Joel
Sent: Thursday, March 17, 2022 8:13 PM
To: [redacted]
Subject: Interview Raffle Winner!

Hello [redacted]
Congratulations!
You were the winner of the first $25 Amazon gift card awarded to interview participants of my research study. Your participant number 12 was randomly selected out of 20 who entered the raffle.
Please reply to this email to claim your prize and make arrangements for how to get the card. I can mail you the card or you can pick it up from my office after we return from spring break.
Thank you for completing my survey and participating in the interview! I really appreciate your help with my research.
Once again, thank you and congratulations!

/ Joel Ramdial, MA, RD, LD
Instructor
Director: MS Applied Nutrition
Kinesiology, Nutrition, and Recreation
joel-ramdial (semo.edu)

T (573) 651-2919
jramdial@semo.edu
msan@semo.edu

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Appendix K

Survey Question Rationale and Alignment

This appendix provides an explanation of why survey questions were included, the type of variable measured by the survey questions, the research questions related to each survey question, and source of the survey question. A summary of the research questions is provided below for cross-referencing purposes.

Research Questions

1. Is there a relationship between health-related behaviors and academic performance among college students at a Public Midwestern University?
    - 1a. Is there a relationship between nutrition habits and academic performance among college students at a Public Midwestern University?
    - 1b. Is there a relationship between exercise habits and academic performance among college students at a Public Midwestern University?
    - 1c. Is there a relationship between sleep habits and academic performance among college students at a Public Midwestern University?
    - 1d. Is there a relationship between alcohol use and academic performance among college students at a Public Midwestern University?
2. Is there a significant difference in academic performance of food secure and food insecure college students at a Public Midwestern University?

Survey Question Rationale and Alignment

Survey Question Topic	Proposed Type of Variable and Relationship to Research Questions	Source of Survey Question(s)	Literature / Support for Inclusion
Academic performance:			
Cumulative college grade point average Estimated fall 2021 grade point average	Dependent variable for all research questions.	Researcher	Despite the valid concerns with measuring academic performance of higher education students with grade point average (GPA), GPA remains the most common metric of academic performance in higher education because no other metric has emerged that is as reliable, valid, and temporally stable (Richardson et al., 2012).

Total college credits earned Undergraduate or graduate student			Control variables used in several studies
Quality of eating habits	Independent variable (predictor) for research questions 1 & 1a. Possible moderating or mediating variable for all other research questions.	Using Colby et al.'s (2020), free, validated Short Healthy Eating Index. This scale was developed from the larger Healthy Eating Index, which is a popular dietary assessment tool that allows researchers to compare one's intake to the national standards for nutritional adequacy: Dietary Guidelines for Americans (Colby et al., 2020).	Several researchers have found significant relationships between eating habits and academic performance of college students (Burrows et al., 2017; Reuter et al., 2020; Valladares et al., 2016; Wald et al., 2014).

Food security	Independent variable (predictor) for research question 2. Possible moderating variable for all other research questions.	Using Hager et al.'s (2010) Vital Signs 2 Question Screening for food insecurity. This instrument was modified from the USDA's 18 Item Screening Tool and is free to use (Hager et al., 2010).	Multiple researcher studies have found negative relationships between food insecurity and academic performance of college students (O'Neill & Maguire, 2017; Payne-Sturges et al., 2018). Recent studies are findings high rates of food insecurity among college students (Nikolaus et al., 2020; Wolfson & Leung, 2020).
Exercise habits	Independent variable (predictor) for research question 1b. Possible moderating or mediating variable for all other research questions.	Using the International Physical Activity Questionnaire – Short Form (IPAQ), which is valid and free to use (Craig, 2003).	Several studies have found a positive relationships between physical activity and academic performance as an indirect or moderating variable in college students (Abbasi et al., 2021;

			Meyer & Larson, 2018; Nasui & Popescu, 2014; Scott et al., 2016; Wald et al., 2014)
Sleep habits	Independent variable (predictor) for research question 1c. Possible moderating or mediating variable for all other research questions.	Using the free, valid Medical Outcomes Study (MOS) Sleep Scale developed by Stewart and Ware as described in the work of Hays and Stewart (1992).	Sleep habits have been found to be significant predictors of GPA in multiple studies (Singleton & Wolfson, 2009; Taylor et al., 2013). Burrows et al. (2017) confirms that health behaviors such as alcohol consumption, sleep, and mental health are the most common health metrics assessed as predictors of academic performance.
Alcohol consumption habits	Independent variable (predictor) for	Using the National Institute of Health: National Institute on	Multiple studies have found alcohol consumption to be a significant predictor

	research question 1e. Possible moderating for all other research questions.	Alcohol Abuse and Alcoholism's (2021) three-question alcohol consumption assessment. The NIAAA's Task Force on Recommended Alcohol Questions recommends asking a minimum of the three question set.	of academic performance (Singleton & Wolfson, 2009; Wald et al., 2014). Burrows et al. (2017) confirms that health behaviors such as alcohol consumption, sleep, and mental health are the most common health metrics assessed as predictors of academic performance.
Demographic questions			
Gender Race / ethnicity	Control variable for all research questions.	Using demographics questions provided by Fernandez et al. (2016) in their recommendations for comprehensive and inclusive demographic	These variables are frequently included as control or moderating variables in study designs investigating academic performance and retention (Payne-Sturges et al., 2018;
Family income	Possible moderating variable for all research questions.		

		questions. This document was obtained through Engineering Education Commons.	Richardson et al., 2012; Scott et al., 2016; Singleton & Wolfson, 2009; Taylor et al., 2013; Valladares et al., 2016; Wald et al., 2014)
Age	Possible moderating variable for all research questions.	Researcher	
Height and weight	Possible moderating variable for all research questions.	Researcher	Will be utilized to calculate BMI, which will be included as a moderating or control variable. Body Mass Index has been found to be an individual predictor of academic performance in some studies (Aimé et al., 2017; Wald et al., 2014).
Current living situation Meal plan			Including as a moderating variable due to the influence

	on access to food and other predictors (Payne-Sturges et al., 2018).

Appendix L

Interview Protocol

Hello _____! Thank you for agreeing to be interviewed for my research. I really appreciate your time and participation. My name is Joel Ramdial. This research is part of my Dissertation in Practice for the University of Missouri Doctorate in Education Leadership and Policy Analysis program. I teach here at Southeast Missouri State University in the food and nutrition programs.

As you know, the purpose of this research is to investigate how nutrition and health behaviors influence academic performance. During this interview, I will ask you some questions about your experience as a student, what you feel influences your academic performance, and how nutrition and health behaviors influence your academic performance. I will be taking notes throughout the interview and will ask some follow up questions from time to time.

The interview should take between 30 to 45 minutes to complete and you can stop at any time.

Before we begin, I want to confirm that you are aware that this interview is being recorded by Zoom. Zoom will send me a video and typed transcript of our interview. I am going to watch the video and correct the transcription after we are done. I will save a copy of the transcript and zoom recording on a password protected usb drive. I will then delete the recording and transcript from Zoom's cloud storage.

The information you provide will be kept confidential. All information reported from this interview will not provide your name or any other information that could identify you or

be traced back to you. After the interview is complete, I will enter you into a raffle for a chance to win one of two $25 Amazon gift cards.

Do you have any questions? **(Answer questions and proceed)**

Would you like to continue? **(If yes, proceed. If no, thank the participant and end the zoom call.)**

1. How is your semester going?
2. How would you describe yourself as a student?
3. In general, what do you think are the biggest influences on your grades?
4. As you know, I am primarily focused on nutrition and health behaviors. How do you think nutrition (foods and beverages) influence academic performance?
5. How do you think access to healthy food influences academic performance?
6. In the survey, I also asked about physical activity, sleep, and alcohol consumption habits. I am also interested in how stress and stress management are involved. How do you think these health-related behaviors influence academic performance?
    a. Follow-up if stress was not discussed: something that's come up in some of the other conversations I've had with students has been an idea that stress sometimes impacts things in one way or another,

> and it could influence the way someone eats or stress levels could impact classes. Do you feel that there's a relationship there and if so, how does that work into the mix?

Thank you so much for participating in this interview. I am sincerely grateful. There is a possibility that I may contact you again and ask you to participate in a focus group to help validate my conclusions from the study. Would you be ok with that?

You have been assigned a participant number and entered into the raffle for the Amazon gift cards. Once all the interviews are completed, I will randomly select two winners using a random number generator. The winners will be contacted immediately and have 1 week to claim their prize.

Once the raffle prizes have been awarded, I will delete the raffle entry survey results that contain your email address.

Thank you again! If you have any questions or follow-up information, please contact me through the same email I used to contact you.

Appendix M

Sample of Transcribed Interview Field Notes

Participant 11.11.5

Interview Field Notes

Interviewer

How is your semester going?

11.11.5

Classes are typical. Usually good.

Interviewer

How would you describe yourself as a student?

11.11.5

Pretty good. I prefer in person so I can ask questions. I'm more engaged in in person classes.

I need deadlines, I'm liked by classmates, make good grades. I'm satisfied with my grades. I have work balance.

Interviewer

In general, what do you think are the biggest influences on your grades?

11.11.5

Time management. My children and life.

Interviewer

As you know, I am primarily focused on nutrition and health behaviors. How do you think nutrition (foods and beverages) influence academic performance?

11.11.5

Very important, if you're not eating a lot it impacts physical and mental performance. And can cause anxiety and harm mental health.

Interviewer

How do you think access to healthy food influences academic performance?

11.11.5

Referred to Maslow's hierarchy, stating if you have no food you are missing basic needs. This would impact someone's ability to work and performing class.

Interviewer

In the survey, I also asked about physical activity, sleep, and alcohol consumption habits. I am also interested in how stress and stress management are involved. How do you think these health-related behaviors influence academic performance?

11.11.5

Sleep is important. Mental health and anxiety are also important. Mental health and anxiety can cause a domino effect. Referred to when one area of life has problems it can negatively impact another which can lead to more anxiety and poor health choices.

Appendix N

Interview Response References per Sub-Theme and Participant

			Interview Participants																			
Level 2 Sub-Themes		Participants →	11.11.5	11.11.6	11.11.95	11.13.11	11.13.4	11.14.1	11.14.3	11.15.10	11.15.5	11.16.5	11.18.2	11.18.85	11.19.12	11.19.5	11.20.11	11.29.11	11.8.11	11.8.6	11.9.6	12.7.5
Total number of references →		446	14	13	28	19	21	19	6	27	23	25	27	22	26	28	21	14	34	26	28	25
DV	IV	↓Number of References ↓																				
		# Per Sub-Theme	# Per Participant																			
IV Access Load	DV AP FocusLoad	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Med V Stress Load	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	MedV Hunger Load	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MedV Nutrition Load	12	0	1	1	0	1	1	0	1	0	0	1	2	0	1	0	0	2	1	0	0
IV Stress, Mental Health Load	DV Attendance, Focus, Exam, Performance, Completing work Load	14	0	1	1	0	0	0	0	2	1	2	0	1	0	1	1	0	0	2	0	2
	MedV Alcohol, drugs Load	4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1
	MedV Effort, Academic Habits, Motivation, Determination Load	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	MedV Nutrition, Exercise, Stress, Motivation Load	14	1	1	1	0	1	1	0	2	0	1	0	0	0	0	0	0	1	4	0	1

	MedV Sleep Load	6	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	2	1	0
IV Access Power	MedV Hunger Power	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	MedV Nutrition Power	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IV Knowledge, Competence, Comprehension Power	DV AP Power	4	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0
IV Mental Health Power	DV AP Grades, Focus, Performance Load	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1
MedV Alcohol Load	DV AP Attendance, Focus, Grades Load	12	0	1	0	1	1	1	0	0	0	1	1	1	0	1	1	0	0	0	1	2
	MedV Mental Health, Motivation, Sleep Load	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1
MedV Exercise Load	MedV, ModV Stress, Mental health Load	2	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
	ModV Confidence Load	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
MedV Health Behaviors Load	DV AP Attendance, Focus, Grades Load	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	MedV Stress, Mental Health Load	3	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
MedV Hunger Load	DV AP Focus Load	9	2	0	0	0	0	0	0	0	1	1	0	2	0	1	0	0	0	0	1	1
	IV Stress, Mental Health Load	2	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

	MedV Time Management, Routine Load	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
MedV Motivation, Drive Load	DV AP Performance, Grades Load	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
MedV Nutrition Load	DV AP Focus, Ability to work, Performance Load	9	1	0	0	0	0	0	0	1	0	0	1	1	1	1	0	0	1	2	0	0	
	MedV Hunger Load	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	MedV Motivation, Energy, Sluggish, Groggy Load	16	0	1	0	0	1	1	1	1	1	1	1	0	0	3	1	1	1	1	1	0	
	MedV Stress, Mental Health, Feel better or worse Load	12	1	0	2	1	1	1	0	0	0	0	1	0	1	0	1	0	0	2	1	0	
	ModV Confidence Load	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	ModV Time Management, Balance, Routine Load	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Medv Sleep Load	DV Focus, Complete work Load	11	0	0	0	0	0	0	1	1	3	1	0	1	1	0	0	1	0	1	0	1	
	MedV Energy, Groggy Load	3	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	
	MedV Motivation Load	3	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	MedV Nutrition Load	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	

	MedV Stress, Anxiety, Feel better or worse Load	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
	MedV Nutrition Habits Load	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
MedV Effort, Work-ethic, Academic habits Power	DV AP, Focus, Performance Power	25	1	0	1	1	1	1	1	1	1	3	1	1	0	2	1	2	3	0	3	1
	MedV Mental Health, Motivation Power	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MedV Exercise Power	DV AP Focus, Class performance Power	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
	MedV Balance, Routine Power	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	MedV Confidence Power	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MedV Energy, Sluggish Power	4	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0
	MedV Stress, Mental Health, Feel better Power	11	0	1	1	0	0	1	0	1	0	1	1	0	1	1	1	0	0	1	1	0
	MedV Effort, Work-ethic, Academic habits Power	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MedV Health Behaviors Power	MedV, ModV Stress, Mental Health Power	3	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0
MedV Hunger Power	DV AP Focus Power	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

	MedV Motivation Power	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MedV Mental Health Load	ModV Relationships, Social Support Load	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
MedV Motivation, Drive Power	DV AP Attendance, Performance, Focus Power	7	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	1	1	1	0	1	0
	MedV Effort Power	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0
MedV Nutrition Power	DV AP Focus, Performance Power	12	0	0	0	0	0	0	0	1	0	1	0	3	2	2	0	1	0	1	1	0	
	MedV Confidence Power	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	MedV Energy, Stamina, Sluggish Power	8	0	0	1	1	1	0	0	0	0	0	2	0	0	1	0	0	0	0	2	0	
	MedV Motivation Power	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
	MedV Stress, Mental Health, Feel better Power	13	0	1	2	1	1	2	0	1	0	0	0	2	0	0	0	0	0	2	1	0	
	MedV Effort, Work-ethic, Academic habits Power	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MedV Nutrition, Eating habits Power	ModV Time Management, Balance, Routine Power	3	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0

MedV Sleep Power	DV AP Focus, Grades Power	5	0	0	1	0	0	0	0	0	0	1	0	1	0	1	0	0	1	0	0	0
	MedV Balance, Routine, Organization Power	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	MedV Energy Power	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MedV Health Behaviors Power	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	MedV Stress, Mental Health, Mood Power	3	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
	ModV Confidence Power	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ModV Courses, Courseload, Employment Load	ModV Time, Obligations Load	6	0	0	1	1	0	0	0	1	0	0	0	0	1	0	1	0	0	1	0	0
ModV Courses, Courseload, Faculty Load	MedV Stress, Mental Health Load	12	0	0	1	0	1	1	0	1	0	1	0	0	2	0	0	0	2	0	3	0
ModV Courses, Coursework, Online Load	MedV Effort, Academic Habits Load	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ModV COVID Load	MedV Drugs Load	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	MedV Exercise Load	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	MedV Stress Load	4	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0
ModV Employment Workload Load	MedV Stress, Mental Health Load	3	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

ModV Facilities to prepare food Load	IV Access Load	3	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
ModV Facilities, Available food options Load	IV Access Choices Load	7	0	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	3	0	0	0
ModV Health Problems Load	MedV Sleep Load	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0
ModV Money Load	IV Access Load	4	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	1
	IV, MedV Stress, Mental Health Load	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
ModV Priorities Load	MedV Health Behaviors, Nutrition Load	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ModV Relationship Load	MedV Alcohol Load	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	MedV Effort, Work-ethic, Distract from Academic Habits Load	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
ModV Social support Load	MedV Motivation Load	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
ModV Social, Classmates, Standards Load	MedV Motivation Load	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
ModV Time, Employment, Courseload Load	ModV Relationship, Social support Load	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0
	IV, MedV Stress Load	6	0	0	0	0	1	0	0	1	0	0	0	0	1	0	1	0	0	0	2	0

ModV Time, Obligations Load	MedV Exercise Habits Load	3	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0
	IV Access Load	4	0	0	0	0	0	1	0	0	2	0	1	0	0	0	0	0	0	0	0	0
ModV Time Management Load	MedV Sleep Load	5	0	0	1	0	1	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0
	ModV Self-regulation, Self-care Load	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
ModV Time management, Planning, Balance Load	IV Stress, MedV Stress, Mental Health Load	3	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0
	MedV Nutrition Load	3	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
ModV Time Managment Load	ModV Balance Load	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
ModV Confidence Power	MedV Motivation Power	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
ModV Courses, Class Format, Faculty, Engaging Power	MedV Effort, Academic Habits Power	6	1	0	0	1	0	0	0	0	1	1	0	0	0	0	0	1	0	0	1	0
ModV COVID Power	ModV Time Management Power	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
ModV Employment Positive Environment Power	MedV Motivation Power	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ModV Facilities,	IV Access Power	2	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Available options Power																							
ModV Facilities, Food preparation Power	IV Access Power	3	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
	MedV Nutrition Power	6	0	0	0	1	2	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	
ModV Health knowledge Power	MedV Nutrition Power	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	
ModV Maturity Power	ModV Time Management, Priorities Power	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
ModV Money Power	IV Access Power	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	
ModV Relationships, Classmates, Co-workers, Team, Friends Power	ModV Social Support Power	6	0	1	0	1	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	
ModV Relationships, Friends Power	IV Access, Food Security, Power	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ModV Relationships, Social support Power	MedV Effort, Academic Habits Power	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	MedV Mental Health, Mood Power	2	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	
	MedV Motivation Power	4	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	
	ModV Accountability Power	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	

	ModV General Positive Influence Power	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
ModV Self-regulation, Rewards Power	MedV Motivation, Determination Power	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
ModV Self-regulation, Schedule, Breaks Power	ModV Time Management Power	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1
ModV Self-regulation, Self-Care Power	MedV Energy Power	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	MedV Stress, Mental Health Power	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
ModV Time Management, Planning Power	MedV Hunger Power	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	MedV Nutrition Power	2	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
ModV Time Management, Routine, Balance Power	IV Mental Health, Stress Power	4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
	MedV Effort, Academic Habits Power	10	4	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	1	1	0	0	
	MedV Health Behaviors Power	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	MedV Sleep Power	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	ModV Priorities Power	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
ModV Time Management, Self-regulation Power	MedV Alcohol Power	3	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0

ModV Values, Meaningful, Power	MedV Motivation, determination Power	6	0	1	0	0	0	0	1	0	0	0	3	0	0	0	0	0	1	0	0	0
ModV Willpower, Drive Power	MedV Effort, Work-ethic Power	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MedV Hunger Power	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	MedV Motivation Power	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	MedV Sleep, Energy Power	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Total number of references		446	14	13	28	19	21	19	6	27	23	25	27	22	26	28	21	14	34	26	28	25
		Total	11.11.5	11.11.6	11.11.95	11.13.11	11.13.4	11.14.1	11.14.3	11.15.10	11.15.5	11.16.5	11.18.2	11.18.85	11.19.12	11.19.5	11.20.11	11.29.11	11.8.11	11.8.6	11.9.6	12.7.5
			Interview Participants																			

Appendix O

Email from Participant Providing Respondent Validation

Ramdial, Joel

From: [redacted]
Sent: Saturday, April 30, 2022 11:52 PM
To: Ramdial, Joel
Subject: Fw: Health Behaviors Interview Findings and Interpretations - Request for Feedback

Hi Joel,

In reviewing your findings from your research, I agree with all of the Power and Load variables that you discovered. Some were things I hadn't even thought of myself, but when seeing them in combination with other suggestions that I know I too had mentioned, they made perfect sense. These are all things I have seen in peers as well. While I may be a non-traditional student coming back to school, in trying to think about my initial collegiate experience, these findings all align with the experiences of myself and my acquaintances.

Thank you for your time, and best of luck in the conclusion of your research.
Take care,

[redacted]

From: Ramdial, Joel <jramdial@semo.edu>
Sent: Monday, April 25, 2022 12:30 PM
Subject: Health Behaviors Interview Findings and Interpretations - Request for Feedback

Hello!
I am emailing to share my findings, and am asking for feedback on my overall

VITA

Joel Ramdial was born in Poplar Bluff, MO, graduated from Poplar Bluff High School and completed an Associate of Arts at Three Rivers Community College. After earning an AA, Joel completed a BFA at Southeast Missouri State University, moved to Edwardsville, IL and eventually became a certified personal trainer. This led to a desire to become a Registered Dietitian to earn the credential that would qualify him to provide dietary guidance to clients. Joel returned to Southeast Missouri State University and completed an MA in Human Environmental Studies: Dietetics, completed a nine-month Dietetics Internship program at the St. Louis Veteran's Affairs Medical Center in St. Louis, MO and became a Registered Dietitian in 2013. He currently teaches in the Nutrition programs at Southeast Missouri State University and directs the MS Applied Nutrition Program.