

DISSERTATION

PHYSICAL ACTIVITY AND MENTAL HEALTH
AMONG UNDERGRADUATE STUDENTS

Submitted by

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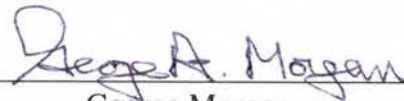
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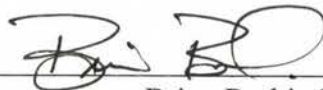
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WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY CATHERINE ELLIOT ENTITLED PHYSICAL ACTIVITY AND MENTAL HEALTH AMONG UNDERGRADUATE STUDENTS BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

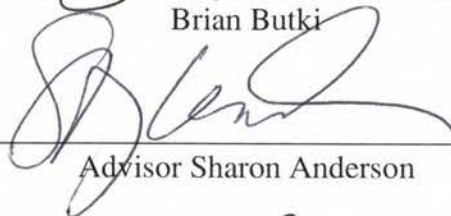
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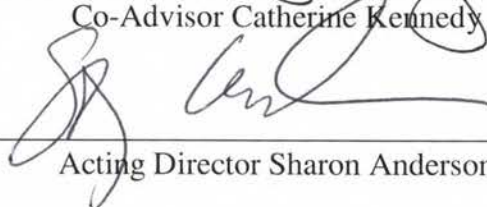
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ABSTRACT OF DISSERTATION
PHYSICAL ACTIVITY AND MENTAL HEALTH
AMONG UNDERGRADUATE STUDENTS

This study was conducted to analyze possible influences of physical activity level, student group, and/or gender on seven mental health variables related to depression in undergraduate students. A campus health initiative, Healthy Campus 2010, set goals of increasing the number of students who are physically active three days per week to 55% and decreasing suicide attempts by 2010. Focusing on undergraduate students, the goal of this research was to replicate previous research efforts that linked physical activity levels with mental health related to depression.

The national sample included a random selection of 2,146 students from the reference group of 61,758 college students enrolled as undergraduate students who completed the spring 2007 National College Health Assessment (NCHA). Colorado State University (CSU) participants served as a comparison group to the NCHA reference group. The analysis included seven 4 x 2 x 2 three-way ANOVAs to discover relationships between the seven mental health variables that related to depression (felt hopeless, felt overwhelmed, felt exhausted, felt very sad, felt depressed, considered attempting suicide, and attempted suicide) and the three independent variables, physical activity level (0 days, 1–2 days, 3–4 days, and 5–7 days), student group (NCHA reference group and CSU), and gender.

There were relationships between the five variables that reflected mild mental health issues and physical activity levels, with small effect sizes. As the physical activity levels increased, students reported better mental health related to depression. There was one significant interaction between student group and physical activity level on the *felt exhausted* variable. There was a relationship between variables reflecting mild mental health and gender. Males reported better depression related mental health, with small to typical effect sizes ($d = .20-.49$). However, the *contemplating suicide* and *attempting suicide* variables were not significantly related to gender or physical activity levels.

Overall, these data support current research by showing similarities between college students and other demographic groups. Physical activity and gender have shown correlations with mental health. These implications may influence college health services to use an integrated care system, merging mental health with medical services.

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TABLE OF CONTENTS

TITLE PAGE.....	i
SIGNATURE PAGE.....	ii
ABSTRACT OF DISSERTATION.....	iii
ACKNOWLEDGEMENTS.....	v
TABLE OF CONTENTS.....	vi
CHAPTER 1: INTRODUCTION.....	1
Purpose.....	4
Research Approach.....	5
Fundamental Research Question.....	8
Mental Health Research Questions.....	8
Definition of Terms.....	9
Limitations and Delimitations.....	13
Need or Significance.....	15
Researcher’s Perspective.....	18
CHAPTER 2: LITERATURE REVIEW.....	22
Research Frame.....	22
Background.....	23
Mental Health Defined.....	25
Physical Activity Defined.....	25
Depression Defined.....	26
Depression and Overtraining.....	27
Depression and Gender Differences.....	28

Physical Activity and Depression.....	29
Physical Activity as an Alternative Depression Treatment.....	31
Physical activity frequency and intensity on depression.....	32
Physical activity as depression prevention.....	33
Gender Differences and Mental Health.....	34
Physical Activity and Mental Health in the Undergraduate Population.....	35
Mental Health on Campus.....	38
Mental Health Prevalence.....	39
Healthy People 2010.....	40
Physical Activity as a Health Indicator.....	40
Mental Health as a Health Indicator.....	41
Healthy Campus 2010.....	41
Physical Activity as a Health Indicator.....	43
Mental Health as a Health Indicator.....	43
Integrative Healthcare on Campus.....	44
Relationship Between Physical Activity and Mental Health.....	45
Physical Activity and Severity of Mental Health Issues.....	46
Other Mental Health Benefits from Physical Activity.....	47
Participation in Sports.....	48
Physical Activity and Other Mental Health Aspects.....	49
Physical Activity-Mental Health Causality Relationship.....	50
Older Adult Physical Activity.....	52
From Research to Theory.....	53

Prospective Longitudinal Research.....	54
Randomized Control Trials.....	55
Methodological Flaws in the Research.....	56
Implications for College Healthcare.....	57
CHAPTER 3: METHOD.....	58
Research Design.....	58
Independent Variables.....	58
Dependent Variables.....	59
Research Questions.....	60
Fundamental Research Questions.....	60
Main Research Questions.....	61
Interaction Questions.....	62
Post Hoc Research Question.....	62
NCHA Instrument.....	63
Reliability and Validity.....	63
NCHA Inter-item Correlations.....	64
Data Collection.....	65
Participants and Site.....	66
Procedure.....	68
Data Analysis.....	69
CHAPTER 4: RESULTS.....	72
Foundation for Interpreting Data.....	72
Sample.....	72

Initial Data Assessment.....	73
Assess the Data for Violations of Assumptions.....	75
General Statistical Interpretation.....	76
Main Research Questions.....	78
Main Research Question One: Felt Hopeless.....	78
Main Research Question Two: Felt Overwhelmed.....	80
Main Research Question Three: Felt Exhausted.....	82
Interpretation of the significant interaction.....	84
Main Research Question Four: Felt Very Sad.....	87
Main Research Question Five: Felt Depressed.....	89
Main Research Question Six: Considered Attempting Suicide.....	91
Main Research Question Seven: Attempted Suicide.....	93
Summary.....	94
CHAPTER 5: DISCUSSION.....	97
Rationale.....	97
Research Approach.....	98
Overall Research Objective.....	102
Main Research Questions.....	102
Research Question One.....	103
Research Question Two.....	104
Research Question Three.....	104
Research Question Four.....	105
Research Question Five.....	106

Research Question Six.....	106
Research Question Seven.....	106
Measures.....	107
Limitations and Delimitations.....	109
Conclusions.....	112
Implications.....	116
Recommendations.....	117
Summary of Conclusions and Implications.....	118
REFERENCES.....	119
APPENDICES.....	126
Appendix A.....	126
NCHA Instrument.....	126
Appendix B.....	134
CSU Human Research Approval.....	134
Appendix C.....	135
NCHA Institutional Profile for CSU.....	135
Appendix D.....	140
CSU Informed Consent Form.....	140
Appendix E.....	141
Script for Data Collection.....	141

CHAPTER 1: INTRODUCTION

During the past few decades, research has increased in the area of physical activity as it relates to mental health, particularly depression. Various experts in the fields of both mental and physical health have examined the relationship between physical activity and mental health. However, research focusing specifically on undergraduate college students is limited. This dissertation targets the undergraduate audience and broadens the knowledge base about the relationship between physical activity and mental health.

Mental health issues cover a myriad of illnesses, of which depression is one of the most prevalent. Most of the research on physical activity and mental health deals specifically with depression. The Centers for Disease Control and Prevention (CDC) (2007) claim, “the annual economic burden of depression in the United States (including direct care, mortality, and morbidity costs) has been estimated to total almost \$44 billion” (para. 1). It is apparent from this statistic that mental health issues are a large part of healthcare today.

Depression is not the only mental health issue plaguing people around the world. Mental health issues, including mental, behavioral, neurological, and substance-use disorders, affect hundreds of millions of people worldwide (World Health Organization Department of Mental Health and Substance Abuse [WHO], 2002). Most notably, depression occurs in more than one in 20 people ages 12 and older (Pratt & Brody, 2008).

“Estimates made by World Health Organization in 2002 showed that 154 million people globally suffer from depression” (WHO, n.d. b, The bare facts section, para. 2). With such a prevalence of depression worldwide, researchers and policy makers alike have given increased attention to mental health issues.

The United States federal government involvement in the issues of mental health and physical activity is evidenced in *Healthy People 2010: Understanding and Improving Health* (hereafter referred to as *Healthy People 2010*). Produced 20 years ago by the United States Department of Health and Human Services (USDHHS), *Healthy People 2010* is a living health document that sets national health objectives, with revisions every decade. Under review by many organizations and for use by all, this document can assist with countless initiatives aimed at improving health.

Healthy People 2010 has identified 10 health indicators, including physical activity, overweight and obesity, tobacco use, substance abuse, responsible sexual behavior, injury and violence, environmental quality, mental health, immunization, and access to healthcare. Because the government holds health indicators in high regard, such facets of health deserve particular attention in research. *Healthy People 2010* identified physical activity and mental health as two of the 10 leading health indicators because they had the required constructs of being motivational, measurable, and important public health issues (USDHHS, 2005).

Healthy People 2010 can be utilized by organizations, groups, or individuals to integrate health into programming, events, or health promotions (USDHHS, n.d. c, How will the objectives be used section). The *Healthy People 2010* objectives can assist organizations in measuring current health status and future health outcomes of personnel.

Healthy People 2010 seeks to improve health with a systematic approach. The document aims to affect national health status by creating goals and objectives that interact with policies, interventions, and access to health care (USDHHS, n.d. b, Healthy people in healthy communities section).

A similar document called *Healthy Campus 2010: Making It Happen* (hereafter referred to as *Healthy Campus 2010*) restructured *Healthy People 2010* objectives to suit the needs of undergraduate students across the United States. As a campus version of the document adapted from *Healthy People 2010*, *Healthy Campus 2010* hones in on the specific needs of college-aged students. *Healthy Campus 2010* uses more than 200 objectives that focus on the college student population, with the goal of increasing overall health in that group (ACHA, 2009c). The health indicators in *Healthy People 2010* formed the basis for the creation of these objectives. Objectives from both of these documents have instigated physical activity and mental health to be topics of research. Both documents can facilitate change if health organizations use the data to effectively guide their program efforts.

Most of the published research studies thus far have emphasized adult target populations; however, my research represents an analysis of undergraduate students, thus having practical applications in college healthcare. The prevalence of mental health issues, especially depression, does not escape the college-aged population. There may be benefits to using alternative medicine in the treatment of mental illness and depression; hence, physical activity could be part of the solution. The current theory proposes that physical activity has a positive overall effect on mental health, specifically depression, among adults. It is possible that one may use physical activity for prevention of or

prescription for mental health illnesses such as depression. And some health clinics are beginning to use a physical activity prescription for their patients with mental health issues. Specifically, general practitioners and mental health professionals may use physical activity as a prescription for depression. In the university setting, this application of services can be quite similar provided the campus offers health services. It is possible that adopting a physical activity prescription to support mental health could close the gap between these two aspects of health.

Purpose

The purpose of this research was to analyze the relationship of mental health to physical activity level, student group, and/or gender among undergraduate students. The three independent variables were physical activity level, student group, and gender. Measurement of physical activity was on four levels: 0 days, 1–2 days, 3–4 days, and 5–7 days of physical activity in the previous week relative to the date of measurement. The two student groups used for comparison were the CSU student group and the NCHA reference group. Gender was analyzed by female and male groups. The dependent variables represented poor mental health related to depression based on seven different mental health issues that varied in intensity from mild to severe. The seven mental health variables related to depression were used to analyze relationships with physical activity levels, student groups, and genders.

Most recent research in physical activity and mental health covers an age demographic in which college students would fit (ages 18 to 23 years). However, few, if any, studies specifically analyze college students and the subgroups within this population (female and male students with various physical activity levels). As noted,

researchers support the notion that physical activity improves mental health status, and many studies specify depression as the target issue under the umbrella of mental health. This research can add to the available data by determining whether an analogous physical activity/mental health and depression trend exists within the college student population among males and females at CSU and in the NCHA reference group.

The research used the NCHA survey instrument; which comprises seven pages of 58 multifaceted questions about overall health. This survey assists health administrators in identifying health disparities among college students. The survey represents all self-reported data consistent with two particular constructs of concern for this dissertation. One construct is about weekly physical activity frequency and the other is about mental health status related to depression. In addition, the demographic variable of gender and student group served as additional constructs. CSU group and NCHA reference group students provided the group comparisons termed *student group*.

Research Approach

The research perspective in this dissertation, containing a forced-choice survey, stemmed from the quantitative research design. As noted previously, this dissertation had three independent variables and seven dependent variables. The NCHA measured the main independent variable pertaining to weekly physical activity frequency on a Likert scale split into eight possible levels (0 to 7 days of physical activity). However, so that each level would have more participants in each group, I combined the eight levels into four meaningful groups of the physical activity level, 0 days, 1–2 days, 3–4 days, and 5–7 days a week. They are meaningful because of the Healthy Campus 2010 goals. These goals use three days of physical activity as the minimum for students to be considered

sufficiently active for health. Another reason for four levels of measurement was to discover potential differences between the levels. It may be possible that being somewhat physically active could have different results than being highly physically active. Therefore, I chose to separate 3–4 days of physical activity from 5–7 days. The same reasons apply for the split of 0 days with 1–2 days. The dependent variables of the mental health construct included a series of seven mental health items related to depression. Five of the mental health items asked respondents about the frequency of feelings that reflected mildly poor mental health related to depression. The other two mental health items asked respondents about the frequency of more serious mental health issues: their considering suicide and their attempting suicide. These seven mental health items related to depression were all scored on the same Likert scale: Never, 1–2 times, 3–4 times, 5 to 6 times, 7 to 8 times, 9 to 10 times, or 11 or more times within the last school year. Upon collecting the survey data, the Statistical Package for the Social Sciences (SPSS) Version 16.0 computed the frequency of students who were physically active on each of the four measurement levels. In addition, SPSS analyzed demographic data, including gender, from both the CSU student group and the NCHA reference group. SPSS also calculated the frequencies of the mental health variables related to depression to discover their prevalence among each of the independent variables.

There were three main comparisons in this research. There were also three independent variables; physical activity, student group, and gender. First, SPSS compared the four physical activity levels on the mental health levels. The physical activity levels were 0 days, 1–2 days, 3–4 days, and 5–7 days of physical activity. Second, SPSS compared the two different student types to each other in terms of mental

health related to depression. The student groups had two levels; the CSU group and the NCHA national reference group. Third, SPSS compared the females and males to each other according to mental health. The gender variable had two levels: females, and males. The tests of between-subjects effects in SPSS's ANOVA analyzed for an interaction between physical activity, student type, and gender in regard to the seven mental health dependent variables related to depression.

A national goal of the Healthy People 2010 effort is to “increase the proportion of adults who engage regularly, preferably daily, in moderate physical activity for at least 30 minutes per day” (U.S. Department of Health and Human Services, 2000, pp. 22–29). The creators of this national goal hoped that the prevalence of physical activity among Americans would double from a 15% baseline measurement to a national target of 30%.

The overarching physical activity goal of *Healthy Campus 2010* is to improve health, fitness, and quality of life through daily physical activity (ACHA, 2002). This is an important goal for undergraduate students. Specifically, the *Healthy Campus 2010* goal adapted from the national goal is to

Increase the proportion of college students who engage in physical activity at least 3 days per week that includes moderate physical activity for at least 30 minutes, or vigorous physical activity for 20 or more minutes per occasion. (ACHA, 2002 p. 79)

The NCHA survey used similar wording in its physical activity item. The national college baseline for this goal was 40.3% and the target goal was 55%. Since ACHA matched the language on the survey with the wording in the *Healthy Campus 2010* goal—achievement of physical activity for three days per week—institutions were able to validate whether or not the *Healthy Campus 2010* physical activity goal had been met at their institutions.

To create appropriate research questions, a review of the available health literature was necessary. The research theory in this dissertation maintained the view that physical activity has a positive influence on mental health related to depression. This theory was based on the cumulative research of Craft, Freund, Culpepper, and Perna (2007); Donaghy (2007); Dunn, Trivedi, and O'Neal (2001); Fox (1999); Harris, Cronkite, and Moos (2006); Paluska and Schwenk (2000); and Wiles, Haase, Gallacher, Lawlor, and Lewis (2007). Used to analyze mental health, these studies include random control trials, quasi-experimental studies, and meta-analyses, to name a few. The theory suggested in these studies indicates physical activity has the ability to positively affect mental health related to depression and possibly prevent depressive symptoms. Therefore, the research theory in this dissertation matched that of those researchers listed above.

Fundamental Research Question

The fundamental research question for this dissertation was, *What is the relationship between physical activity level and several variables that reflect poor mental health among undergraduate students?*

Mental Health Research Questions

The research questions involved in this dissertation use the term *mental health* when referring to mental health related to depression. The constructs in each mental health survey item assimilate closely to depression.

The primary research questions related to the mental health variables that reflect poor mental health for this dissertation included the following:

1. Do physical activity level, student group, and/or gender influence *feeling things were hopeless?*
2. Do physical activity level, student group, and/or gender influence *feeling overwhelmed by all you had to do?*
3. Do physical activity level, student group, and/or gender influence *feeling exhausted (not from physical activity)?*
4. Do physical activity level, student group, and/or gender influence *feeling very sad?*
5. Do physical activity level, student group, and/or gender influence *feeling so depressed that it was difficult to function?*
6. Do physical activity level, student group, and/or gender influence *seriously considered attempting suicide?*
7. Do physical activity level, student group, and/or gender influence *attempting suicide?*

Definition of Terms

American College Health Association (ACHA): “The American College Health Association is the principle advocate and leadership organization for college and university health” (ACHA, 2009b, para. 1). This organization is membership based and consists mostly of colleges and universities in the United States of America, with few international institutions.

Colorado State University (CSU) Group: Undergraduate students enrolled at CSU who self-selected to take the required health and wellness course offered through the Health and Exercise Science department. These students had the option not to complete the survey, assuming they were attending class when the survey collectors distributed the survey.

Disability adjusted life years (DALYs): “The disability-adjusted life year (DALY) [is] a measure that combines healthy life years lost because of premature mortality with those lost as a result of disability” (World Bank, 1993, p. 1). DALYs are defined in terms of the years of life lost for depression.

Exercise: “A subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness” (Caspersen, Powell, & Christensen, 1985, p. 126). Many studies discussed in the review of literature used the term *exercise* as the intervention focus. However, for this research, the term *physical activity* was the variable of interest. *Physical activity* was appropriate for this research since it was a broader term that encompassed *exercise* and the like.

Health behaviors: Actions that influence health either positively or negatively, and that affect one’s ability to sustain daily life functions. For example, some topical areas of emphasis in the NCHA survey included alcohol, tobacco, or other drug use; sexual health; weight; nutrition; exercise; mental health; personal safety; and violence (ACHA, 2002). The health behaviors pertinent to this research are physical activity level and mental health level.

Mental health: “Positive mood, general well-being, and relatively infrequent symptoms of anxiety and depression” (Stephens, 1988, p. 41). Additionally, mental health is “a state of successful mental functioning, resulting in productive activities, fulfilling relationships, and the ability to adapt to change and cope with adversity...indispensable to personal well-being, family and interpersonal relationships, and one’s contribution to society” (USDHHS, n.d. d, Definition of mental health section, para. 1). The NCHA survey included seven dependent variables that inquired about various levels of mental health. The survey asked,

Within the last school year how many times have you: felt things were hopeless, felt overwhelmed by all you had to do, felt exhausted (not from physical activity), felt very sad, felt so depressed that it was difficult to function, seriously considered attempting suicide, attempted suicide. (ACHA, 2002, p. 7)

The term *mental health* is used somewhat loosely in this dissertation. It is a general term used in this dissertation to mean mental health related to depression. The terms used in the survey items such as hopelessness, overwhelmed, exhausted, sad, depressed, and suicide all fit well into the category of depression, under the umbrella of mental health. These terms do not mention specific conditions of anxiety disorder, personality disorder, or mood disorder, therefore do not cover all aspects of mental health. An analysis of each mental health variable took place individually as a way to analyze various levels of mental health related to depression. In addition, *mental health* includes

A state of complete physical, mental and social well-being, and not merely the absence of disease. It is related to the promotion of well-being, the prevention of mental disorders, and the treatment and rehabilitation of people affected by mental disorders. (WHO, n.d. b, para. 1)

National College Health Assessment (NCHA) (Appendix A): A self-reported, forced-choice, general health survey that affiliated colleges and universities conducted.

The American College Health Association designed and assessed this survey and administered it at self-selecting colleges and universities. The 58-question survey queried overall health behaviors of college students.

National College Health Assessment (NCHA) reference group: A group of 107 self-selected colleges and universities across the United States of America that completed the NCHA survey via paper and pencil or via the Internet. For analysis, the NCHA reference group data excluded Colorado State University (CSU), which kept the groups heterogeneous. For my research, the NCHA reference group was a random sample of students from colleges and universities who completed NCHA surveys in spring 2007.

Physical activity: As one of the independent variables, a primary focus in this dissertation was physical activity, which encompasses exercise and physical fitness. The NCHA survey somewhat defined the physical activity construct: “On how many of the past seven days did you: participate in vigorous exercise for at least 20 minutes or moderate exercise for at least 30 minutes?” (ACHA, 2002, p. 6). Caspersen et al. (1985) also defined physical activity as

Any bodily movement produced by skeletal muscles that results in energy expenditure. The energy expenditure can be measured in kilocalories. Physical activity in daily life can be categorized into occupational, sports, conditioning, household, or other activities. (p. 126)

Physical fitness: Caspersen et al. (1985) explained physical fitness as “a set of attributes that are either health- or skill-related. The degree to which people have these attributes can be measured with specific tests” (p. 126). Some researchers measured and defined physical fitness levels in different ways. I considered physical fitness a form of physical activity within the review of literature, thus fitting it within the scope of this research.

Limitations and Delimitations

As in any research, many limitations affected the results of this dissertation. One of the biggest limitations was that the reference group data were secondary data from the ACHA rather than data collected at CSU. The CSU data were collected from select classrooms where professors allowed access in order to survey their students. In addition, this research used a convenience sampling procedure, thus decreasing the generalizability of findings. The results were not generalizable to all undergraduate students. However, because of the high response rate of the CSU group of students who took the pencil-and-paper survey in a required general education class, the data included a high representation of the CSU population.

Another limitation was the need to rely on the self-reported data from the students. This limitation includes the requirement that an assumption be made that the participants understood the questions and honestly responded. In this quantitative dissertation, the findings were subject to interpretation. Students with missing responses were excluded from the analysis. Specifically, students could not have missing data for the physical activity item, the mental health items, the gender item, or the year-in-school item for their responses to be included for analysis among the research questions containing those variables. SPSS filtered the year-in-school survey item to include first through fourth year and higher than fourth year undergraduate students, to specify the target population.

Another limitation included the wording of the physical-activity survey item. The item uses the term *exercise* rather than *physical activity*. It would have been best to use the *physical activity* instead of *exercise* provided there was more freedom to create the

survey. As a result, there is a disparity between the wording of the survey and that of the *Healthy Campus 2010* objective for physical activity. The NCHA used the term *exercise*, where *Healthy Campus 2010* used the word *physical activity*. Using *physical activity* instead of *exercise* could have helped prevent possible confusion between the two terms. For example, some students may be very physically active throughout the day, but when they read the word *exercise* they don't think to include all physical activities that they may have done. It was not possible to add a definition of *exercise* to the physical activity survey item. Such a definition may have assisted respondents in more accurately answering the item. However, the wording of the survey for this research was somewhat based on the *Healthy Campus 2010* objectives, so the constructs coincided well. Because of using the established NCHA instrument, there was no freedom to add questions without paying an extra fee, which was beyond the scope of the research budget. Therefore, this research was limited to the questions that the established NCHA survey instrument included.

There were many delimitations to account for in this research. One delimitation was that the study was confined to CSU group and the NCHA reference group sample. Consequently, the results were only generalizable to the groups studied. At the same time, the research lent itself to being generalized because of the good sample representation. Another delimitation was that the study considered for analysis only students who self-reported that they were undergraduates (first year through fourth year-plus). The data were delimited to 2007 spring semester students, so it excluded students who did not enroll in that semester. Another delimiter was that sampling core curriculum classes limited the time and dates on which the actual data collection happened, so the

sample included only CSU group students who attended a health and wellness course on the day of the survey administration. Students who enrolled in a required health and exercise science course created the CSU student sample. Much like the situation at other universities, students typically fulfill CSU's required courses during their freshman or sophomore year in college. Therefore, the CSU student sample included an overrepresentation of freshmen and sophomore students. It was unknown exactly how the samples were gleaned at the NCHA reference group institutions, so it was difficult to determine representation for the NCHA reference group.

Need or Significance

A study of the relationship between physical activity and mental health related to depression for college students was important for several reasons. First, an understanding of this relationship may reveal the plausibility of prescribing physical activity within the college healthcare setting. Second, with the prevalence of mental health issues and depression among college students, prescribing physical activity may be an appropriate, cost-effective alternative to medicinal prescription practices. Third, knowledge continues to grow in this area among many age groups; however, a void has existed in the published research among the college-aged population. One missing piece of research was in the area of college students' health. The research emphasis of this study was undergraduate students. The purpose was to study physical activity and various levels of mental health related to depression, while attempting to bridge the knowledge gap, and increase health information about the target student populations.

Physical activity levels have been analyzed among those individuals who were depressed and those who were not. Paluska and Schwenk (2000) found people with

depression to be less physically active than people without depression. Paluska and Schwenk insinuated the possibility that people with high physical activity are less susceptible to depression than people with low physical activity. Fontaine (2000) stated that some physical activity is better than none. It seems that students with high physical activity levels may reap mental health benefits. It is possible that even minimal levels of physical activity can positively influence mental health related to depression. There is weak evidence, however, of a proportional relationship with level of physical activity and degree of influence on mental health related to depression.

This survey made contributions to the field of physical and mental health among undergraduate students. Upon completion of this research, SPSS revealed overall health trends based on descriptive statistics from self-reports of physical and mental health related to depression. In this research, analyzing the health trends gave insight into potential health relationships. The advantage of focusing on physical activity and mental health research related to depression is the array of literature available. However, research pertaining to college students' physical activity and mental health was scarce. Each piece of relevant literature, with its known and unknown methodological weaknesses, combined with the rest to become the current theory. Future researchers can retest these beliefs for result validity. Researchers can also refocus the theory to analyze the topic using another research design. By analyzing current literature, the population scope became undergraduate students only. The NCHA instrument aided as the measurement tool for undergraduate students. As a result, the body of knowledge permeated into college health. This new knowledge could possibly lead to policy changes among university healthcare systems. Therefore, this research was important for

facilitating changes in college healthcare. One such change might include joining the mental health department and clinical health department on college campuses. This seamless integration of two, currently separate departments may be the change we see in the structure and organization of college health centers.

Epistemologically, past and present literature entices researchers to continue analysis related to this particular health issue. The current state of the health industry provokes a perceived need for this research. This need may stem from the increasing prevalence of mental illness and the associated financial burden on the health system, among other factors. In a narrative review, Fox (1999) concludes the following:

There is a very high cost attributed to mental disorders and illness, and in the last 15 years there has been increasing research into the role of exercise a) in the treatment of mental health, and b) in improving mental well-being in the general population. There are now several hundred studies and over 30 narrative or meta-analytic reviews of research in this field. These have summarised the potential for exercise as a therapy for clinical or subclinical depression or anxiety, and the use of physical activity as a means of upgrading life quality through enhanced self-esteem, improved mood states, reduced state and trait anxiety, resilience to stress, or improved sleep. (p. 144)

The cost of mental health treatments places a constraint on the budgets of patients, insurance companies, and healthcare providers. In addition, mental health issues are on the rise throughout the world and have been on the radar of the WHO. Therefore, the emphasis is increasing on research in this field. Research funding continues to provide opportunities for those seeking to broaden the health-related knowledge base.

As mentioned earlier, the WHO has targeted mental health issues, specifically depression, one of the seven mental health variables of concern in this research, as one of its many areas for improvement. According to the WHO, by 2020, depression will become the second cause of increased disability adjusted life years (DALYs) when

including all ages and both sexes (WHO, n.d. a). Extending beyond a national crisis, depression has a worldwide prevalence about which many organizations should be concerned.

Within the general population, the incidence of mental health issues appears in certain subgroups. Conducting this research demonstrates interest in the undergraduate college student population. Annual national data collections, such as the NCHA, have provoked the interest of researchers and healthcare policymakers on campuses nationwide. The rate of students reporting ever being diagnosed with depression has increased by 56% in the past six years, from 10% in spring 2000 to 16% in spring 2005 (data set of 54,111 students and 71 schools) (ACHA, 2009a). In the fall of 2006, the ACHA found depression, anxiety, and seasonal affective disorder (SAD) accounted for 15.7% or the fifth highest health impediments to academic achievement (ACHA, 2007). Currently, depression is the second highest cause of the DALYs that encompass college-aged males and females combined (WHO, n.d. a). Universities nationwide have identified undergraduate students as a culture that requires special attention in the area of mental health related to depression. As a researcher, it was important to delve into that area of health and contribute to the growing body of knowledge.

Researcher's Perspective

My perspective comes from personal experience as a physically active college student who has the desire to explore the possible relationships between physical activity and mental health related to depression. I have witnessed mental health issues in students who are very physically active, and I have a desire to determine whether physical activity is a form of protection against mental health issues. Most of my experiences have shown

physical activity to positively affect one's mental health. As a doctoral student with an emphasis in health and exercise science, I find the topic of physical activity to be appropriate. In addition, I am involved at the campus health center as an advocate of preventive health practices. With the recent integration of CSU's campus health center and the counseling center, I believe the seamless integration of these services may help both the mental and physical health of the students.

I play a major role in the health-promotion research at the campus health center. My bias is the belief that there are students on campus who participate in purposive regular physical activity (playing a sport, lifting weights, or participating in fitness classes at the recreation center). I also believe that other students participate in regular physical activity, but they do not consider it physical activity. Students may not realize that they are being physically active just by walking or cycling to and from campus. These students may believe that physical activity must take the form of purposive exercise. Researchers have identified physical activity as any activity that involves movement, and not necessarily exercise per se. For example, cycling and walking to class are forms of physical activity that students may not consider when they are answering the physical activity item on the survey. I believe students are being physically active when they are lifting weights or running, just as those students are who are cycling or walking to class. In addition, I hold the general belief that overall mental health is higher in men than women. I tested both of these notions as research questions in this dissertation.

I am a proponent of increasing physical activity in the daily life of all adults. This perspective has caused evident bias in the research. The bias is that physically active

students will have better mental health related to depression than students who are not physically active. I propose that high physical activity levels will result in higher mental health levels in general.

With regard to the *Healthy Campus 2010* goals, I believe they are desirable and important to attain. I consider the state of Colorado a place of recreation-friendly weather and terrain. The CSU students are the target population that currently resides in northern Colorado during the fall and spring semester. I suspect that the CSU sample population will have higher physical and better mental health than those individuals from the NCHA reference group. This assumption comes from my own experience of the differences between living in north eastern United States and in northern Colorado. I feel that the living conditions of the front range of Colorado are more appropriate for better mental health. More sunshine can and warmer temperatures throughout the year help prevent seasonal affective disorder and allow for more outdoor activities during more days of the year.

Much of my strength of knowledge and training lies primarily in the quantitative framework, with qualitative knowledge, as well. The NCHA survey data had been collected annually for 2 years prior to my holding the position as the research assistant in the Health Promotions department of CSU's Harthshorn Health Center. I stepped into the position to administer the survey to the CSU students for the following 3 years. The context of this research is rooted in physical activity and possible ramifications of physical activity on mental health related to depression. With this research, I am able to contribute to the field by analyzing physical activity in the realm of college health.

College students have not been analyzed much in the literature. Therefore, my research can contribute to expanding the body of knowledge.

The focus in this dissertation was undergraduate college students as the target audience. I used CSU students as the group for comparison in this study against the NCHA [National College Health Assessment] reference group. These group comparisons helped to identify differences in physical activity levels and differences in mental health levels related to depression. Within each of the student groups, SPSS analyzed the variables by gender; female versus male CSU students, and female versus males in the NCHA reference group. These student groups and gender groups were two of the independent variables that created the subgroups for data comparison.

CHAPTER 2: LITERATURE REVIEW

In recent years, with a national obesity epidemic emerging in the United States, interest in the topic of physical activity is flourishing. The National Institute of Health states, “obesity has risen to epidemic levels in the U.S. It causes devastating and costly health problems, reduces life expectancy, and is associated with stigma and discrimination” (National Institute of Health [NIH], 2008, para. 1). According to the World Health Organization (WHO), physical inactivity (a lack of physical activity) factors into the many risks for chronic diseases (2009). Overall, diseases brought on by physical inactivity have been estimated to cause 1.9 million deaths globally (WHO, 2002a). Physical inactivity is an obesity issue not only in the United States; it also is a concern that affects lives worldwide. Clearly, physical activity is a physical health issue; but my research focus is on potential depression related mental health affiliations with physical health. I found interest in this topic because the current literature echoes this likely association.

Research Frame

The purpose of this dissertation was to delineate, based on survey data, possible relationships, if any, between physical activity and mental health related to depression. I framed this research in the quantitative tradition, using self-reported quantitative information from the National College Health Assessment (NCHA). The objective of the investigation was the determination of any plausible relationship between physical

activity and mental health related to depression, based on data from undergraduate students at Colorado State University (CSU) and throughout NCHA participating schools (the student groups). It is important to understand these issues within the separate frameworks of physical activity and mental health related to depression before SPSS analyzed them as a function of each other within the student groups.

Background

Research in the area of physical activity and mental health continues to grow. As the ideas on this topic multiply, one can identify themes in the literature. In a narrative review, Fox (1999) identifies what he calls, the *key messages*:

There is growing evidence demonstrating that exercise can be effective in improving the mental well-being of the general public, largely through improved mood and self-perceptions.

There is good evidence to demonstrate that exercise is effective as a treatment for clinical depression and anxiety. (p. 411)

Although these messages are from many years ago, Fox (1999) has isolated components of health that have been under review by researchers ever since. The first item discusses the main point of the research contained in this literature review: that exercise might be an effective tool for improving the mental health of many people. It also claims that improved mental health is made visible through improved mood and self-perceptions. These two components of mental health also are a part of a few research articles discussed in this review of literature.

Fox's second message reaches the core of this literature review, pointing to exercise as a treatment for depression and anxiety. According to the National Institute of Mental Health (NIMH, 2008), depression is the fourth largest mental illness among adults over the age of 18. Since depression affects 14.8 million Americans (6.7% of adults 18

years old and older), it is a large constituent among all mental disorders. This combined view supports the speculation that physical activity can be a treatment for depression. The methods proposed in chapter three might contribute to the body of knowledge on the topic of the relationship between mental and physical health. This literature review has attempted to confirm theories about physical activity and its effect on mental health by analyzing data from a wide array of participants. With more research to come, this dissertation is only a small piece of a larger spectrum of research in the field of college students' health.

Fontaine (2000) illustrates the various effects of physical activity on mental health as it relates to depression. Physical activity can relate to a moderate decrease in depression symptoms, but it is not definite whether physical activity can prevent depression from beginning. Physical activity can also show a relationship with small to moderate decreases in anxiety, and small decreases in panic disorder. Small to moderate improvements can be made in self-esteem when physical activity is utilized as a therapy. When combined with social interactions, positive effects are shown to be related to increases in physical activity. Regular, intense physical activity shows a large increase in energy or vigor.

Overall, the literature supports the notion that physical activity benefits people with mental health problems. Fox delineates the assortment of possibilities for how physical activity can help those with mental health issues. Physical activity contributes to minimizing mental health problems in four situations, according to Fox (1999):

(a) treatment of mental illness and disorders, (b) prevention of mental illness and disorders, (c) improvement of mental and physical well-being of those with mental illness, and (d) improvement of mental well-being of the general population. (p. 412)

Mental Health Defined

Before surveying undergraduate students on this subject, one must first analyze physical activity and mental health separately among the existing literature. The dependent variable in my research was mental health related to depression. The literature had different definitions of mental health, derived from empirical data collection and analysis. My research helped me to analyze general mental health, covering mild to severe mental health issues related to depression. Therefore, a suitable operational definition for this dissertation was general as well. Stephens' (1988) study defined mental health as "positive mood, general well-being, and relatively infrequent symptoms of anxiety and depression" (p. 41). Health and Human Services defines mental health in the Healthy People 2010 document as "a state of successful mental functioning, resulting in productive activities, fulfilling relationships, and the ability to adapt to change and cope with adversity...indispensable to personal well-being, family and interpersonal relationships, and one's contribution to society" (USDHHS, n.d. d, Definition of mental health section, para. 1). A combination of definitions by Stephens and USDHHS matches the scope of the mental health data being collected in this dissertation.

Physical Activity Defined

My research had a focus of how physical activity levels interacted with mental health levels related to depression. Physical activity was the main independent variable of interest in this research. Within the literature lies confusion about the meaning of physical activity and exercise. Recent literature contained few operational definitions. Consequently, it seemed easy to use *physical activity* and *exercise* interchangeably. In the literature, however, one term seemed to be studied independent of the other. Some

studies have focused just on physical activity, and others have just analyzed exercise. A delineation of the terms “physical activity” and “exercise” helped to clarify confusion. On self-report surveys that query health behaviors, a participant might need a definition of physical activity or exercise to respond accurately. In 1985, Caspersen et al. have defined *physical fitness* in addition to *physical activity* and *exercise*, as an attempt to standardize the terms:

“Physical activity,” “exercise,” and “physical fitness” are terms that describe different concepts. However, they are often confused with one another, and the terms are sometimes used interchangeably. . . . Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure. The energy expenditure can be measured in kilocalories. Physical activity in daily life can be categorized into occupational, sports, conditioning, household, or other activities. Exercise is a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness. Physical fitness is a set of attributes that are either health- or skill-related. The degree to which people have these attributes can be measured with specific tests. (p. 126)

Based on the definitions of those three terms, my primary focus in this dissertation was physical activity. However, the literature review contains research with use of all three terms.

Depression Defined

Mental health is an umbrella term that encompasses many illnesses. One such illness is a disorder called depression. Occurring in all genders, ages and backgrounds, depression is a common mental disorder that conveys a loss of interest or pleasure, guilty feelings or low self-worth, troubled sleeping or eating, low energy, and poor concentration (Adams & Moore, 2007). Antidepressant medications and psychotherapy are effective for 60% to 80% of those affected by depression, according to the WHO

(2009). The research in this dissertation used the term *mental health* to discuss *mental health related to depression*.

The literature varies in the methods discussed for determining depression levels among participants. The problem with standardizing these depression measurements was that doing so could lead to gaps in the literature cited in this dissertation. For example, some research may use clinically diagnosed participants, while other studies may use self-reports from survey data. Fox (1999) reports that many persons suffer from diagnosed depression, although more individuals experience low mental welfare, revealed by emotional and stress-related difficulties. Those with less severe depression may be undiagnosed; hence, the complications associated with depression assessment (Fox, 1999). Because of the empirical nature of mental health, many who suffer the symptoms of depression do not become clinically diagnosed as such.

Some longitudinal studies with measurements over time seem to show that maintained physical activity has some benefit to mental health. In addition, Harris et al. (2006) took four depression measurements over a 10-year period and found less concurrent depression in depressed patients with higher levels of physical activity. Harris et al. state:

Our results suggest that more physical activity is associated with reduced concurrent depression. In addition, it appears that physical activity may be especially helpful in the context of medical problems and major life stressors. Clinically, encouraging depressed patients to engage in physical activity is likely to have potential benefits with few obvious risks. (p. 79)

Depression and Overtraining

Some students are prone to high levels of physical activity. Student athletes, in particular, have high levels of physical activity. It is interesting to see if the physical

activity levels affect mental health the same as non-athletes that are highly physically active. Among college student athletes, there is minimal research on the prevalence of depression. One particular study by Marcello (2006) found that students who are physically active on a regular basis are not immune to the effects of depression. Marcello (2006) found that depression can be a symptom of overtraining. Overtraining, or doing physical activity so much that it is harmful, invites the notion of a training threshold. At a training threshold, one might reach such a high level of physical activity that it causes negative effects on mental health. It is possible that athletes and non-athletes can experience this training threshold. An excessive amount of physical activity may become a symptom for depression, possibly harming one's overall health. Researchers mention changes in the mind, such as "constant fatigue, depression, and emotional instability" as "signs and symptoms of overtraining" (Smith, 2004, as cited in Marcello, p. 101). As the regular training advances into overtraining, mental health levels deteriorate.

However, in terms of exercise addiction, the author of *SPARK*, John Ratey states, "getting addicted to exercise applies to a very small segment of the population, most notably girls with anorexia or anyone with a body dysmorphic syndrome, a mental disorder defined by a preoccupation with a perceived deficit in appearance" (p. 184). This is not to say that exercise addiction is not harmful or should be ignored by health professionals. It is a very important health concern and should be monitored carefully by health care providers who deal with patients that show signs of exercise addiction.

Depression and Gender Differences

Depression has been found in the undergraduate student subgroup and in other groups, as well. Differences in depression levels have been found among females and

males within numerous subgroups. Depression seems to affect genders differently. This dissertation focused on the mental health related to depression and gender differences among college undergraduate students. Craft et al. (2007) state, “one in five women will be diagnosed with a depressive disorder in her lifetime” (p. 1499). Craft et al. identify women as a subgroup that little is known about in terms of adherence to an exercise program. This may cause trouble when trying to research the association of physical activity and depression related mental health among women.

Another study analyzed women who had been physically active (on a sport team) in the past. In this study of past female college athletes, 82% of the women had begun athletics at least in high school, if not earlier. According to this study, former female athletes self-reported significantly less physician-diagnosed depression in their late 30s through the age of 75 (Wyshak, 2001). These results might be misleading; however, if they are correct, then early physical activity has a positive impact on long-term health and mental health, as well. It seems that all of the possible confounding variables involved with the Wyshak research made it more difficult to link physical and mental health. According to current research, the athletes would have experienced better mental health during the time they were involved with a sport team. What this study means to future mental-health practices could have ramifications for policy change on campuses across the nation. Such changes might include required physical activity classes, or increased opportunities for team sport participation on campus.

Physical Activity and Depression

Some researchers analyze physical activity as it pertains to diagnosed depression rather than to general mental health. Findings suggest that clinical depression is less

likely to occur in those who maintain a physical activity regimen than in those who live a sedentary lifestyle. A study by Malebo, van Eeden, and Wissing (2007) analyzed the impact that sport participation played on the psychological and psychosocial development of young black adults in South Africa. The findings suggest that students between the ages of 20 and 35 who actively play sports had less negative feelings, less depression, and a better outlook on life (Malebo et al., 2007). In addition, these participants had higher self-efficacy beliefs. Malebo et al. noted that participants had higher levels of purpose in life and overall autonomy. The age demographic is similar to the dissertation population so there could be some overlap of results.

In John Ratey's book *SPARK* he discusses the notion that most people experience depression symptoms even they aren't clinically depressed. He states, "Just because you don't have all the symptoms of depression doesn't mean you can't feel better" (Ratey, 2008, p. 115). In other words, physical activity can help with the symptoms of depression, without the diagnosis of being *clinically depressed*. This information lends itself to maintaining physical activity for overall mental health, rather than just for specific issues such as depression.

Since physical activity is generally positive for general health, it's no surprise that doctors are encouraging exercise regardless of a patient's mental health status. Biddle and Mutrie (2001) state, "Providing that people do increase their physical activity levels, then there are numerous health benefits that can be accrued even if it does not help with depression. There are very few treatments that can boast this kind of promise" (p. 241). This statement invites the notion that *exercise probably won't hurt the status of one's mental health*.

Biddle and Mutrie (2001) agree,

The fact that the knowledge base is incomplete and that the evidence for a causal connection between inactivity and depression is not universally accepted should not stop mental health practitioners of all kinds from advocating that their patients and clients should become more physically active. At best this may help them feel less depressed and at worst this could have a positive health impact on other aspects of their lives – what is there to lose? (p. 241)

In the best case scenario, physical activity might help one's mental health. Of course, injury and the possibility of overtraining are negatives that could occur with physical activity, but they are trumped by the benefits to overall health.

Physical Activity as an Alternative Depression Treatment

Medications for the treatment of depression can be costly; hence, inexpensive alternatives are the subject of recent research. Physical activity and exercise are current topics of interest in the search for feasible alternatives, and growing evidence supports the benefits of exercise for symptoms of depression as mental illness intervention treatment (Craft et al., 2007; Donaghy, 2007; Dunn et al., 2001; Fox, 1999; Harris et al., 2006; Paluska & Schwenk, 2000; Wiles et al., 2007). It is assumed that more research is to come in these areas.

The options for treatment of mental health issues are vast. Loewenthal and Cinnirella (1999) identify psychopharmacology, psychotherapy, religious help, and any combination of these three as possible mental-health interventions. The current depression research seems to be adding to the arsenal of mental-health treatment options. Biddle et al. (2003) state, “the anti-depressant effect of exercise can be of the same magnitude as that found for other psychotherapeutic interventions. No negative effects have been noted in depressed populations” (p. 156). Physical activity is currently

underutilized but might provide additional treatment to modern medications and psychological prescriptions, according to Paluska and Schwenk (2000).

Physical activity frequency and intensity on depression. The frequency and intensity of exercise has been measured in terms of its relationship to depression. In their cross-sectional comparison of depression and exercise, Kritz-Silverstein, Barrett-Connor, and Corbeau (2001) found more positive results from physical activity. They confirmed that regular strenuous exercise can be used to significantly lower depression scores. In addition, frequency of exercise of three or more times per week also showed lower depression scores (Kritz-Silverstein et al., 2001). These results were a testament to the frequency and intensity of exercise that other studies have neither controlled for nor measured.

Each study from the past has guided subsequent research, giving this field a sound foundation of knowledge. To give substantive value to this research, however, some assumptions had to be made in the clinical arena. To effectively continue the research progression, it is vital to pause and discern the direction of future research. Paluska and Schwenk (2000) reviewed literature on assorted elements of physical activity and their alleviating effects on depression and anxiety. They found both clinical and research implications that direct future research efforts. One idea reveals improvements on depression and anxiety when either aerobic activity or strength exercises are used. One research implication of concern is how physical activity may affect populations of varying age, gender, ethnic background, and physical ability. Physical activity shows similar effectiveness as psychotherapy for improving mild to moderate depressive symptoms. People diagnosed with clinical depression may experience a large

improvement in mood after increasing their amounts of physical activity. It may be possible for physical activity to help prevent mild depression from advancing into a major depressive disorder. On the other spectrum of physical activity are the people who overtrain and exercise to excess. To manage depression related mental health issues related to overtraining, it is necessary to reduce physical activity levels with monitored depression levels (Paluska & Schwenk, 2000).

Physical activity as depression prevention. Not all of the results support the view that physical activity has a positive influence on mental health related to depression. In particular, there is debate regarding physical activity as prevention for depression. Paluska and Schwenk (2000) were not been able to associate regular physical activity with the actual prevention of depression. To determine whether physical activity acts to prevent depression would require accounting for all confounding variables. In the social sciences, linking causality to one variable in terms of disease/disorder prevention seems difficult, especially in the case of mental health because it varies in each person. Therefore, there is reluctance to attribute physical activity as a form of depression prevention.

Concerning physical activity and its use as treatment for mental health, Biddle and Mutrie (2001) state,

Of interest to us is the role of physical activity in the prevention and treatment psychological disorders. Physical activity could be seen as part of a treatment programme that might assist with enhancing moods and self-esteem, encouraging socializing and improving physical health. In thinking about how physical activity might prevent psychological disorders, it is possible that it provides a means by which one's sense of self develops, promotes more positive moods, allows competencies to develop, provides opportunities for socialization and promotes physical health and fitness. (p. 202)

Biddle and Mutrie are not the only researchers suggesting that exercise becomes part of a treatment for mental health issues. John Ratey discusses how depression research has given us the knowledge about the brain and exercise. In discussing exercise, Ratey states, “It counteracts depression at almost every level. In Britain, doctors now use exercise as a first-line treatments for depression, but it’s vastly underutilized in the United States, and that’s a shame”(Ratey, 2008, p. 114).

Gender Differences and Mental Health

Targeting women or men can contribute to the understanding of gender differences in mental health. Craft et al. (2007) analyzed the impact on the depression related mental health of women on a home-based exercise intervention and an intensive, structured exercise intervention at a fitness facility. Both interventions showed increases in the women’s physical activity levels, and hence a reduction in depressive symptoms (Craft et al., 2007). The intervention consisted of “one exercise session, a pedometer, and a monthly call” (Craft et al., 2007, p. 1508). Craft et al. found this intervention to be enough to encourage depressed women to initiate an exercise program. Using a pedometer to track fitness and some sort of cue to action (i.e., a monthly call, email, or newsletter) is a common healthcare intervention. In terms of this dissertation, the CSU health promotions department has a physical activity program for faculty, staff, and students. This program utilizes weekly newsletter reminders about physical activity. The newsletter initiates a cue to action in the member to start/continue physical activity.

Craft (2005) conducted research on the antidepressant effects of exercise and two psychological mechanisms, self-efficacy and distraction among Caucasian women (mean age 43.21 years). Using only 19 people in the study and not using a placebo group, it was

difficult to generalize the findings, however the approach was quasi-experimental. The results alluded to the control group having higher depression scores than the exercise group at week 3 and week 9. Craft (2005) found associations between exercise and a reduction in depression symptoms. There were also changes in self-efficacy that happened within the first 3 weeks of the study. Craft (2005) suggested that exercise may be used as “adjunct therapy in the treatment of clinical depression” (p. 168). This doesn’t mean that physical activity is the first line of defense. However, if physical activity is coupled with psychotherapy (if the patient is able to be physically active), there could be more benefit than if each was used separately.

Adams and Moore researched relationships between physical activity and mental health in college females. They analyzed a cross-section from the Spring semesters of the 2002 and 2003 NCHA dataset. The conclusion of their research was that exercise was modestly negatively associated with depression. Therefore more moderate to vigorous exercise associated with less depression. In terms of strength training, there was a negative association with depression, anxiety, and suicidal ideation (as strength training increased, depression, anxiety, and suicidal ideation decreased). This research by Adams and Moore utilizes similar mental health and physical activity constructs as were used in the current dissertation. Since the same survey instrument was used, it is possible to compare results from 2002-2003 with the 2007 female results from this dissertation.

Physical Activity and Mental Health in the Undergraduate Population

Throughout the past few years, physical activity and its connection to mental health has been an evolving research topic. Because there has not been much emphasis on any particular subgroup, however, avenues are available for expanding this research.

Various levels of physical activity are associated with different populations, including different age groups and genders. Within the realm of college-aged students, Grace (1997) found physical activity to be reduced because a portion of 18-to-24-year-old students self-reported to be sedentary. Long-term effects of physical activity on mental health have revealed a variety of results. One study of college students, by Giacobbi, Hausenblas, and Frye (2005), found that

On days when our participants perceived more positive life events, they also tended to engage in more exercise and experience more positive mood. . . . the participants tended to have a more positive mood on days when they participated in greater amounts of leisure-time exercise. (p. 77)

According to the National Center for Education Statistics (NCES, 2005), as of 2003, college enrollment has grown to encompass 38% of 18- to 24-year-olds in the United States of America. The college years of one's life may be a time when one learns behaviors that become habits for life. So instilling healthy habits, such as physical activity, during these years might be critical for physical and mental vitality in the future. Physical activity might not only assist in maintaining health, but also in preventing illness. In terms of dollars, mental health issues have potential to affect entire nations. Therefore, these health topics are worthy of additional research, particularly in the college-aged population (e.g., 18 to 25 years old). Using survey data, this dissertation attempted to decipher whether any links exist between physical activity and mental health among undergraduate students.

There was only one published research article pertaining to physical activity and more severe mental health issues among college students. Taliaferro, Rienzo, Pigg, Miller, and Dodd (2009) analyzed associations between aerobic exercise and muscle toning activities with hopelessness, depression, and suicidal behavior of college students.

This new research had parallel objectives and to my dissertation. Taliaferro et al. utilized 2005 NCHA data from the reference group data collection by the ACHA. This dissertation utilized the NCHA survey data; however, the data was from 2007. Since the survey items in 2005 were identical to those in 2007, making comparisons between both research results may be helpful.

The physical activity survey items in the NCHA survey related to weekly aerobic exercise and muscle toning. The research by Taliaferro et al. (2009) utilized both of these physical activity measures, but this dissertation only used the weekly exercise measurement. The mental health survey items pertaining to the frequency of feeling hopelessness, depressed, as well as suicidal ideation and suicidal attempts in the past school year were used in the research by the authors. This dissertation used all of the same mental health items in addition to two others. Therefore, research by Taliaferro et al. (2009) coincides quite well with the research in this dissertation.

Taliaferro et al. (2009) conducted a logistical regression on the 43,499 student surveys, with the following overall results;"65.4% reported feelings of hopelessness, and 46.1% stated they felt so depressed it was difficult to function 1 or more times during the past school year" (p. 429). The results indicated that women experienced higher rates of hopelessness (69.7%), depression (49.6%), and suicidal behavior (11.2%) than men. Physically active men had better mental health than men that were not active among all mental health variables. This pattern was similar among female college students as well. The results showed physically active women had better overall health than inactive women. Men and women who participated in aerobic exercise or muscle toning had reduced feelings of hopelessness, depression, and suicidal behavior. After the researchers

controlled for physical activity type, women with frequent muscle toning activities (6 to 7 times/week) had an increased risk of hopelessness. Also; women with low/moderate (1 to 5 times/week) “levels of toning activities were less likely to feel depressed” (Taliaferro et al., 2009, p. 431). After controlling for toning activities, aerobic activity was significantly related to less hopelessness, depression, and suicidal behavior among both genders.

Mental Health on Campus

Depression related mental health status of college students is an important factor to administrators in higher education. Frequently undiagnosed, mild depression can be seen in students with recurring bouts of unhappiness (Fox, 1999). The NCHA data from fall 2006 show that

The number of students who reported having been diagnosed with depression sometime in their lifetimes was 14.8% ($n = 13,738$). Of that percentage, 34.4% ($n = 4,703$) reported that they were diagnosed in the past school year, 26.4% ($n = 3,598$) reported that they are currently in therapy for depression, and 36.6% ($n = 4,975$) reported that they were currently taking medication for depression. (p. 41)

Given the prevalence of depression, college students might make good use of a health center that prescribes physical activity.

The trend of increased depression rates does not show signs of decreasing anytime soon. From year to year, the statistical prevalence of depression related mental health problems has increased, or remained steady, at best. In the fall 2007 semester, 18.9% of students reported experiencing depression within the past 12 months (ACHA, 2008).

College students may experience symptoms that cause disturbances on academic performance, as well as the overall ability to function. The rate of students reporting ever being diagnosed with depression has increased 56% in the past six years. The depression

prevalence increased from 10% of the total students in spring 2000 to 16% of the total students in spring 2005 (data sets had different sample sizes) (ACHA, 2009a).

Mental Health Prevalence

Many agencies are collecting data about mental health, particularly depression. According to the WHO, by 2020, depression will become the second cause of Disability Adjusted Life Years (DALYs) when all ages and both sexes are included (WHO, n.d. a). “DALYs for a disease are the sum of the years of life lost due to premature mortality” (WHO, n.d. a). Oatley (2007) explains the process for diagnosing depression:

A major depressive episode can be diagnosed if, for at least two weeks, a person is unbearably sad or has lost pleasure in most things, together with four other symptoms that include sleep disturbance, lack of energy, slowing of action, inability to concentrate, feelings of worthlessness, and thoughts of suicide. (p. 288)

The ACHA’s survey was called the National College Health Assessment and included a subset of mental health questions. The mental health portion of the survey pertained to the following aspects of mental health: feeling overwhelmed, exhausted (not from physical activity), sad, depressed, hopeless, and considering attempting suicide and attempting suicide in the last school year. These questions matched Oatley’s (2007) definition of a major depressive episode diagnosis; meaning without a clinical diagnosis as such. The ACHA, according to fall 2006 data, found depression, anxiety disorder, and SAD accounted for 15.7%, or the fifth highest, of health impediments to academic achievement (ACHA, 2007). Currently, depression is the second highest cause of DALYs encompassing college-aged males and females combined (WHO, n.d. a).

Healthy People 2010

There have been nationwide efforts to analyze data and create guidelines from which to direct healthcare efforts. In 2000, the U.S. Department of Health and Human Services (USDHHS) created the 10-year national health objectives named Healthy People 2010 (USDHHS, 2000). This document has two overarching goals, “to increase the quality and years of healthy life among people of all ages”, and “to eliminate health disparities” (USDHHS, n.d., a, Healthy People 2010 goals section). These broad goals are supported by 467 specific objectives in 28 focus areas (USDHHS, n.d. a). Each objective has a measureable and obtainable target of improvement to be achieved by 2010 (USDHHS, n.d. a). Some of the focus areas include “access to quality health services, diabetes, educational and community-based programs, health communication, mental health and mental disorders, physical activity and fitness, and public health infrastructure” to name a few (USDHHS, n.d., a, Objectives section). The U.S. Health and Human Services (n.d. d) state that,

The Leading Health Indicators reflect the major public health concerns in the United States and were chosen based on their ability to motivate action, the availability of data to measure their progress, and their relevance as broad public health issues. (Leading health indicators section, para. 1)

Physical Activity as a Health Indicator

Physical activity was identified by Healthy People 2010 as one of the ten Leading Health Indicators (USDHHS, n.d. d). “In 1999, 65 percent of adolescents engaged in the recommended amount of physical activity. In 1997, only 15 percent of adults performed the recommended amount of physical activity, and 40 percent of adults engaged in no leisure-time physical activity” (USDHHS, n.d. d, Physical activity section, para. 2). Based on this information, USDHHS created physical activity targeted objectives. For

example, objective 22–2 aims to “increase the proportion of adults who engage regularly, preferably daily, in moderate physical activity for at least 30 minutes per day” (USDHHS, n.d. d, Physical activity section, para. 5). More specifically, objective 22–7 aspires to “increase the proportion of adolescents who engage in vigorous physical activity that promotes cardiorespiratory fitness 3 or more days per week for 20 or more minutes per occasion” (USDHHS, n.d. d, Physical activity section, para. 4).

Mental Health as a Health Indicator

Mental health was identified by Healthy People 2010 as another Leading Health Indicators (USDHHS, n.d. d, Leading health indicators section). “Approximately 20 percent of the U.S. population is affected by mental illness during a given year; no one is immune. Of all mental illnesses, depression is the most common disorder.” (USDHHS, n.d. d, Mental health section, para. 1). One example of a mental health objective is 18–9b stating, “increase the proportion of adults with recognized depression who receive treatment” (USDHHS, n.d. d, Mental health section, para. 4). This objective was influenced by staggering statistics, “more than 19 million adults in the United States suffer from depression. Major depression is the leading cause of disability and is the cause of more than two-thirds of suicides each year” (USDHHS, n.d. d, Mental health section, para. 1). These statistics were published in the Healthy People 2010 national initiative in November of 2000. If the 2010 objectives are met, the Healthy People 2020 statistics should exhibit a healthier population.

Healthy Campus 2010

The Task Force for National Health Objectives adapted Healthy People 2010 objectives to create Healthy Campus 2010 (ACHA, 2002); which specify goals for the

national college population (18- to 25-year-olds). Healthy Campus 2010 “establishes national health objectives and serves as a basis for developing plans to create college health programs to improve student health” (ACHA, 2002, p. 3). As a companion document to Healthy People 2010, Healthy Campus 2010 provides “guidelines for assessing campus needs; and then, developing, implementing and evaluating programs to improve the health of students, faculty, and staff” (ACHA, 2002, p. 3). These student specific goals can be used as benchmarks, as well as guidance for future programming efforts.

To create increased health among college students, it was necessary to determine a reference point as a way to measure changes in the future. When possible, ACHA collected baseline data as a way to create targets for health objectives on Healthy Campus 2010. These baseline data can be compared to 2020 data as a way to evaluate changes. Most of the college baselines used in the Healthy Campus 2010 objectives were created using the “ACHA-National College Health Assessment Spring 2000 or other national college data source” (ACHA, 2002, p. 115). Three guiding principles were used in setting the national targets for the college population physical activity and mental health. The first type of objectives pertained to health services and protection. The second type of objectives were those that could be influenced in the short term by policy decisions, lifestyle choices, and behaviors (i.e. physical activity, and mental health). Both the first and second type of objectives had targets that were set as *better than the best*. This means that the target was set at a number that is better than the best of the lowest subgroup in an objective. The third type of objectives were those that were unlikely to change by 2020. The target for these objectives represented “an improvement for a

substantial proportion of the population and is [was] regarded as a minimum acceptable level” (ACHA, 2002, p. 115), and showing improvement if the baseline is already above the target.

Physical Activity as a Health Indicator

Within Healthy Campus 2010 lies a physical activity and fitness goal to “improve health, fitness, and quality of life through daily physical activity” (ACHA, 2002, p. 78).

These ACHA (2002) goals are supported by the following, college student specific objectives:

22–2/3: Increase the proportion of college students who engage in physical activity at least 3 days per week that includes moderate physical activity for at least 30 minutes, or vigorous physical activity for 20 or more minutes per occasion.

College Target: 55%

College Baseline: 40.3%

22–2: Increase the proportion of adults and college students who perform physical activities that enhance and maintain muscular strength and endurance at least twice per week.

College Target: 65%

College Baseline: 47.2%

22–3: Increase the proportion of adults and college students who perform physical activities that enhance and maintain flexibility.

College Target: Did not collect

College Baseline: Did not collect

22–9: Increase the proportion of adolescents and college students who participate in daily school physical education.

College Target: Did not collect

College Baseline: Did not collect

22–15a: Increase the proportion of college students that rode a bicycle in the last school year.

College Target: 65%

College Baseline: 53%. (pp. 79–82)

Mental Health as a Health Indicator

Within Healthy Campus 2010 lies a mental health and mental disorder goal to “improve mental health and ensure access to appropriate, quality mental health services”

(ACHA, 2002, p. 66). These ACHA (2002) goals are supported by the following, college student specific objectives:

18–2: Reduce the rate of suicide attempts by adolescents and college students (12-month average rate).

College Target: 0.53%

College Baseline: 1.5%

18–9: Increase the proportion of adults and college students with mental disorders who receive treatment.

18–9a: Adults aged 18 to 54 years with serious mental illness

College Target: Did not collect

College Baseline: Did not collect

18–9b: Adults aged 18 years and older with recognized depression.

College Target: 50%

College Baseline: 30.4%

18–9c: Adults aged 18 and older with schizophrenia.

College Target: Did not collect

College Baseline: Did not collect

18–9d: Adults aged 18 and older with generalized anxiety disorder.

College Target: Did not collect

College Baseline: Did not collect. (pp. 66–

68)

Some objectives attempt to decrease negative effects of mental health, where other objectives attempt to increase treatment and recognition of mental disorders. Objective 18–2 attempts to *decrease* the number of suicide attempts, where objective 18–9 hopes to *increase* treatment for students with mental disorders. Objective 18–9, which includes sub-goals a-d attempt to increase the treatment of students with mental disorders. The mental disorder focal points are a. serious mental illness; b. recognized depression; c. schizophrenia; and d. anxiety disorder.

Integrative Healthcare on Campus

On many campuses, mental healthcare facilities are located in a separate building or office where students may feel uncomfortable or embarrassed to enter. However, some campuses are directing efforts toward integrating both the health center and the

counseling center. Socially, there is a stigma surrounding mental health services (Ojeda & Bergstresser, 2008). Hopefully, integration will reduce the stigma of using mental health professional services. In this situation, patients that see a psychotherapist are in the same waiting room as those seeing a medical doctor. The other hope of healthcare integration is to incorporate seamless operations, where mental and physical health practices support each other. Physical activity may be prescribed to people with mental health issues, especially those related to depression. If used correctly in the mental health setting, physical activity prescription may reduce the stigma involved with mental illness. Also, physical activity may help to increase mental health; uniting the physical and mental component of health.

Relationship Between Physical Activity and Mental Health

Exercise and physical activity have been used in studies about improvement of an array of mental health issues. Fox (1999) found evidence to be growing in the area of exercise and its relationship with improved mental well-being in terms of better mood and self-perceptions. Most studies pertaining to mental health and exercise support physical activity as a potential antidepressant, claiming that physical activity can reduce the risk for physical comorbidities that occur with depression (Craft et al., 2007). Stephens' (1988) concluded that the level of physical activity was positively related to general well-being, less anxiety and depression, and a positive mood. As cited in Paluska and Schwenk (2000), there is a positive correlation "between physical activity levels and improved mental health" (p. 168). Much of the literature agrees that there is some positive association between poor mental health, namely depression, and no or minimal

levels of physical activity or exercise (Craft et al; Donaghy, 2007; Dunn et al., 2001; Fox; Harris et al., 2006; Paluska & Schwenk; Wiles et al., 2007).

Predicting depression based on physical activity levels elicited similar results as general mental health findings. The results implied that one can almost predict the likelihood of someone being diagnosed as depressed based on her/his physical activity levels. Camacho, Roberts, Lazarus, Kaplan, and Cohen (1991) conducted this research. Results showed people with low activity levels who were not depressed initially were more likely to become depressed than those with higher initial physical activity levels. It was more beneficial to be physically active now as a way to decrease the likelihood of becoming depressed in the future. This relationship is a key finding in the search for preventive care in the field of mental health related to depression.

Physical Activity and Severity of Mental Health Issues

Some studies have found that physical activity decreases the likelihood of one becoming clinically depressed. Fox (1999) found four prospective epidemiological studies that suggested physically active people are less likely to suffer clinical depression. Paluska and Schwenk (2000) also identified physical activity's ability to manage mild and moderate mental health diseases. These researchers initiated the notion of the severity of mental health to physical activity. They proposed that physical activity might be effective only for a low severity (mild) level of mental health.

The relationship of physical activity to reduced concurrent depression incorporates the timeliness of the actual physical exertion. There is a notion that physical activity improves mental health during/around the time of the actual energy expenditure. In relation to mental health, there is minimal research on physically active adolescents

who become sedentary in their adult lives. If this situation arises, it is unclear whether or not individuals' mental health during the adult years can reap the benefits of the adolescent physical activity. In contrast, the individuals' current physical activity levels may determine the current mental health level. However, mental health could be a combination of one's past and current physical activity levels.

Other Mental Health Benefits from Physical Activity

Aside of the known physical health benefits of physical activity and exercise, there are other benefits that pertain to mental health. Dunn et al. (2001) state advantages of exercise, such as its lower cost compared to antidepressant medication, its completion outside of the doctor's office, and that it doesn't carry the stigma of being in a medical healthcare facility for counseling. Among younger people where the rate of depression is high, exercise can be done in a reasonably safe manner (without medications) (Dunn et al.).

Many studies are finding that physical activity not only reduces depression, but it also has a positive influence on other mental health aspects such as mood, self-perception, anxiety, and stress. Good evidence shows depression and anxiety can be treated effectively through exercise (Fox, 1999). Donaghy (2007) discovered associations between exercise and decreased depression, stress reduction, positive mood, and increased physical self-perceptions and body image. If the physical activity extends beyond assisting with depression, sufferers of mild mental health symptoms might be assisted as well.

Participation in Sports

Unlike other researchers, Malebo et al. (2007) delve into sport participation as the physical activity-like variable. The authors shed positive light on the relationship between sport participation and mental health. Active participation in sports is an integral part of some people's lives. One form of physical activity, especially at an early age, can be organized or unorganized sports. In this research it is important, however, that physical activity maintain a broad definition, beyond just sport participation. The research goal is to look at how an array of physical activities might direct mental health related to depression.

Physical activity does not have to take the shape of sport participation. Physical activity might include walking, hiking, gardening, cycling, walking up and down steps in a building, or any assortment of movements. With its focus on sport participation, however, Malebo et al. could have found results that have implications for highly active students. Maybe there is a key component in sport participation or high levels of physical activity that perpetuates positive mental health related to depression. This key might take the form of team camaraderie, the setting and achievement of goals, interpersonal growth, teamwork, dealing with adversity, and so on. Any assortment of variables could play a role in the positive psychological effects of sport participation and high levels of individual exercise. The determination of those variables is beyond the scope of this research. It should be noted, however, that there is an inherent difference between sport participation and physical activity in general. Sport participation is only one type of physical activity. This dissertation includes a comparison between students at four different physical activity levels. My survey did not distinguish the type of physical

activity as a construct. Therefore, there is no way to know whether students reporting physical activity were part of a team or active individually.

Physical Activity and Other Mental Health Aspects

Some researchers have looked not only at depression, but also at other aspects of mental health. For example, groups of middle-aged men with leisure physical activity levels were compared to men with occupation-related physical activity (Wiles et al., 2007). The men were followed for either 5 years or 20 years, and a general health questionnaire was used for measurement. The authors found minimal support for physical activity having a positive effect on common mental disorder (CMD); defined as anxiety and depression. Overall, there was minimal verification that men in physically demanding jobs had reduced CMD over a 5-year period, and no verification over 10 years.

Additionally, the study by Wiles et al. (2007) compared a group of men doing leisure-time physical activity to a group of men doing physical activity as part of one's occupation. One might draw a parallel between these two groups and the groups in my research study (CSU group and NCHA reference group). The students with low to medium physical activity levels might be comparable to the leisure-time physical activity group from the study. At the same time, the students with high physical activity levels may be comparable to the group doing physical activity as part of one's occupation. If one can make this comparison, it might illustrate a possible difference between highly active students and non-active students. Some students may partake in physical activity as part of their leisure-time activities or as part of a job, where others don't do any physical activity. The research results didn't validate physical activity as a benefactor to

mental health when physical activity was mandated as part of a career. However, after 5 years, among the group of men who participated in heavy-intensity leisure-time physical activity, there was a small reduction of common mental disorder (Wiles et al., 2007).

Some studies that focused on the links between physical activity and mental health looked at the duration of the mental health improvement effects. As mentioned earlier, in their study of middle-aged men, Wiles et al. (2007) discovered an association between intense physical activity and a small reduction in the occurrence of mental disorders over 5 years, and no evidence for longer periods of time. These researchers posed two questions: *Does physical activity have only an immediate effect on mental health? Must physical activity be maintained as a lifestyle behavior in order to cause mental health benefits?* Research over longer periods of time does exist. As cited in Donaghy (2007), “analysis of ten longitudinal studies measuring exercise and depression two times or more unveiled a positive association between exercise and psychological well being (p. 4).

Physical Activity-Mental Health Causality Relationship

The goal of much research is to identify a cause-effect relationship between physical activity levels and mental health. Physical activity often elicits positive effects; however, to determine a causal relationship between physical activity and some specified outcome is a challenge when one is drawing conclusions. For example, it is difficult to show a solid causal link between exercise and decreased depression.

Birkeland, Torsheim, and Wold (2009) analyzed the relationship between physical activity and depressed mood among adolescents aged 13 to 23. This 10-year longitudinal study consisted of 924 Norway adolescents which aimed to discover which

variable (physical activity or depressed mood) precedes the other by measuring them both over time. Two additional goals of this research were to discover if early physical activity was associated with lower levels of depressed mood later in life (called the protection hypothesis), and if early depressed mood was associated with lower levels of physical activity later in life. Birkeland et al. (2009) state, "The results suggest that leisure-time physical activity and depressed mood covary, but are inconclusive regarding which comes first" (p. 31). The researchers found that no hypotheses held up over the course of the 10 year study even though both physical activity and depressed mood covaried together over short periods of time (revealing an inverse relationship). However, no long term causal relationships could be found between the two variables. Most research, such as this, has not claimed causal relationships because of numerous variables outside the scope of the study and inconclusive evidence. Current research such as this is having difficulty showing, with certainty, whether physical activity proceeds depressed mood or vice versa.

According to Biddle et al. (2003) an exercise instructor/sport coach/personal trainer may act as a covariate to exercise, thus improving mental health collectively. Additionally, there are few experimental research studies with evidence for causation (Biddle et al., 2003). It is unclear whether physical activity level has an effect on mental health status, or whether mental health status promotes a physical activity level. The trends indicate that physically active people who exercise regularly are less likely to be diagnosed with depression. But it is still uncertain whether or not the cause of improved mental health is exercise. Therefore, with survey research such as that proposed in this dissertation, an association between physical activity and mental health related to

depression is the best evidence we can glean. It is impossible to account for all extraneous variables within survey data; hence, no causation can be shown in this dissertation.

Older Adult Physical Activity

Physical activity and mental health levels have also been studied in older adults. Older adults show similar results in terms of mental health based on physical activity levels. Farmer et al. (1988); Kritz-Silverstein et al. (2001); and Strawbridge, Deleger, Roberts, and Kaplan, (2002) have collected epidemiological studies of older community members. Results indicate less depression when older community members are physically active (Harris et al., 2006). As part of a follow up to a national study, Farmer et al. (1988) analyzed 1,900 healthy subjects aged 25 years to 77 years. The results may have been the first to indicate that physical inactivity among this group might be a risk factor for mental health issues.

Among older adults, Kritz-Silverstein et al. (2001) investigated depression levels to see how they were affected by high levels of physical activity. The researchers studied a community sample of older men and women (aged 50 years to 89 years) in California. Cross-sectional analyses found an association between high levels of exercise and less depressed mood. A prospective analysis looked at people who made two visits to a clinic for health check-ups. The analysis of these visits found no association between initial exercise level and the mental health score (as measured by the Beck Depression Inventory). The prospective analysis was vital in determining that “exercise does not protect against future depressed mood for those not clinically depressed at baseline” (Kritz-Silverstein et al., p. 596). The problem with this type of research is that there is no

way to account for depression as a preexisting condition that simply went undiagnosed. In other words, one might have been depressed at baseline without the actual diagnosis as such. Using both men and women in research refutes the research results of women-only college athletes discussed previously. It might be possible that the difference is in sample makeup, since one included males and the other one didn't. Another possibility is that the type of exercise was different—organized team versus any type. Regardless of the reasons for the difference in results, it is important to note that there are clashing results on the topic of long-term mental health benefits.

One aspect of this research not accounted for are subjects who are severely limited in their physical activity opportunities. Those individuals who are wheelchair bound or are limited in their mobility were not included in all of the previously mentioned studies. Strawbridge et al. (2002) has analyzed this angle of research. They hoped their research would determine whether having disabled subjects could cause confusing results. After adjusting for all of the variables, Strawbridge et al. found support for “the protective effects of physical activity on depression for older adults, and argue[d] against excluding disabled subjects from similar studies” (p. 328). Hence, in the older adult population, disabled subjects might be included in a sample without changing the results.

From Research to Theory

Many arguments have been made proposing either biological or psychological theories to explain links between physical activity and improvements in mental health. Currently, there is not total agreement about how physical activity affects mental health.

In their book *Psychology of Physical Activity*, Biddle and Mutrie (2001) have created a summary of the research about physical activity and clinical depression. Biddle and Mutrie (2001) state,

- cross-sectional population surveys support an association between higher levels of physical activity and lower levels of depression
- the weight of evidence shows that prospective studies suggest a protective effect from activity on the development of depression, but not all studies show this
- meta-analytic findings show a large effect size from studies that have used exercise as a treatment for depression
- the weight of evidence suggests that there is a causal connection between physical activity/exercise and depression. (p. 241)

In addition, Marie Donaghy (2007) has done an extensive review of the quasi-experimental literature, including both prospective longitudinal research and randomized controlled trials (RCTs).

Prospective Longitudinal Research

Donaghy (2007) found eleven prospective longitudinal studies that consisted of physical activity and depression variables, with at least two points of measurement (i.e., baseline and follow-up). Most of these studies were conducted in the United States and ranged from 1988 through 2006. Choosing studies with two or more measurements created leverage to illuminate any protective effects that physical activity had on mental health. In other words, with multiple measurement points there is a possibility to see the change between the points. This change may show that physical activity could be responsible for improving one's mental health. Donaghy alluded to the increase of mental well-being after exposure to a physical activity intervention over time.

Randomized Control Trials

Donaghy (2007) also analyzed fourteen RCTs to support, or refute the effect of an exercise intervention on clinically depressed participants. These studies were mostly conducted in the United States and ranged from 1979 through 2005. In all of the studies, participants with exercise intervention showed the same, if not better, mental health than those without physical activity. In other words, there was never a case in which the physical activity intervention was detrimental to a clinically depressed participant.

We can combine the general findings of these studies to glean an overall result. Both the prospective longitudinal analysis and the RCT analysis provide the foundation that physical activity may reduce depression (Donaghy, 2007). In addition, the author concluded that exercise is equivalent to cognitive therapy in terms of reducing depression. Donaghy found that similar conclusions have been reached by other researchers concerning mental health and physical activity.

A randomized control trial study was published in 2007 that compared the ability of exercise and antidepressant medication in reducing depression among subjects with major depressive disorder (Blumenthal et al.). Over a four month period, 202 adults were divided into groups of supervised exercise, home-based exercise, medication, and placebo. The results indicated that exercise participants as well as patients on medication exhibited similar results. The placebo group did not do as well as exercise and medication groups; however they showed higher than typical response rates for a placebo group. Overall, Blumenthal et al. suggested that “a considerable portion of the therapeutic response is determined by patient expectations, ongoing symptom monitoring, attention, and other nonspecific factors” (2007, p. 587).

Methodological Flaws in the Research

One problem with the research Donaghy (2007) analyzed was the inherent methodological flaws within each study. The researcher stated that there were weaknesses in many of the studies that she reviewed. The weaknesses were methodological in nature and included a “lack of concealment in randomization, limited use of intention to treat and blinding, the benefits of exercise far outweigh the risks” (Donaghy, 2007, p. 76). With these flaws, it is difficult to obtain a clear picture of the relationship between mental health and physical activity.

Methodological weaknesses are unavoidable in most research designs. There are a few methodological weaknesses to consider with regard to RCTs. Devereaux et al. (2004) conducted an observational study to determine the persistence of concealment in randomization and blinding in RCTs. For this research, authors of 105 published RCTs were contacted, and data from 98 of the RCTs were collected. Devereaux et al. found that concealment of randomization was not mentioned in by authors in 55% of published articles, and the blinding status of participants was missing in 26% of published articles. These authors “reported concealing randomization (96%; 95% confidence interval CI=87–100%)” and “blinding participants (20%; 95% CI=7–41%) . . . despite not reporting the use of these methodological safeguards in their publications” (p. 1232). This may give readers misleading information when trying to gather information about health.

One can be confident from this result however, that just because there is no report of bias-reducing procedures in a published article doesn't mean that those procedures weren't used (Devereaux et al., 2004). In other words, the bias-reducing methodologies

used by authors might not necessarily be discussed in their published articles.

Henceforth, it can almost be assumed that the validity of the reported benefits of physical activity in the RCTs analyzed by Donaghy (2007) do indeed outweigh the risks of the RCTs' methodological weaknesses. Hence, I can accept the results of Donaghy's study with more confidence.

Implications for College Healthcare

The advantage of physical activity and mental health research is the wide array of literature available to researchers. Current theory culminates from each piece of literature, notwithstanding each study's respective methodological weaknesses. SPSS can retest these theories for validity provided there are clear and thorough procedures. I can refocus the theories to analyze the same topic with a different approach. Research is systematically rearranged to meet the needs of investigators in a multitude of industries. The body of knowledge then permeates into other areas, possibly leading to results that cause policy changes. This dissertation refocused the collection of literature and narrowed the scope of the population to undergraduate students only. Therefore, it is significant for implications within the area of college health.

CHAPTER 3: METHOD

In this chapter, there is an outline of the methodology used in this dissertation. This discussion includes subsections related to the details about research design, questions, approach, and instruments; reliability and validity issues, data collection, participants, and site; and finally research and analysis procedures.

Research Design

The research perspective in this dissertation stemmed from the quantitative research design. The method of research utilized a well-established quantitative survey instrument called the National College Health Assessment (NCHA) (Appendix A), developed by the American College Health Association (ACHA). The research was comparative in nature with complex-difference questions. I chose to analyze the physical-activity and mental-health constructs from the NCHA survey, which contained a multitude of health constructs. Based on the construct selection, the dissertation had three independent variables and seven dependent variables. The independent variables were physical activity level, student group (CSU group and NCHA reference group), and gender. The seven dependent variables pertained to various levels of poor mental health related to depression, ranging from mild to severe.

Independent Variables

This dissertation measured the three independent variables in various ways. The item related to the physical activity level variable asked about the individual's

weekly frequency of physical activity. The physical activity item had eight possible levels (from 0 to 7 days of physical activity). I further categorized the levels into only four possible physical activity levels (0 days a week, 1–2 days a week, 3–4 days a week, and 5–7 days a week). The student group independent variable had two levels or groups: CSU group and the NCHA reference group. This dissertation compared the CSU group and the NCHA group against each other. The gender variable had two levels: female and male.

Dependent Variables

The seven dependent variables in this dissertation addressed levels of various aspects of poor mental health related to depression. The mental health construct comprised a list of seven feelings and actions (the variables are listed *a* through *g*). The mental health construct asked students, *Within the last school year how many times have you:*

- a.* Felt things were hopeless.
- b.* Felt overwhelmed by all you had to do.
- c.* Felt exhausted (not from physical activity).
- d.* Felt very sad.
- e.* Felt so depressed that it was difficult to function.
- f.* Seriously considered attempting suicide.
- g.* Attempted suicide. (ACHA, 2003 p. 7)

Measurements for these mental health levels derived from the following response options:

1. Never
2. 1 to 2 times
3. 3 to 4 times
4. 5 to 6 times
5. 7 to 8 times
6. 9 to 10 times
7. 11 or more times. (ACHA, 2003, p. 7)

These seven dependent variables about poor mental health run the gamut from mild mental health issues to severe mental health issues related to depression. In addition, the measurements reflect various frequencies, from *never* to *11 or more times* in the previous school year.

Research Questions

Fundamental Research Question

The fundamental research question for this dissertation was *Does physical activity influence mental health among undergraduate students?* Subquestions included variations of, *What is the relationship between physical activity, student group, and/or gender, and select mental health variables that reflect poor mental health?*

Main Research Questions

The primary research questions related to the mental health variables that reflect poor mental health for this dissertation included the following:

1. Do physical activity level, student group, and/or gender influence *feeling things were hopeless?*
2. Do physical activity level, student group, and/or gender influence *feeling overwhelmed by all you had to do?*
3. Do physical activity level, student group, and/or gender influence *feeling exhausted (not from physical activity)?*
4. Do physical activity level, student group, and/or gender influence *feeling very sad?*
5. Do physical activity level, student group, and/or gender influence *feeling so depressed that it was difficult to function?*
6. Do physical activity level, student group, and/or gender influence *seriously considered attempting suicide?*
7. Do physical activity level, student group, and/or gender influence *attempting suicide?*

Interaction Questions

1. Is there an interaction between physical activity level and student group in regard to how many times students experienced poor mental health variables a through g ?
2. Is there an interaction between physical activity level and gender in regard to how many times students experienced poor mental health variables a through g ?
3. Is there an interaction between student group and gender in regard to how many times students experienced poor mental health variables a through g ?
4. Is there an interaction between physical activity level, student group, and gender in regard to how many times students experienced poor mental health variables a through g ?

Post Hoc Research Question

I developed a subsequent research question based on the results of the main mental-health-related research questions. The physical activity variable contained four levels of measurement (0 days, 1–2 days, 3–4 days, and 5–7 days). When the physical activity variable was found to be statistically significant, it was necessary to gather more data about which levels showed differences. Post hoc statistics revealed which physical activity levels were statistically significant with one another. It was helpful to know if 0 days was statistically different than 1–2 days, 3–4 days, and/or 5–7 days; and so on. The post hoc question to glean this information was the following:

Is there a difference between students within the four physical activity levels in regard to how many times they experienced poor mental health variables a through g ? (For variables a through g , See dependent variable section above).

NCHA Instrument

The NCHA's survey instrument provided a general scope of college students' health, including mental and physical health habits, sexual behaviors, drug and alcohol use, and health perceptions, to name a few. The two main constructs of interest in this dissertation were mental health related to depression and physical activity. Since its pilot test in 1998–1999, the NCHA survey has achieved validity and reliability and is a nationally accepted survey. It has been compared to the Centers for Disease Control and Prevention's (CDC's) National College Health Risk Behavior Survey (1998).

The ACHA created the comprehensive NCHA survey in 1998, selecting items from established health instruments. The ACHA acquired the following instruments, which it used to create the 58 NCHA survey questions:

National College Health Risk Behavior Survey (NCHRBS), Student Health Survey, the Core Survey, the College Alcohol Study, Annual Student Health Behavior Assessment, Monitoring the Future study, and the National Health Objectives as outlined in Healthy People 2000. (as cited in ACHA, 2001, p. 4)

The CDC developed the NCHRBS in collaboration with other agencies within healthcare and academia (ACHA, 2001). Similar to my research sample, the NCHRBS studied undergraduate college students who were 18 years old or older.

Reliability and Validity

Because the NCHA survey was very similar in scope to the CDC's NCHRBS and the Harvard School of Public Health College Drinking Study, the ACHA compared these two studies to the NCHA instrument after the pilot testing. Cronbach's alphas (α) were used to compare the NCHRBS to the NCHA in terms of the internal consistency of each instrument. The ACHA conducted three pilots of the NCHA but did not report

alpha levels. The first pilot in 1998 took samples from nine institutions of higher education ($n = 2,007$). The second pilot occurred in the spring of 1999 at 10 institutions ($n = 3,531$). The third pilot occurred in the fall of 1999 at seven institutions ($n = 3,649$). The ACHA compared these NCHA pilots against both the NCHRBS and the College Drinking Study to discover reliability and validity.

Those analyses verified the reliability and validity of the scales of the depression related mental health items of interest for this dissertation. The physical activity item from the NCHA survey instrument was a key construct. SPSS could not test a reliability/alpha for physical activity within the NCHA instrument because it was only one item on the survey. The ACHA used the Pearson correlation coefficient to compare the NCHA results to the NCHRBS by correlating one variable or construct in the NCHRBS with similar items on the NCHA. The correlated variables included an item that pertained to physical inactivity.

NCHA Inter-item Correlations

It was necessary for me to deem the NCHA instrument reliable. To ensure reliability, I applied Cronbach's alpha to the NCHA survey items. I used inter-item correlations to analyze item reliability. Among the student groups, SPSS calculated inter-item correlations on the seven mental health items from the NCHA data. The 21 correlations for CSU group were all positive and ranged from .031 to .718. Cronbach's alpha was .883, and Cronbach's alpha based on standardized items was .823. Because the means and standard deviations were not very different among these groups, I used the unstandardized Cronbach's alpha. The 21 correlations for the NCHA reference group were all positive, ranging from .039 to .761. Cronbach's alpha was .844, and

Cronbach's alpha based on standardized items was .828. Once again, because the means and standard deviations were not very different, I used the unstandardized Cronbach's alpha.

Data Collection

Researchers secured Institutional Review Board (IRB) approval for a 4-year data collection of the NCHA survey to be administered to CSU undergraduate students once per academic year (Appendix B). Data collection occurred in fall 2003, spring 2005, spring 2006, and spring 2007. The data from spring 2007 was used for data analysis in this dissertation.

I used the paper-and-pencil NCHA instrument rather than the online computer survey because of the higher response rates of the paper-and-pencil instrument, the desired on-site collection format, and the student accessibility in the classroom. The paper-and-pencil survey was distributed and subsequently collected during class-time; increasing the likelihood of students completing the survey. Having the cooperation of professors was a key component to having student access via face-to-face contact for data collection. Students in the physical presence of the researcher for data collection showed higher response rates than sending the survey online. Because the survey data was collected nationwide at more than 100 institutions of higher education annually, the ACHA has combined all data sets to be used as reference groups for each semester every academic year. I controlled the CSU data collection; however, I was not able to control the reference group data collection.

Participants and Site

The CSU student sample consisted of male and female undergraduate students enrolled in a university required health and wellness core curriculum courses. The ACHA articulated the lower response rate (around 10–35%) of mail and web-based surveys (ACHA, 2009d). Therefore, it seemed more efficient to distribute paper surveys rather than mailing or using web-based surveys. Data collectors surveyed the students within a 3-week period in February of 2007. A very high percentage of potential CSU students, but not all of them, completed the survey. The CSU student population provided 1,154 finished surveys (96 students did not complete or return the survey), resulting in a 92.3% response rate. The response rate is unknown for the NCHA reference group.

The design for this dissertation was comparative, with two student groups, gender, physical activity level, and depression related mental health level. I compared the CSU group with the NCHA reference group students to create the student comparison group variable. The other comparison group variables were gender and the four physical activity levels. Collecting a pretest was not possible because physical activity was an attribute for many students since before the data collection. Therefore, I expected students with lifestyles containing high physical activity levels to show higher physical activity frequencies on the survey.

Participants self-selected to complete the survey based on their enrollment in a university required health and wellness core curriculum course in which the survey was administered. Because of the nature of a required course, the sample approximated a probability sample, as students were from multiple majors and levels. The cooperation

of professors in the departments offering these courses has created a representative sample for data collection from the CSU student group.

In terms of the NCHA reference group, institutions completing the NCHA survey were included in the reference group data set. This data set included demographic data from each institution such as location and size of institution. Such items were queried on the institutional profile form that the ACHA required for survey processing (Appendix C). The research was limited to the quality of the sample collected by each institution. The reference group consisted of data from institutions that issued paper surveys as well as Web-based surveys. Some institutions opted to utilize the identical Web version of NCHA. As a result, the reference group data consisted of a variable that allowed me to identify collection type, either paper survey or Web-based survey. Hence, the sampling techniques may have varied across these two data collection types. For example, the Web-based surveys may have been distributed via email selection to students, whereas the paper survey may have been distributed to select classrooms, or via mail.

Some institutions may have formal regulations against soliciting classrooms for survey research; hence, data collection could have happened via other means. The actual reference group data was only as good as the response rate, regardless of the means of collection. Following data collection for this group, completed paper surveys were mailed to the ACHA processing center. All surveys were sent through the survey scanner and data input occurred immediately. Web survey data input occurred simultaneously as the student completed each item.

Procedure

Prior to data collection, approval from through the university's Institutional Review Board (IRB) was obtained (Appendix B). Four professors teaching Health and Wellness core classes granted approval for classroom survey distribution and collection. I contacted the professors directly to arrange dates and times for data collection. The professors allowed the data collectors to administer the survey during the last 30 minutes of class. The professors left the room during the survey administration so as not to influence students' participation.

The survey administrators informed the students that the 8-page survey required approximately 20 minutes to complete. Before distributing the survey to the students, the Informed Consent Form (Appendix D) was give to the students. The Informed Consent Form stated that the survey was voluntary, could be stopped at any time, and did not affect students' class grades if they chose not to participate. The survey administrator read the Script for Data Collection (Appendix E) aloud to the students before distributing the surveys. Some of the questions on the survey were personal and may have caused distress to the students. Therefore, the survey administrator emphasized the availability of the University Counseling Center to students who felt they needed to seek assistance after they had completed the survey. There were no items on the survey that requested the students to identify themselves, which maintained anonymity for the students.

The NCHA reference group data was taken from the ACHA's data collection of all sampled undergraduate students throughout North America. Colleges and universities throughout the United States and some in Canada self-selected for students

to complete the NCHA survey. As an ACHA member, CSU self-selected for students to complete the survey, as well.

The NCHA survey was administered to CSU group separately from the institutions in the NCHA national reference group. For this dissertation, as noted previously, I compared CSU undergraduate students and the NCHA reference group mainly on their levels of physical activity and depression related mental health; gender was also a consideration. Because human subjects were the focus of the survey, this research was rooted in the social sciences. King and Zeng (2007) subscribe to the concept of social science research:

Social science is about making inferences—using facts we know to learn about facts we do not know. Some inferential targets (the facts we do not know) are *factual*, which means that they exist even if we do not know them. (p. 183)

I assisted with data collection in the spring 2007 semester; therefore, I selected this particular data set for analysis in this dissertation. After I had received IRB approval, the department head in the Health and Wellness Core Curriculum department granted permission for me to administer such a survey. I then arranged dates and times for data collection.

Data Analysis

My statistical procedures utilized the Statistical Package for the Social Sciences Version 16.0 (SPSS, 2008) software. My goal was to use inferential statistics with this survey data. It is clear that any data will be only as good as the manner in which it was collected. In this dissertation, the CSU student participant sample was non-random and the reference group probably not random either. Regardless of how the CSU group was

sampled, the data were not generalizable to the national undergraduate population for the reasons stated previously.

For each of the seven depression related mental health variables that reflected poor mental health (*a* through *g*), a three-way factorial analysis of variance (ANOVA) was the appropriate statistical analysis approach, given the equal variance across groups and a normally distributed dependent variable. For each of these mental health variables related to depression, SPSS calculated a three-way 4 x 2 x 2 factorial ANOVA. There were assumptions that coincided with an ANOVA statistical analysis. These assumptions were that the data came from a normally distributed population, the variances in all of the groups were somewhat similar, and the observations were independent (Field, 2005).

In a three-way ANOVA, I was to conduct a post hoc analysis if there were statistically significant differences between groups with three or more levels, as shown with a significant ANOVA *F* (Morgan, Leech, Gloeckner, & Barrett, 2004). An ANOVA is greatly affected by substantially different variances of comparison groups (Morgan et al., 2004). Therefore, I used a Levene test to assess the assumption that the variances of two groups were equal (Morgan et al., 2004). Post hoc multiple-comparison tests, such as the LSD, Scheffe, Tukey HSD, or the Games-Howell, were the options for me to choose from depending upon the significance of the Levene test and my desired level of conservativeness (Morgan et al., 2004). Based on the Levene test results, I chose my conservativeness to set the alpha or *p* value required for statistical significance (Morgan et al., 2004). I analyzed post hoc tests to determine where the differences existed among the physical activity levels, and the interactions.

If I found the Levene test to be significant, I would have used the Games-Howell test. Field (2005) stated that ANOVA is robust even when violations of the statistical assumptions are present; however, alternative tests exist if needed.

For the three-way factorial ANOVA research analysis I used survey data to analyze relationships among variables across four physical activity levels, two student groups, two genders, and seven mental health variables related to depression. Sound data collection within this method enabled me to tackle the problem of determining what, if any, relationship existed between physical activity, student group, and gender among mental health variables reflecting depression.

CHAPTER 4: RESULTS

In this chapter, I outline the research results. This discussion includes subsections related to the details about the foundation for interpreting data, the sample, general statistical interpretation, main research questions with possible interactions, and finally the summary of results.

Foundation for Interpreting Data

The purpose of this research was to explore the relationships between undergraduate student mental health status and the physical activity level, student group, and gender. During data exploration, analyses were conducted in order to reveal detailed results. The goal was to determine differences among the various comparison groups. This chapter explains the demographics of each group of participants and their relationships. The research questions were answered with various analytic methods, including 7 three-way analysis of variance tests with subsequent post hoc tests, when appropriate; to compare physical activity levels.

Sample

The ACHA recommended that institutions with 20,000 to 29,999 students collect at least 900 completed surveys for a representative sample size (ACHA, 2009d). At CSU, there was a population of 25,046 in the spring semester of 2007 when the survey was conducted. The entire sample completing the NCHA survey in spring 2007 consisted of 61,758 undergraduate students. There were some missing data pertaining

to the independent and dependent variables among the 1,154 CSU students sampled. Therefore surveys with important missing data were eliminated, leaving a sample of $n = 1,037$ for the CSU student population. The statistical power was very high for comparing 61,758 NCHA reference group students to 1,037 CSU students. Thus, upon initial comparison of CSU students and NCHA reference group students, all the responses to the mental health variables related to depression showed statistical significance ($p \leq .001$) but often very small to negligible effect sizes. Also, comparing these two student groups was a problem due to violating the assumption of homogeneity of variances. As a result, I took a random sample of the NCHA reference group data as a comparison group. When analyzing the valid percents of each distribution, there was never more than 1% difference between the entire reference group sample and the random sample of the reference group. Therefore, I decided to use the random sample of the reference group rather than the entire reference group. These randomly selected students were identified using the random sample tool in SPSS. The students that were analyzed were identified as having undergraduate status (first, second, third, fourth, and fifth or more year undergraduate students). This population excluded students with missing data for any of the key dependent and independent variables.

Initial Data Assessment

Descriptive statistics were reviewed to find outliers and illegal values. The eight physical activity levels were restructured into four levels (0, 1–2, 3–4, or 5–7 days of physical activity per week) to have a more even distribution in each category. The demographic distributions of the sample include physical activity level, gender, year in

school, gender, and ethnicity. Examining these data may provide an understanding of the composition of the CSU and NCHA reference group sample. The data on Table 4.1 shows data pertaining to demographics of the sample. The data showed that The CSU group had a high percentage of students with physical activity levels in the 3–4 days per week range, followed by the 5–7 day range. The NCHA reference group however reported the highest two physical activity levels as 1–2 days, then 3–4 days per week. Hence, CSU had a larger number of students in the higher physical activity level ranges, where the NCHA reference group had more students in lower physical activity level ranges.

Looking at gender within the two student groups, CSU had a more even distribution of females to males in the sample. This may have been due to the fact that the survey was collected in a classroom with a fairly even distribution of genders and a seemingly high response rate by both genders. The NCHA reference group data for gender showed a high amount of females, accounting for 62.9% of the group.

Additionally, the CSU data collection was heavy on underclassmen responses, with first year students accounting for 55.9%, and second year students accounting for 24.0%. The reason for this was that the data collection occurred in core curriculum classrooms. Core curriculum classes contained mostly first and second year students. On the other hand, the NCHA reference group had a more even distribution across all grade levels except for the fifth year plus, with only 6.2%. Many ACHA affiliated universities could have taken samples from throughout campus, and possibly via online surveys. This could explain the more even distribution of their sample.

Finally, the CSU group had primarily White ethnicity at 85.2%, followed by Hispanic ethnicity at 6.8%. The NCHA reference group showed a slightly better distribution of ethnicity. Whites were still the highest ethnicity with 70.7%, but Asians were second with 10.5%, followed by Hispanics with 8.0%. These ethnic distributions could have been a result of the location and socioeconomic status of the universities from which the samples came.

One can utilize Table 4.1 to check the *Healthy Campus 2010* physical activity goal. The goal was to increase the number of students who were physically active 3 or more days per week to 55%. CSU had 61% of students who were physically active 3 or more days per week. The NCHA reference group had 43% of students who were physically active 3 or more days per week. These results indicated that CSU met the *Healthy Campus 2010* goal and the NCHA reference group has not met the goal yet.

Assess the Data for Violations of Assumptions

The data consisted of two groups; The CSU group and the NCHA reference group. The CSU group was independent from the NCHA reference group because the CSU group was not included in the NCHA reference group sample. The Levene's test of homogeneity of variance was violated for all of the mental health variables related to depression except *felt exhausted*. Hence, with the exceptions of the *felt exhausted* variable, equal variances were not assumed. A 4 x 2 x 2 analysis of variance statistic was calculated for effects of physical activity level, student group, and gender on each of the mental health variables related to depression. Interactions between the variables of physical activity level, student group, and gender were also computed. Tables 4.2,

4.5, 4.7, 4.11, 4.14, 4.17, and 4.19 display the ANOVA results for all of the independent variables and each of the dependent variables related to depression.

Table 4.1

Demographic Characteristics of Study Participants

Characteristic	CSU <i>n</i>	CSU %	NCHA Reference Group <i>n</i>	NCHA Reference Group %	Overall <i>n</i>
Physical Activity Level					
0 Days	153	14.4	282	26.5	435
1–2 Days	259	24.4	329	30.9	588
3–4 Days	362	34.2	293	27.5	655
5–7 Days	285	26.9	162	15.2	447
Gender					
Female	534	52.9	660	62.9	1,194
Male	475	47.1	390	37.2	865
Year in School					
1 st Year	600	55.9	281	26.2	881
2 nd Year	257	24.0	269	25.1	526
3 rd Year	125	11.6	270	25.2	395
4 th Year	58	5.4	187	17.4	245
5 th Year +	33	3.1	66	6.2	99
Ethnicity					
White	941	85.2	800	70.7	1,741
Black	26	2.4	60	5.3	86
Hispanic	75	6.8	90	8.0	165
Asian	36	3.3	119	10.5	155
Indian	9	0.8	15	1.3	24
Other	17	1.5	48	4.2	65
Total	1,073		1,073		2,146

General Statistical Interpretation

In order to deem a result statistically significance, a significant *p* level of .007 was required. Because of the very large samples and seven separate analysis of

variance tests, a decision was made to be more conservative by using a significance level of $p < .007 (.05/7)$.

When significant F tests for physical activity level were discovered, post hoc comparisons were necessary to determine the location of the differences. When there were significant differences among the four physical activity levels, the Games-Howell post hoc test was used because the Levene's test for the assumption of homogeneity of variance for the mental health variables related to depression was usually violated.

When the post hoc tests revealed statistically significant differences between the physical activity levels, effect sizes were calculated (Cohen, 1988) to determine substantive significance between the groups. In this dissertation, a $d \approx .2$ was interpreted as a smaller than typical effect size, $d \approx .5$ a typical effect size, and a $d \approx .8$ a larger than typical effect size. These effect size interpretations are based on typical effects within the social sciences. The post hoc tests and effect sizes (d) are listed in the post hoc tables. Vaske, Gliner, and Morgan's (2002) modification of Cohen's (1988) terminology, are used to interpret the size of the post hoc differences.

Interpretations of the effect sizes for the eta squares in the ANOVA tables are as follows: η^2 of about .010 is considered to be small or smaller than typical in the social sciences and η^2 about .090 is considered to be typical or medium. The interpretations are again based on Cohen (1988) and Vaske et al. (2002). The means and standard deviations for poor mental health of students for each independent variable are found in Tables 4.3, 4.6, 4.8, 4.10, 4.12, 4.15, 4.18, and 4.20.

Main Research Questions

Main Research Question One: Felt Hopeless

Table 4.2 shows that both the physical activity levels, $F(3, 2014) = 8.39, p < .001, \eta^2 = .01$, and gender, $F(1, 2014) = 27.34, p < .001, \eta^2 = .01$, showed significant differences on the *felt hopeless* mental health variable. No interactions were found to be significant. Within gender, females ($M = 2.72$) showed lower mental health levels (more feelings of hopelessness) than males ($M = 2.23$). The means and standard deviations for the *felt hopeless* variable of students in each physical activity level are found on Table 4.3. This gender difference ($d = .27$) was considered a smaller than typical effect size.

Table 4.2

ANOVA Source Table for "Felt Hopeless" Variable

Source	SS	$\frac{d}{f}$	MS	F	p	Partial η^2
Physical Activity Level	82.89	3	27.63	8.39*	< .001	.012
Student Group	16.86	1	16.86	5.12	.024	.003
Gender	89.90	1	89.90	27.34*	< .001	.013
Physical Activity Level and Student Group Interaction	9.43	3	3.14	0.96	.413	.001
Physical Activity Level and Gender Interaction	14.80	3	4.93	1.50	.213	.002
Student Group and Gender Interaction	0.00	1	0.00	0.00	.999	.000
Physical Activity Level, Student Group, and Gender Interaction	2.03	3	0.68	0.21	.893	.000

* = $p < .007$

Table 4.3

Means, Standard Deviations, and n for “Felt Hopeless” Variable

Variable	<i>n</i>	<i>M</i>	<i>SD</i>
Physical Activity Level			
0 Days	415	2.91	2.09
1–2 Days	563	2.58	1.89
3–4 Days	627	2.43	1.76
5–7 Days	425	2.16	1.55
Student Group			
CSU Group	993	2.36	1.71
NCHA Reference Group	1,037	2.67	1.95
Gender			
Female	1,180	2.72	1.88
Male	850	2.23	1.75

Analyzing post hoc test comparisons showed significant differences among the four physical activity levels. The Levene's test for homogeneity of variance for the *felt hopeless* variable was violated ($p < .001$), thus the Games-Howell post hoc test for unequal variances was used. Table 4.4 reveals results from the post hoc comparisons on the *felt hopeless* variable. The mean *felt hopeless* rating for those with no days of physical activity was significantly higher ($p < .001$) than the rating for those with 3–4 days of physical activity, but the effect size was smaller than typical ($d = .25$). Also 0 days of physical activity was significantly higher than 5–7 days of physical activity ($p < .001$), with a typical effect size ($d = .41$). Finally, students with 1–2 days of physical activity showed more feelings of hopelessness than students reporting 5–7 days of physical activity, but the effect was smaller than typical ($d = .24$). The post hoc tests showed a linear trend in the *felt hopeless* variable. As physical activity level increased feelings of hopelessness decreased (mental health was better).

Table 4.4

Pairwise Games-Howell Post Hoc Tests for Physical Activity Level on "Felt Hopeless," Effect Sizes (Cohen, 1988), and 95% Confidence Intervals

Pairwise Effects	Mean Diff.	<i>p</i>	ES (<i>d</i>)	95% CI	
				<i>LL</i>	<i>UL</i>
0 days vs. 1–2 days	.33	.044	.17	.01	.66
0 days vs. 3–4 days	.47	.001*	.25	.15	.78
0 days vs. 5–7 days	.73	.001*	.41	.41	1.05
1–2 days vs. 3–4 days	.13	.574	.08	-.13	.40
1–2 days vs. 5–7 days	.40	.001*	.24	.12	.67
3–4 days vs. 5–7 days	.26	.048	.16	.00	.52

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit; $d \approx .2$ = smaller than typical effect size; $d \approx .5$ = typical effect size

* = $p < .008$

Main Research Question Two: Felt Overwhelmed

The mental health variable of *felt overwhelmed* showed statistical significance only within the gender variable, $F(1, 2011) = 103, p < .001, \eta^2 = .05$. No interactions were found to be significant (Table 4.5). Within the significant gender variable, females ($M = 4.66$) showed lower mental health levels than males ($M = 3.71$) (Table 4.6), with a typical effect size ($d = .49$). Physical activity level was not found to be significant; therefore post hoc tests were not needed.

Table 4.5

ANOVA Source Table for "Felt Overwhelmed" Variable

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	Partial η^2
Physical Activity Level	39.35	3	13.12	3.51	.015	.005
Student Group	24.85	1	24.85	6.65	.010	.003
Gender	383.34	1	383.34	102.56*	< .001	.049
Physical Activity Level and Student Group Interaction	45.72	3	15.24	4.08	.007	.006
Physical Activity Level and Gender Interaction	14.85	3	4.95	1.32	.265	.002
Student Group and Gender Interaction	0.38	1	0.38	0.10	.749	.000
Physical Activity Level, Student Group, and Gender Interaction	4.13	3	1.38	0.37	.776	.001

* = $p < .007$

Table 4.6

Means, Standard Deviations, and n for "Felt Overwhelmed" Variable

Variable	<i>n</i>	<i>M</i>	<i>SD</i>
Physical Activity Level			
0 Days	414	4.64	1.98
1–2 Days	563	4.25	1.97
3–4 Days	626	4.17	2.00
5–7 Days	424	4.03	2.01
Student Group			
CSU Group	989	4.07	1.98
NCHA Reference Group	1,038	4.44	2.00
Gender			
Female	1,177	4.66	1.90
Male	850	3.71	2.01

Main Research Question Three: Felt Exhausted

The mental health variable of *felt exhausted* (not from physical activity) exhibited statistical significance among a few variables (Table 4.7). The variables of physical activity level, $F(3, 2008) = 4.17, p = .006, \eta^2 = .01$; student group, $F(1, 2008) = 9.16, p = .003, \eta^2 = .01$, and gender $F(1, 2008) = 75.84, p < .001, \eta^2 = .04$, all showed significant differences. The interaction of physical activity level and student group was also significant, $F(3, 2008) = 4.51, p = .004, \eta^2 = .01$. The *felt exhausted* means of the NCHA reference group decreased as physical activity levels increased, where CSU students maintained a steady level. There was a significant difference between 0 days and 5–7 days of physical activity on the *felt exhausted* variable of the NCHA reference group ($p < .001, d = .47$), with a typical effect size.

Table 4.7

ANOVA Source Table for “Felt Exhausted (Not from Physical Activity)” Variable

Source	SS	df	MS	F	p	Partial η^2
Physical Activity Level	49.44	3	16.48	4.17*	.006	.006
Student Group	36.24	1	36.24	9.16*	.003	.005
Gender	300.04	1	300.04	75.84*	< .001	.036
Physical Activity Level and Student Group Interaction	53.53	3	17.84	4.51*	.004	.007
Physical Activity Level and Gender Interaction	15.34	3	5.12	1.29	.275	.002
Student Group and Gender Interaction	0.71	1	0.71	0.18	.671	.000
Physical Activity Level, Student Group, and Gender Interaction	18.25	3	6.08	1.54	.203	.002

* = $p < .007$

The NCHA reference group students ($M = 4.31$) showed lower mental health than the CSU group ($M = 3.90$), but the effect was smaller than typical ($d = .20$). In addition, Table 4.8 shows that females ($M = 4.46$) reported lower mental health levels than males ($M = 3.64$) with a typical effect size ($d = .41$). There was a significant difference between the various physical activity levels on the *felt exhausted* variable. To reveal which physical activity groups were different, a post hoc test was necessary. Upon finding a Levene's test of homogeneity of variance that was significant (violated) for the *felt exhausted* variable ($p = .042$), the Games-Howell post hoc test was used. After the post hoc tests were analyzed for physical activity level, significant differences were found between 0 days ($M = 4.43$), and 5–7 days ($M = 3.80$) at $p < .001$, with a smaller than typical effect ($d = .30$) (Table 4.9).

Table 4.8

Means, Standard Deviations, and n for "Felt Exhausted" Variable

Variable	<i>n</i>	<i>M</i>	<i>SD</i>
Physical Activity Level			
0 Days	414	4.43	2.10
1–2 Days	563	4.21	1.95
3–4 Days	626	4.03	2.06
5–7 Days	424	3.80	2.04
Student Group			
CSU Group	989	3.90	2.03
NCHA Reference Group	1,038	4.31	2.04
Gender			
Female	1,177	4.46	1.96
Male	850	3.64	2.06

Table 4.9

Games-Howell Pairwise Post Hoc Tests for Physical Activity Level on “Felt Exhausted,” Effect Sizes (Cohen, 1988), and 95% Confidence Intervals

Pairwise Effects	Mean	<i>p</i>	ES	95% CI	
	Diff.		(<i>d</i>)	<i>LL</i>	<i>UL</i>
Post Hoc Tests of Main Effects					
0 days vs. 1–2 days	.23	.277	.11	-0.10	0.56
0 days vs. 3–4 days	.40	.012	.19	0.06	0.73
0 days vs. 5–7 days	.61	< .001*	.30	0.25	0.98
1–2 days vs. 3–4 days	.16	.475	.09	-0.13	0.46
1–2 days vs. 5–7 days	.38	.014	.21	0.04	0.72
3–4 days vs. 5–7 days	.22	.315	.11	-0.11	0.54

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit; $d \approx .2$ = smaller than typical effect size, $d \approx .5$ = typical effect size

* = $p < .007$

Interpretation of the significant interaction. Figure 4.1 illustrates the statistically significant interaction between physical activity level and student group on the *felt exhausted* variable. After finding the interaction, careful examination of the interaction and main effects followed. The CSU group reported exhaustion similarly across the physical activity levels, revealing a steady trend. Among the NCHA reference group, however, as the physical activity level increased students reported feeling less exhausted.

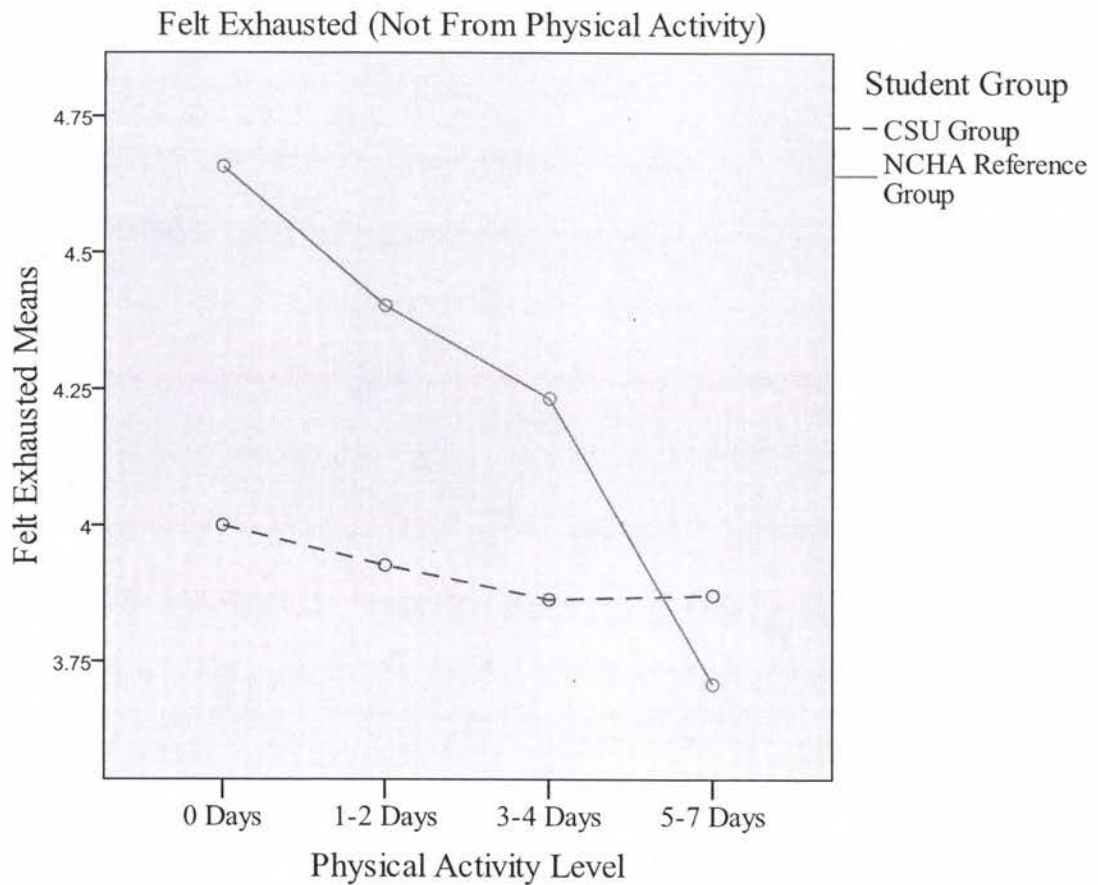


Figure 4.1. The estimated marginal means of *felt exhausted* for the interaction between physical activity level and student group plot the interaction showing four simple effects.

When plotted on the same graph, as in Figure 4.1, the student groups revealed an interaction. It was necessary to compute a one-way ANOVA and contrasts for this interaction. To glean more detailed data, it was necessary to create eight new levels of the physical activity variable, containing every combination of physical activity level and student group. The first four new levels contained CSU students with 0, 1–2, 3–4, and 5–7 days of physical activity respectively. The final four new levels contained NCHA reference group students with 0, 1–2, 3–4, and 5–7 days of physical activity

respectively. The overall ANOVA for the new variable was $F(7, 2101) = 6.63, p < .001, \eta^2 = .02$. Levene's test for equality of variances was checked and was not violated ($p = .197$).

The follow-up contrasts compared corresponding student group means for each of the four levels of physical activity. Figure 4.1 and Table 4.10 show the four contrasts comparing the two student groups on each physical activity level. Assuming equal variances, only the first two contrasts were significant. The first contrast compared the CSU group and NCHA reference group students who were not physically active during the week [$t(2101) = -3.23, p = .001$ (2-tailed)]. The CSU group showed better mental health ($M = 4.00$) than the NCHA reference group ($M = 4.66$) among students with 0 days of physical activity. The second contrast compared the CSU group and NCHA reference group students who were physically active 1–2 days a week [$t(2101) = -2.82, p = .005$ (2-tailed)]. The CSU group showed better mental health ($M = 3.93$) than the NCHA reference group ($M = 4.40$) among students with 1–2 days of physical activity. These two significant contrasts revealed smaller than typical effect sizes at $d = .14$ and $d = .12$ respectively. The third and fourth contrasts measured the two higher physical activity levels between the student groups and were not statistically significant. Thus, for the felt exhausted dependent variable, the significant interaction was because the NCHA group felt more exhausted if they had little or no physical activity, but there was not a significant difference between the CSU and NCHA group who were activity 3 or more days.

Table 4.10

Means, Standard Deviations, and n for “Felt Exhausted” as a Function of Physical Activity Level and Student Group

Physical Activity Levels	CSU Group			NCHA Reference Group			<i>t</i>
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	
0 days of physical activity	153	4.00	2.08	280	4.66	2.08	-3.23*
1–2 days of physical activity	257	3.93	1.96	328	4.40	1.92	-2.82*
3–4 days of physical activity	359	3.86	2.03	292	4.23	2.07	-2.31
5–7 days of physical activity	279	3.87	2.10	161	3.71	1.97	0.81
Total	1,048	3.90	2.04	1,061	4.32	2.03	

* = $p < .007$

Main Research Question Four: Felt Very Sad

The mental health variable of *felt very sad* showed statistical significance on the physical activity level, $F(3, 2013) = 5.95, p < .001, \eta^2 = .01$; and gender $F(1, 2013) = 84.21, p < .001, \eta^2 = .04$. The ANOVA source Table 4.11 displays the details for these significant variables. Females ($M = 3.44$) reported lower mental health levels than males ($M = 2.58$) with a typical effect size ($d = .46$), as shown on Table 4.12.

Table 4.11

ANOVA Source Table for "Felt Very Sad" Variable

Source	SS	df	MS	F	p	Partial eta ²
Physical Activity Level	64.17	3	21.39	5.95*	< .001	.009
Student Group	3.47	1	3.47	0.97	.326	.000
Gender	302.86	1	302.86	84.21*	< .001	.040
Physical Activity Level and Student Group Interaction	9.85	3	3.28	0.91	.434	.001
Physical Activity Level and Gender Interaction	8.10	3	2.70	0.75	.522	.001
Student Group and Gender Interaction	3.85	1	3.85	1.07	.301	.001
Physical Activity Level, Student Group, and Gender Interaction	8.49	3	2.80	0.78	.506	.001

* = $p < .007$

Table 4.12

Means, Standard Deviations, and n for "Felt Very Sad" Variable

Variable	n	M	SD
Physical Activity Level			
0 Days	416	3.39	2.06
1–2 Days	566	3.18	2.01
3–4 Days	625	3.03	1.92
5–7 Days	424	2.73	1.73
Student Group			
CSU Group	990	2.97	1.88
NCHA Reference Group	1,039	3.19	2.01
Gender			
Female	1,180	3.44	1.99
Male	849	2.58	1.78

The Games-Howell post hoc tests for physical activity revealed significant differences between 0 days ($M = 3.39$) with 5–7 days ($M = 2.73$) at $p < .001$; a smaller than typical effect size ($d = .35$). Another significant post hoc difference for physical activity was revealed between 1–2 days ($M = 3.18$) with 5–7 days ($M = 2.73$) at $p = .001$; a smaller than typical effect size ($d = .24$). Table 4.13 shows these significant post hoc tests for physical activity.

Table 4.13

Pairwise Games-Howell Post Hoc Tests for Physical Activity Level on “Felt Very Sad,” Effect Sizes (Cohen, 1988), and 95% Confidence Intervals

Pairwise Effects	Mean	<i>p</i>	ES	95% CI	
	Diff.		(<i>d</i>)	<i>LL</i>	<i>UL</i>
0 days vs. 1–2 days	.26	.177	.10	-.07	.60
0 days vs. 3–4 days	.38	.014	.18	.06	.70
0 days vs. 5–7 days	.69	< .001*	.35	.36	1.02
1–2 days vs. 3–4 days	.11	.741	.07	-.17	.40
1–2 days vs. 5–7 days	.43	.001*	.24	.13	.73
3–4 days vs. 5–7 days	.32	.024	.16	.03	.60

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit; $d \approx .2$ = smaller than typical effect size, $d \approx .5$ = typical effect size

* = $p < .008$

Main Research Question Five: Felt Depressed

The mental health variable of *felt depressed* revealed differences between physical activity levels, $F(3, 2014) = 10.37, p < .001, \eta^2 = .02$, and between the gender variable, $F(1, 2014) = 10.63, p = .001, \eta^2 = .01$, (Table 4.14). Females ($M = 2.15$) showed lower mental health levels than males ($M = 1.82$); a smaller than typical effect size ($d = .20$). Table 4.15 displays the mean and standard deviation data for the *felt depressed* dependent variable for each independent variable.

Table 4.14

ANOVA Source Table for "Felt Depressed" Variable

Source	SS	df	MS	F	p	Partial eta ²
Physical Activity Level	85.84	3	28.61	10.37*	<.001	.015
Student Group	6.14	1	6.14	2.23	.136	.001
Gender	29.34	1	29.34	10.63*	.001	.005
Physical Activity Level and Student Group Interaction	8.62	3	2.87	1.04	.373	.002
Physical Activity Level and Gender Interaction	15.95	3	5.31	1.93	.123	.003
Student Group and Gender Interaction	0.15	1	0.15	0.06	.814	.000
Physical Activity Level, Student Group, and Gender Interaction	3.23	3	1.08	0.39	.760	.001

* = $p < .007$

Table 4.15

Means, Standard Deviations, and n for "Felt Depressed"

Variable	n	M	SD
Physical Activity Level			
0 Days	414	2.35	2.02
1–2 Days	565	2.10	1.72
3–4 Days	628	1.93	1.61
5–7 Days	424	1.68	1.24
Student Group			
CSU Group	992	1.90	1.59
NCHA Reference Group	1,038	2.12	1.76
Gender			
Female	1,180	2.15	1.74
Male	850	1.82	1.58

The Games-Howell post hoc of physical activity level on *felt depressed*, showed in Table 4.16, reveals differences between 0 days ($M = 2.35$) with 3–4 days ($M = 1.93$)

of physical activity ($d = .23, p = .001$), a smaller than typical effect size. Additionally, 0 days ($M = 2.35$) of physical activity was significantly different with 5–7 days ($M = 1.68$) of physical activity ($d = .40, p < .001$), a typical effect size.

Table 4.16

Pairwise Games-Howell Post Hoc Tests for Physical Activity Level on “Felt Depressed,” Effect Sizes (Cohen, 1988), and 95% Confidence Intervals

Pairwise Effects	Mean	<i>p</i>	ES	95% CI	
	Diff.		(<i>d</i>)	<i>LL</i>	<i>UL</i>
0 days vs. 1–2 days	.29	.071	.13	-.02	.60
0 days vs. 3–4 days	.44	.001*	.23	.14	.74
0 days vs. 5–7 days	.69	<.001*	.40	.40	.99
1–2 days vs. 3–4 days	.15	.401	.10	-.10	.39
1–2 days vs. 5–7 days	.40	.000	.28	.16	.64
3–4 days vs. 5–7 days	.25	.021	.17	.03	.48

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit; $d \approx .2$ = smaller than typical effect size, $d \approx .5$ = typical effect size

* = $p < .008$

Main Research Question Six: Considered Attempting Suicide

Table 4.17 reveals no significant differences within any of the independent variables on the *considered attempting suicide* mental health variable. Thus, no post hoc tests were necessary as a result of the findings. The mean and standard deviation data (Table 4.18) implies that students with 0 through 2 days of physical activity report a higher mean for the *considered attempting suicide* variable; however, it was not statistically significant.

Table 4.17

ANOVA Source Table for "Considered Attempting Suicide" Variable

Source	SS	df	MS	F	p	Partial eta ²
Physical Activity Level	4.87	3	1.62	2.76	.041	.004
Student Group	0.03	1	0.03	0.05	.826	.000
Gender	0.18	1	0.18	0.31	.579	.000
Physical Activity Level and Student Group Interaction	0.16	3	0.05	0.09	.965	.000
Physical Activity Level and Gender Interaction	5.31	3	1.77	3.01	.029	.004
Student Group and Gender Interaction	0.94	1	0.94	1.60	.206	.001
Physical Activity Level, Student Group, and Gender Interaction	0.50	3	0.17	0.28	.839	.000

Table 4.18

Means, Standard Deviations, and n for "Considered Attempting Suicide" Variable

Variable	n	M	SD
Physical Activity Level			
0 Days	416	1.22	0.81
1-2 Days	564	1.24	0.92
3-4 Days	627	1.16	0.71
5-7 Days	424	1.10	0.56
Student Group			
CSU Group	992	1.16	0.75
NCHA Reference Group	1,040	1.20	0.79
Gender			
Female	1,181	1.19	0.79
Male	851	1.17	0.74

Main Research Question Seven: Attempted Suicide

Finally, Table 4.19 displayed no significant differences for the three independent variables or on the interactions for *attempted suicide*. Table 4.20 displays the mean and standard deviation data for the independent variables on the *attempted suicide* variable. Since the data were not statistically significant, it is difficult to draw conclusions of real-world value for this variable.

Table 4.19

ANOVA Source Table for "Attempted Suicide" Variable

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	Partial η^2
Physical Activity Level	1.64	3	0.55	3.73	.011	.006
Student Group	0.00	1	0.00	0.00	.993	.000
Gender	0.57	1	0.57	3.91	.048	.002
Physical Activity Level and Student Group Interaction	0.50	3	0.17	1.14	.330	.002
Physical Activity Level and Gender Interaction	0.41	3	0.14	0.94	.423	.001
Student Group and Gender Interaction	0.00	1	0.00	0.00	.984	.000
Physical Activity Level, Student Group, and Gender Interaction	0.24	3	0.08	0.56	.645	.001

Table 4.20

Means, Standard Deviations, and n for "Attempted Suicide" Variable

Variable	<i>M</i>	<i>SD</i>
Physical Activity Level		
0 Days	1.03	0.27
1–2 Days	1.08	0.61
3–4 Days	1.03	0.25
5–7 Days	1.02	0.19
Student Group		
CSU Group	1.04	0.41
NCHA Reference Group	1.04	0.36
Gender		
Female	1.03	0.30
Male	1.06	0.48

Summary

The statistically significant differences on the physical activity levels for the seven mental health variables related to depression ranged from the least acceptable value of $p < .008$ down to $p < .001$. A linear trend was revealed across each of the first five mental health variables related to depression: as the physical activity level increased, mental health related to depression improved. There were seven significant physical activity post hoc tests revealed at the $p < .008$ level. Six of these seven differences were between students reporting 0 days of physical activity and either 3–4 days or 5–7 days of physical activity. The other difference was between students reporting 1–2 days and 5–7 days of physical activity. This led me to believe that the majority of differences lie between the mental health of those with 0 days and those with 3 or more days of physical activity per week. So the higher frequency of weekly physical activity corresponds with better mental health. Zero days of weekly physical

activity has more relation to poor mental health. The results of the seven 3-way ANOVAs are summarized in Table 4.21.

Table 4.21

Summary Table of Statistically Significant Results

Dependent Variable	PA	Student Group	Gender	Interaction
Felt Hopeless	0>3-4			
	0>5-7	--	F>M	--
	1-2>5-7			
Felt Overwhelmed	--	--	F>M	--
Felt Exhausted	0>5-7	NCHA>CSU	F>M	PA x SG
Felt Very Sad	0>5-7		F>M	
	1-2>5-7	--	F>M	--
Felt Depressed	0>3-4			
	0>5-7	--	F>M	--
	1-2>5-7			
Considered Attempting Suicide	--	--	--	--
Attempted Suicide	--	--	--	--

Note. PA = physical activity; F = female; M = male; SG = student group; 0 = no days; 1-2 = 1-2 days; 3-4 = 3-4 days; 5-7 = 5-7 days; -- = not significant

Among the first five mental health variables related to depression, there were significant differences within gender. All of the gender differences revealed males self reporting better mental health than females. There was one significant difference between the student groups ($p = .003$) within the *felt exhausted* variable. In this case, the CSU group experienced, on average, better mental health than the NCHA reference group. There was one interaction found between physical activity and student group within the *felt exhausted* variable, $p = .004$. The interaction showed that the NCHA reference group had better mental health as the physical activity level increased while

the CSU group had steady levels of mental health as physical activity levels increased. Within the mental health variables related to depression there were a total of 16 out of 84 significant differences at $p < .007$.

In summary, the data identified physical activity level and gender as the main factors that showed the most significant differences among several of the mental health variables that reflected mild poor mental health. Students who had medium to high physical activity levels reported better mental health than students with lower physical activity levels. Overall, men reported better mental health than women. The mental health variables that mentioned suicide showed no significant differences among the physical activity levels, student groups, or genders. This led to the conclusion that gender and physical activity level made a difference in the first five mental health variables related to depression; however, the effect sizes were mostly smaller than typical. There was a low frequency of students reporting these more severe mental health issues. The independent variables of physical activity, student group, and gender showed no differences or interactions on the two suicide items. Most of the differences were found only among the less severe mental health issues.

CHAPTER 5: DISCUSSION

The information gained from this dissertation may contribute to the knowledge of college health research. The purpose of this research was to analyze the relationships between mental health, physical activity level, and gender among undergraduate students. In the dissertation, I separated the student group variable into Colorado State University (CSU) students and the National College Health Assessment (NCHA) national reference group students. The main concepts and focus of the research, however, were the physical activity and mental health variables related to depression. The physical activity levels I analyzed were 0 days, 1–2 days, 3–4 days, and 5–7 days of weekly physical activity. Other analysis included seven mental health variables related to depression based on frequencies measured in the students' previous school year. These variables ranged from mild mental health concerns (e.g., sadness) to severe mental health concerns (e.g., suicide contemplation and attempted suicide). This chapter focuses on the results of the dissertation for each research question.

Rationale

The research theory employed in this dissertation is that physical activity is a positive influence on mental health related to depression. This theory was based on the cumulative research of Craft et al. (2007); Donaghy (2007); Dunn et al. (2001); Fox (1999); Harris et al. (2006); Paluska and Schwenk (2000); and Wiles et al. (2007). It has been used to study the relationship between mental health and physical activity.

Previous research findings indicated that physical activity has the ability to positively affect and possibly prevent mental health issues, particularly depression. In this dissertation, I expected the combination of outcomes for the four physical activity levels among the student groups and genders to reflect different mental health levels. For example, I expected men to have better overall mental health than women, and The CSU group to have better mental health than the NCHA reference group. Adding physical activity into the mix of variables, I predicted students with higher physical activity levels to have better mental health than students with lower physical activity levels as suggested in previous trends. Even though this dissertation is based on survey data, the findings in this dissertation were congruent with the majority of the previous research, which includes random control trials, quasi-experimental studies, and meta-analyses.

Research Approach

The research approach in this dissertation was comparative in nature, with four nonrandomly-assigned physical activity groups. Physical activity, an attribute independent variable may have been high in some students because they were involved with sports. Participants were not randomly assigned to the two student groups (CSU group and NCHA reference group students) because they were already intact groups (nonequivalent comparison group design) (Morgan et al., 2004). These survey data were said to be *objective* because one could easily quantify the items contained on the survey (Gliner & Morgan, 2000). No additional analysis was necessary because the items on the survey had been answered quantitatively and could be assumed without misinterpretation. Because of the extensive methodological coursework I have

completed, the use of quantitative survey data was a match with my skill set and familiarity. So it was advantageous for me to analyze the data quantitatively.

Other research methods were possible for collecting this data. For example, if one were to attempt to make the research experimental, the survey could be used as a pretest and posttest instrument to measure mental health based on a physical activity intervention on campus. Quasi-experimental research may be an alternative to true experimental research for institutions with limited time, money, and other resources. The findings from this dissertation could initiate integration between counseling centers and health clinics at universities. The findings of this dissertation extend only to the participating undergraduate students at CSU and those students at reference group institutions.

The theoretical framework for this dissertation is based on objectivism. Crotty (1998) states:

Objectivism is the epistemological view that things exist as *meaningful* entities independently of consciousness and experience, that they have truth and meaning residing in them as objects ('objective' truth and meaning, therefore), and that careful (scientific?) research can attain that objective truth and meaning. (pp. 5–6)

Survey research in the spirit of post-positivism embodies a belief that the participants in the research may reveal provisional truths, as introduced in Popper's philosophy explained by Crotty (1998).

This theoretical perspective provided a context for the research process because the dissertation pertained to the mental health of human subjects. I felt that human subjects are a population in constant flux; therefore I treated them as such. However, during the survey completion, I assumed the students' truthfulness and I trusted their

willingness to participate in the entire survey. I was convinced of the integrity in the overall trends that resulted from the data collection and analysis. With objectivism as the theoretical framework for this dissertation, my goal was to discover the truths about physical activity and mental health related to depression, as two separate yet meaningful entities under the umbrella of health.

The statistical approach used for this dissertation was inferential statistics. Using inferential statistics enabled me to make judgments about my population based on the differences between the various groups. The epistemology in this research approach was the scope of knowledge available from previous research, as explained in the review of literature. Previous research aided my decision to use three specific independent variables. The ontological assumptions I made were inherent in this research because previous literature has paved the way for the link between physical and mental health. Physical and mental health related to depression had strong implications within my student population, similar to other social science research. An additional ontological assumption helped ground the research in the quantitative tradition, in that I applied the physical and mental health variables related to depression measured by the survey data to the Likert scale.

The student group and gender independent variables were both dichotomous. Physical activity and mental health related to depression were ordinal variables. The main design was seven between-groups, three-way (4 x 2 x 2) factorial ANOVAs. The research consisted of complex difference questions.

I based the research design on the quality, format, and content of the already established NCHA survey instrument. The NCHA survey breadth was excellent;

however, the depth of each item was limited: It merely skimmed the surface of the physical activity and mental health constructs and revealed limited information. The format of the survey was forced choice. The NCHA survey queried the frequency of both physical activity and mental health in a Likert-scale format. The physical activity item inquired about weekly exercise frequency. The physical activity construct had an eight-point Likert scale that ranged from 0 days to 7 days of physical activity per week. The mental health construct inquired about seven mental health-related emotions and actions. The mental health construct had a seven-point Likert scale ranging from *never in the last school year* to *11 or more times in the last school year*.

The NCHA survey results for the physical activity item were dependent upon the distribution of scores along the Likert scale. For example, since few students reported 5–7 days of physical activity, there was not an equal distribution of scores on the Likert scale. For statistical comparison, the best-case scenario would have been an equal distribution of responses across the Likert scale for each independent variable group. That configuration would have allowed for more detailed comparisons of various levels of physical activity and mental health related to depression. Because the student group and gender independent variables were dichotomous, they offered a better chance of equal distributions of scores in each level or category. For the mental health dependent variable, the best comparison would have shown a normal curve within each subgroup compared.

Some issues of concern with this design were that 1) it was nonrandom assignment without a pretest; 2) it was impossible to determine the similarity of the groups before the physical activity; and 3) there was weak equivalence, especially if the

participants volunteered and any difference in outcomes might be due to differences in groups (Morgan et al., 2004). Also, some students may have felt more pressure to complete the survey than other students because of their relationship with the professors, a classmate, etc., which could cause a weakness in equivalence. To improve the research design, students could have been recruited more randomly throughout campus rather than in just the core curriculum courses, which contained mostly first and second year students. However, the sample was representative in that it contained students from all majors. Another way to improve the research design would have been to use random assignment with a pretest in the form of true experimental research. However, because the focus of the analysis is physical activity, this approach could be difficult to actually use.

Overall Research Objective

The overall research objective was to determine the relationship between physical activity level, student group, and/or gender and mental health variables related to depression for the target student population. An additional goal was to determine interactions of physical activity, student group, and/or gender on the mental health variables related to depression? Because there were seven mental health variables related to depression, I asked the following more specific questions to attain the overall research objective.

Main Research Questions

Each research question targeted a different mental health variable related to depression. I analyzed all of the responses to these questions using a 4 x 2 x 2 ANOVA. This analysis of variance compared the physical activity, student group

(CSU group and NCHA reference group students), and gender variables for each mental health variable.

Research Question One

The first research question focused on the relationship of physical activity level, student group, and/or gender on the *feeling things were hopeless* variable. Using an ANOVA test, I found significant differences among the students' physical activity levels and between genders. The mean felt-hopeless rating for those students with no days of physical activity was significantly higher than the rating for those students with 3–4 days of physical activity, but the effect size was smaller than typical. Also, the response rate for 0 days of physical activity was significantly higher than for 5–7 days of physical activity, with a typical effect size. These results indicated that students with little weekly physical activity experience feelings of hopelessness more often than students with 3 to 7 days of weekly physical activity. Also, students with 1–2 days of physical activity showed more feelings of hopelessness than students who reported 5–7 days of physical activity, but the effect was smaller than typical. Overall, students with low physical activity levels experienced more hopelessness than students with higher physical activity levels. Within gender, females showed lower levels of mental health (more feelings of hopelessness) than males. This gender difference reflects a smaller-than-typical effect size. I found no significant differences between the student groups of CSU and the NCHA reference group. In addition, I found no interactions to be statistically significant for the first mental health variable.

Research Question Two

The second research question addressed the relationship of physical activity level, student group, and/or gender on the *feeling overwhelmed by all you had to do* variable. The ANOVA test showed that gender was the only significant difference among the groups analyzed. Females showed lower mental health levels than males, with a small to typical effect size. The analysis showed no differences between the various physical activity levels, the student groups, and the interactions of the three independent variables.

Research Question Three

The third research question focused on the relationship of physical activity level, student group, and/or gender on the *feeling exhausted (not from physical activity)* variable. Physical activity level, student group, and gender all showed significant differences for this variable. The NCHA reference group students showed lower mental health than the CSU group, but the effect was smaller than typical. Females showed lower mental health levels than males, with a small to typical effect size. An analysis of the post hoc tests for physical activity level showed significant differences between the 0 and 5–7 day levels, with a smaller than typical effect. There was also an interaction between physical activity level and student group. This was the only interaction found among all of the data that was computed. The CSU group reported similarly across all physical activity levels on the *felt exhausted* variable. However, the NCHA reference group reported feeling less exhausted as physical activity levels increased.

With this information it was important to look at the differences between each student group for each physical activity level. A one-way ANOVA with four follow-up contrasts were calculated and two significant simple effects were found. The results indicated significant differences between the CSU student group and the NCHA reference group in both the 0 days and 1–2 days of physical activity. Both of these significant differences had smaller than typical effect sizes. The third and fourth contrasts measured the two higher physical activity levels (3–4 and 5–7 days) between the student groups, and were not significant.

When both student groups were compared, the NCHA reference group was, on average, more exhausted (not from physical activity) than the CSU group. These interaction results indicated there is no significant difference between the CSU group and the NCHA reference group except on the two lower levels of physical activity.

Research Question Four

The fourth research question addressed the relationship of physical activity level, student group, and/or gender on the *felt very sad* variable. Physical activity level and gender responses relative to this variable were statistically significant. Females showed lower mental health levels than males. The Games-Howell post hoc tests for physical activity level revealed significant differences between 0 days and 5–7 days, with a smaller than typical effect size. I found another significant difference between 1–2 days and 5–7 days of physical activity, with a smaller than typical effect size. In both cases, mental health was better among the students with higher physical activity levels.

Research Question Five

The fifth research question dealt with the relationship of physical activity level, student group, and/or gender on the *feeling so depressed that it was difficult to function* variable. This variable revealed differences between physical activity levels and between the gender variable. Females showed lower mental health levels than males, with a smaller than typical effect size. The Games-Howell post hoc test for physical activity level revealed differences between the 0-days and both the 3–4 days and 5–7 days levels. Again, the trend continued to show that higher physical activity levels correspond with better mental health.

Research Question Six

The sixth research question focused on the relationship of physical activity level, student group, and/or gender on the *seriously considered attempting suicide* variable. I found no significant differences among any of the independent variables relative to this mental health variable. Not many students reported considering suicide, even occasionally, so the results for this variable were highly skewed.

Research Question Seven

The seventh research question addressed the relationship of physical activity level, student group, and/or gender on the *attempting suicide* variable. Similar to the results for research question six, there were no significant differences among any of the independent variables relative to research question seven. This dependent variable had very low response rates. As a result, it would be hard to find significant group differences for the independent variables.

Measures

Because of the nature of inferential statistics, potential threats to reliability and validity were present in this study. The notion of internal validity rules out other factors, or covariates, that could affect the relationship of physical activity to poor mental health. One typical threat to validity across the literature on this topic was that the various research studies used different operational definitions. For example, one study may have measured physical activity differently than another study. The NCHA used self-report data that involved no direct physical measurement on either the physical activity or mental health variable. In addition, the reference group data came mostly from universities and colleges throughout the United States. It is unknown which universities are included in the dataset as it is confidential information. Not knowing exactly what institutions the data came from could result in an external validity problem when generalizing results. If this is true, there could be a higher/lower occurrence of depression, or physical activity, or both in that particular area rather than in the area from which this survey was administered (northern Colorado). Hence, if a significant difference was found between the CSU group and the reference group, that difference could be the result of something outside of the dissertation constructs.

The groups both contained 1,073 participants, large enough groups to have high validity. However, the reference group was so large (more than 60,000) that the data revealed many significant findings with very much smaller than typical effect sizes. I utilized the effect sizes to locate substantive significance. Again, because other researchers collected the reference group data, there could have been extraneous environmental events occurring; such as a tragedy on campus before the launch of the

survey that cannot be identified at the present time. Such an event could have influenced the number of surveys completed and the truthfulness of those that were completed.

Depending on the time of data collection, school breaks/vacations could have affected the responses that contain the phrase, *in the last 30 days....* The CSU data collection was timed so that spring break behaviors were not included in the 30-day time frame mentioned in the questions. My desire was to discover only habits of the students that were present during their stay at CSU rather than when they were on a holiday break. It doesn't seem likely that the time of the data collection (February) affected the CSU sample. However, survey timing could have affected the data from other schools in the NCHA reference group.

I gained evidence based on content validity because ACHA experts agreed that the survey measured overall health of college students, as it purports. The evidence based on response processes was unknown for the reference group because various processes may have been used. For example, one institution could have used randomly mailed surveys, whereas other institutions could have surveyed students in randomly selected classrooms. With the use of Web surveys, some institutions may have randomly selected students to receive the survey via email for completion online.

External validity for the CSU sample could be rated medium to high because of the large student sample taken from a required, all-university core curriculum class. However, there may have been survey response bias from the students because they were attending a health and wellness class, and the survey topic was health. In terms of generalizability, the student sample was a good demographic match to the entire CSU

student population taking general education courses, so it represented CSU well. The generalizability of the reference group data may not have been representative of all college students because it was a costly and time-consuming instrument to administer. Therefore, the data may be biased toward institutions with larger budgets, time, and staff for data collection and analysis.

The validity limitations for the external population data of this research represent a threat that prohibits generalizing the findings to the entire population. Generalizing to all CSU students results in medium to high external validity because CSU had a convenience sample that showed good representation of the actual population. As noted previously, I did not collect the NCHA reference group data; rather, they were submitted to the ACHA from 107 schools mostly throughout the United States. Hence, these data were out of my control. Assuming the reference group institutions collected random samples, there should not have been any issues; however, one cannot be certain of random samples and good response rates.

Limitations and Delimitations

As in any research, this dissertation research had its limitations. Three main limitations affected the results. One of the greatest limitations was that the reference group data were secondary data from ACHA rather than data I collected. The CSU data came from select classrooms where professors allowed me into the classroom to conduct the survey. As a result, I used a convenience sampling procedure for this dissertation. Therefore, the dissertation results were not fully generalizable to all undergraduate students at CSU and, especially, throughout the nation. However, because the CSU courses were required for all undergraduates and there was a high

response rate for the first and second year CSU students taking the pencil-and-paper survey in the classroom, the dissertation reflects a high representation of the CSU population.

A second limitation in this dissertation was the reliance on self-reported data from the participants. The study is based on an assumption that the participants understood the questions and honestly responded. In this quantitative study, the findings were subject to interpretation. I excluded students with missing responses from the analysis. Students could not have missing data for the physical-activity item, the mental-health items, the gender item, or the year-in-school item to be included for analysis among the research questions that required those variables. I filtered the year-in-school survey item to include all undergraduate students because they were the target population.

A third limitation included the wording of the physical-activity survey item. The item uses the term *exercise* rather than *physical activity*. Ideally, if I had had the freedom to create the survey, I would have used the term *physical activity*. In this regard, there is a disparity between the wording of the survey and that of the *Healthy Campus 2010* objective for physical activity. The survey uses *exercise*, and the objectives use *physical activity* instead of *exercise* because of the possible confusion between the terms. For example, some students may be very physically active throughout the day, but when they read the word *exercise* they do not think to include all physical activities that they may have done. I could not add a definition of *exercise* to the appropriate item as desired. A physical activity definition may have assisted respondents in more accurately answering the item. However, because the wording of

the survey was somewhat based on the *Healthy Campus 2010* objectives, the constructs coincided well. Using the established NCHA instrument allowed no freedom for me to add questions without paying an extra fee, which was beyond the scope of the research budget. Therefore, this dissertation was limited to the questions on the established NCHA survey instrument.

There were three main delimitations to account for in this research. One delimitation was that the dissertation was confined to CSU students and the NCHA reference group students. Therefore, the results were generalizable only to the groups studied. Otherwise, because of the good sample representation, the research would have lent itself to being generalized. The second delimitation was that the dissertation considered for analysis only students who self-reported that they were undergraduates (first year through fourth year-plus). The data were delimited to 2007 spring semester students, so the research excluded students who did not enroll in that semester. The third delimitation was that the CSU sample included only students who attended a required health and exercise science course on the day of survey administration. And sampling core curriculum classes limited the time and dates on which the actual data collection could happen. Much like at other universities, CSU group students typically fulfill required courses during their freshman or sophomore year in college. Therefore, the CSU student sample included an overrepresentation of freshmen and sophomore students. How the samples were gleaned at the NCHA reference group institutions was unknown, so representation could not be determined.

Conclusions

The research in this dissertation has shed light on the relationship between mental health and physical activity levels. Higher levels of physical activity showed a positive, linear relationship with better mental health among college students. As physical activities increased, mental health improved. Not many such studies have been identified within the college student demographic. However, within this dissertation, the students who self-reported higher physical activity levels also reported better overall mental health related to depression. Students who reported 0 days of physical activity typically had poorer levels of mental health related to depression in comparison to students who reported more days of physical activity. Therefore, those students reporting 5–7 days of physical activity had better mental health (as reflected in responses to most variables) than students in all other physical activity levels. Among the four physical activity levels, those reporting 0 days of physical activity often reported statistically significant poorer mental health related to depression. When differences were found to be statistically significant, their effect sizes were usually typical or smaller than typical effect sizes. However, it is critical to note the substantive importance of the trend that this study indicates between physical activity and mental health in all variables except the suicide-related variables. In addition, even though the suicide-related variables showed no statistical significance, it is still important to note that the trend followed that of the other five variables concerning poor mental health related to depression. Since this was not experimental research, it is impossible to show causation between the variables of physical activity and mental health related to depression. However, there was clearly some level of association

between increased physical activity and better mental health related to depression. Overall, this data show that college students are no different than any other demographic group in terms of mental health levels and their relationship to physical activity and gender (Craft et al., 2007; Donaghy, 2007; Dunn et al., 2001; Fox, 1999; Harris et al., 2006; Paluska & Schwenk, 2000; Wyshak, 2001).

This dissertation compared the various mental health variables related to depression between the two gender groups. The findings among college females and males mimic the findings of Craft et al. (2007). Within all mental health levels, with the exception of the two suicide-related variables, males reported better depression related mental health than females. These findings were statistically significant within the first five mental health variables related to depression: *feeling hopelessness*, *feeling overwhelmed*, *feeling exhausted (not from physical activity)*, *feeling very sad*, and *feeling so depressed it was difficult to function*. Although gender was not found to be statistically significant with the two variables concerning mental health, the trend of males reporting better mental health than women was still prevalent within this research.

This dissertation compared a sample of the NCHA national reference group students to CSU group students within all seven mental health variables related to depression. There was only one statistically significant difference found between the student groups. Within the *felt exhausted* mental health variable, CSU group students reported better mental health than the NCHA reference group students. It is interesting that the only statistically significant differences were within the *felt exhausted* variable. It is unclear why this happened. Since this is the first time the CSU group of students

have been compared to the national reference group of students, there is no previous data for comparison. Further research in the area of college health may put individual college standings into perspective with national data. Using national data such as that from the NCHA makes it easier to identify deficiencies in student health when one is making comparisons with similar individual institutions. With access to the national data, colleges and universities that research mental health and physical activity may be able to pinpoint specific wants and needs of students. This may help administrators identify areas for growth within their own student health services.

Also, within the *felt exhausted* variable, there was an interaction between physical activity and student group. This was the only statistically significant interaction found in this dissertation. The CSU student group had better mental health than the NCHA reference group for the first two (lower) physical activity levels. For the 3–7 days of physical activity, the NCHA reference group had similar mental health to the CSU group. This created an interaction among the variables. One reason for why this may have happened is that the CSU group students who were physically active for 5–7 days per week may have been overtraining, which took a toll on their mental health.

This particular physical activity level provokes a non-linear dose response. Such results reveal a U-shape trend where very low and very high physical activity levels negatively correlate with positive mental health related to depression. The *felt exhausted variable* was the only variable to show such results. CSU students who are training 5–7 days per week may be showing worse mental health than students who are active 3–4 days per week. It may be possible that there are students who are physically

active 5–7 days for only 30 minute bouts and students who are physically active 5–7 days for 2 hour bouts. In this case, the frequency of physical activity is high (5–7 days), but the duration of each physical activity bout may make a difference in the mental health level. Although students with long duration physical activity bouts would be classified under the same physical activity level (5–7 days) as students with short duration physical activity bouts, their mental health differences may characterize them *obsessive* with physical activity. If a student’s physical activity progresses from a healthy lifestyle behavior to an *obsession* there may be negative consequences for mental health related to depression. This relationship suggests a negative mental health relationship from too much exercise in both frequency and duration. In this situation, if a student does not get the extremely high amount of physical activity desired, the student may have adverse effects on their mental health. However, this is mere speculation and warrants further research.

Marcello (2006) and Smith (2004) found that depression can be a symptom of overtraining. Based on these studies, one possible explanation for the CSU students who reported poorer mental health at the 5–7 days of physical activity was that they were overtraining; hence, they reported poorer mental health than the NCHA reference group. Maybe students reporting 5–7 days of physical activity in the NCHA reference group are not overtraining on the days they are active. More research is needed to determine if there is a difference between students within the 5–7 days of physical activity group. Researching other possible reasons, such as access to physical activity and influences on mental health may also help to explain why the NCHA reference

group had better mental health than CSU group students in the group with 5–7 days of physical activity.

Overall, this data support current findings by Craft et al. (2007), Donaghy (2007), Dunn et al. (2001), Fox (1999), Harris et al. (2006), Paluska and Schwenk (2000), and Wyshak (2001), which reveal college students to be no different than any other demographic group in terms of the relationships between their mental health levels and their physical activity and gender. Because this is the first time CSU has been compared to the national reference group, it is difficult to fully explain the survey results. Clearly, college health is an area that needs further research to determine the relationships between mental and physical health. Determining the reasons behind these relationships warrants further investigation because as young adults grow older, their health will become more of a concern.

Implications

The current goals for college students' health are based on previous health benchmarks. Increasing physical activity to 3 or more days per week is a goal set by *Healthy Campus 2010* (ACHA, 2002) for universities across the nation. As the year 2010 approaches and new goals are set for 2020, physical activity and mental health standards will be revised. An increase in physical activity has the potential to improve not only the physical health of students, as recommended by *Healthy Campus 2010*, but also their mental health status. If indeed physical activity can improve mental health in undergraduate students, there may be important implications for programming in the area of college students' health. Harris et al. (2006) found that physical activity appears to benefit "medical problems and major life stressors. Clinically, encouraging

depressed patients to engage in physical activity is likely to have potential benefits with few obvious risks” (p. 79). It seems that physical activity may have a positive influence on college students’ mental health in addition to the obvious physical benefits. As a result, programming for college students’ health might include physical activities.

Recommendations

The research outcomes on depression and physical activity have opened doors for new research about the feasibility of prescribing physical activity in the mental healthcare setting. These developments, in turn, lead to high interest in this topical area. Physical activity may be an option for effective and inexpensive depression therapy (Paluska & Schwenk, 2000). And with limited funding at university mental health service departments, alternative treatments such as physical activity may pose viable alternative options. This evolution has implications for further research and new program development at the university setting. Integrating the counseling/psychology/mental health department of a university with its clinical/physical health department may result in a seamless and holistic wellness entity on the college campus that can effectively address both aspects of health.

Future studies might include experimental research focused on club or intramural sport athletes as a comparison group with students not involved with organized sports. Unlike a club or intramural sport participant, the typical undergraduate student is not expected to attend physical activity practices. It would be an interesting comparison to see how mental health levels are affected among students who are physically active on a sport or intramural team compared to students who are not on a team. It is unknown how similar or different the two groups may be from each

other. Another possible study might include an experimental design of inactive students who receive a physical activity intervention. Additional constructs would also need to be studied with such an experimental research.

Summary of Conclusions and Implications

The dissertation findings purport a positive relationship between physical and mental health. I can draw three key conclusions from these results. First, with appropriate research it may be possible to discover a causal relationship between physical activity and mental health. Therefore, experimental research could be conducted at the university level. A second conclusion is that physical activity may be utilized to relieve poor mental health conditions. Adding physical activity to pharmaceuticals and psychological counseling may help the overall effectiveness of university counseling center services. If including physical activity within this arena becomes commonplace, it is certain that subsequent changes will follow. The third conclusion is that the possibility exists for merging mental healthcare facilities with medical healthcare facilities. In order to accomplish such a merge, organizational, operational, and physical location restructuring is required. Two key components to the execution of a merge are combining both mental and physical healthcare into the same building, and functioning as one cohesive organization. Integrated healthcare in the public sector has already begun in the United States. This research takes the concept of healthcare integration a step further. It reinforces the notion of integration at the college and university level. At Colorado State University, the integration process is beginning to take shape now. If these changes demonstrate success, there may be more medical and mental health center integrations across the nation.

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APPENDICES

Appendix A

NCHA Instrument (AHCA, 2003)

American College Health Association

National College Health Assessment

Instructions:

The following questions ask about various aspects of your health.

To answer the questions, fill in the oval that corresponds to your response.

Select only one response unless instructed otherwise.

Use a No. 2 pencil or blue or black ink pen only. Do not use pens with ink that soaks through the paper. CORRECT: INCORRECT: X -

This survey is completely voluntary. You may choose not to participate or not to answer any specific question. You may skip any question you are not comfortable in answering.

This survey is completely anonymous. Please make no marks of any kind on the survey which could identify you individually.

Composite data will then be shared with your campus for use in health promotion activities.

Thank you for taking the time and
thought to complete this survey.
We appreciate your participation!

Copyright © 2002 American College Health Association

PAGE ONE

PLEASE DO NOT WRITE IN THIS AREA



SERIAL #

Survey Data Collection System (NCHA) Form 1000 (10/2002) Printed in U.S.A.

The first 8 questions ask about health, health education, and safety.

1. Considering your age, how would you describe your general health?

- Excellent Very good Good Fair Poor Don't know

2. On which of the following health topics have you ever received information from your college or university? (Select all that apply)

- Tobacco use prevention Pregnancy prevention
 Alcohol and other drug use prevention AIDS or HIV infection prevention
 Sexual assault/relationship violence prevention Sexually transmitted disease (STD) prevention
 Violence prevention Dietary behaviors and nutrition
 Injury prevention and safety Physical activity and fitness
 Suicide prevention None of the above

3. Use the scale below to record the BELIEVABILITY of each source of health information.

4. Do you usually get health-related information from any of the following sources?

(Please mark the best response for each question to the right)

- Leaflets, pamphlets, flyers
 Campus newspaper articles
 Health center medical staff
 Health educators
 Friends
 Resident assistants/advisors
 Parents
 Religious center
 Television
 Magazines
 Campus peer educators
 Faculty/coursework
 Internet/world wide web
 Other: (please specify)

Unbelievable
 Neither Believable nor Unbelievable
 Believable

Believable

No Yes

Scale for question 3 with 5 columns: Unbelievable, Neither Believable nor Unbelievable, Believable, Believable, Unbelievable. Each column has 13 rows of radio buttons corresponding to the sources in question 4.

Scale for question 4 with 2 columns: No, Yes. Each column has 13 rows of radio buttons corresponding to the sources in question 4.

5. Within the last school year, how often did you:

(Please mark the appropriate column for each row)

- Wear a seatbelt when you rode in a car?
 Wear a helmet when you rode a bicycle?
 Wear a helmet when you rode a motorcycle?
 Wear a helmet when you were inline skating?

N/A didn't do this within the last school year

Always
 Most of the time
 Sometimes
 Rarely
 Never

Scale for question 5 with 5 columns: Always, Most of the time, Sometimes, Rarely, Never. Each column has 4 rows of radio buttons corresponding to the activities in question 5.

6. Within the last school year, were you:

- In a physical fight?
 Physically assaulted (do not include sexual assault)?

Yes
 No

Scale for question 6 with 2 columns: Yes, No. Each column has 2 rows of radio buttons corresponding to the questions in question 6.

14. In the last two weeks, on how many occasions did you drink the same or more alcohol as indicated in item #13? State your best estimate. (If less than 10, code answers as 00, 01, 02, etc.)

T	
I	<input type="radio"/> 00 <input type="radio"/> 01
M	<input type="radio"/> 02 <input type="radio"/> 03
E	<input type="radio"/> 04 <input type="radio"/> 05
S	<input type="radio"/> 06 <input type="radio"/> 07
	<input type="radio"/> 08 <input type="radio"/> 09
	<input type="radio"/> 10 <input type="radio"/> 11
	<input type="radio"/> 12 <input type="radio"/> 13
	<input type="radio"/> 14 <input type="radio"/> 15
	<input type="radio"/> 16 <input type="radio"/> 17
	<input type="radio"/> 18 <input type="radio"/> 19
	<input type="radio"/> 20 <input type="radio"/> 21

15. How many alcoholic drinks do you think the typical student at your school had the last time he/she "partied"/socialized? (If less than 10, code answers as 00, 01, 02, etc.)

D	
R	<input type="radio"/> 00 <input type="radio"/> 01
I	<input type="radio"/> 02 <input type="radio"/> 03
N	<input type="radio"/> 04 <input type="radio"/> 05
K	<input type="radio"/> 06 <input type="radio"/> 07
S	<input type="radio"/> 08 <input type="radio"/> 09
	<input type="radio"/> 10 <input type="radio"/> 11
	<input type="radio"/> 12 <input type="radio"/> 13
	<input type="radio"/> 14 <input type="radio"/> 15
	<input type="radio"/> 16 <input type="radio"/> 17
	<input type="radio"/> 18 <input type="radio"/> 19
	<input type="radio"/> 20 <input type="radio"/> 21

16. Think back over the last two weeks. How many times, if any, have you had five or more alcoholic drinks at a sitting?

None 2 times 4 times 6 times 8 times
 1 time 3 times 5 times 7 times 9 or more times

(Please mark the appropriate column for each row)

17. During the last school year, if you "partied"/socialized, how often did you...

- Alternate non-alcoholic with alcoholic beverages
- Determine, in advance, not to exceed a set number of drinks
- Choose not to drink alcohol
- Use a designated driver
- Eat before and/or during drinking
- Have a friend let you know when you've had enough
- Keep track of how many drinks you were having
- Pace your drinks to 1 or fewer per hour
- Avoid drinking games
- Drink an alcohol look-alike (non-alcoholic beer, punch etc.)

	Usually Always	Sometimes Rarely	Never
Not applicable/Don't drink	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(Please mark the appropriate column for each row)

18. If you drink alcohol, within the last school year, have you experienced any of the following as a consequence of your drinking?

- Physically injured yourself
- Physically injured another person
- Been involved in a fight
- Did something you later regretted
- Forgot where you were or what you did
- Had someone use force or threat of force to have sex with you
- Had unprotected sex

	Yes	No
Not applicable/Don't drink	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>

19. Within the last 30 days, what percent of students at your school used? State your best estimate.

% Used Cigarettes	% Used Alcohol	% Used Raloxynal or BHB
<input type="radio"/> 00 <input type="radio"/> 01	<input type="radio"/> 00 <input type="radio"/> 01	<input type="radio"/> 00 <input type="radio"/> 01
<input type="radio"/> 02 <input type="radio"/> 03	<input type="radio"/> 02 <input type="radio"/> 03	<input type="radio"/> 02 <input type="radio"/> 03
<input type="radio"/> 04 <input type="radio"/> 05	<input type="radio"/> 04 <input type="radio"/> 05	<input type="radio"/> 04 <input type="radio"/> 05
<input type="radio"/> 06 <input type="radio"/> 07	<input type="radio"/> 06 <input type="radio"/> 07	<input type="radio"/> 06 <input type="radio"/> 07
<input type="radio"/> 08 <input type="radio"/> 09	<input type="radio"/> 08 <input type="radio"/> 09	<input type="radio"/> 08 <input type="radio"/> 09
<input type="radio"/> 10 <input type="radio"/> 11	<input type="radio"/> 10 <input type="radio"/> 11	<input type="radio"/> 10 <input type="radio"/> 11
<input type="radio"/> 12 <input type="radio"/> 13	<input type="radio"/> 12 <input type="radio"/> 13	<input type="radio"/> 12 <input type="radio"/> 13
<input type="radio"/> 14 <input type="radio"/> 15	<input type="radio"/> 14 <input type="radio"/> 15	<input type="radio"/> 14 <input type="radio"/> 15
<input type="radio"/> 16 <input type="radio"/> 17	<input type="radio"/> 16 <input type="radio"/> 17	<input type="radio"/> 16 <input type="radio"/> 17
<input type="radio"/> 18 <input type="radio"/> 19	<input type="radio"/> 18 <input type="radio"/> 19	<input type="radio"/> 18 <input type="radio"/> 19
<input type="radio"/> 20 <input type="radio"/> 21	<input type="radio"/> 20 <input type="radio"/> 21	<input type="radio"/> 20 <input type="radio"/> 21

The next 11 questions ask about sex behavior, perceptions, and contraception.

20. Within the **last school year**, with how many partners, if any, have you had sex (oral, vaginal, or anal)? (If less than 10, code answers as 00, 01, 02, etc.)

PARTNERS

00	01
02	03
04	05
06	07
08	09
10	11
12	13
14	15
16	17
18	19
20	21

21. Within **last school year**, were your sexual partner(s), if any,
 N/A Female
 Male Both Male and Female

22. Within the **last school year**, with how many partners do you think the **typical student at your school** has had sex (oral, vaginal, or anal)? (If less than 10, code answers as 00, 01, 02, etc.)

PARTNERS

00	01
02	03
04	05
06	07
08	09
10	11
12	13
14	15
16	17
18	19
20	21

(Please mark the appropriate column for each row)

23. Within the **last 30 days**, if you are sexually active, how many times did you have:

Have not done this during last 30 days	1-2 times	3-4 times	5-6 times	7-8 times	9-10 times	11 or more times
Never did this sexual activity						
Oral sex?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vaginal Intercourse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anal Intercourse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(Please mark the appropriate column for each row)

24. How many times within the **last 30 days** do you think the **typical student at your school** has had:

0 times	1-2 times	3-4 times	5-6 times	7-8 times	9-10 times	11 or more times
Oral sex?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vaginal Intercourse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anal Intercourse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(Please mark the appropriate column for each row)

25. Within the **last 30 days**, if you are sexually active, how often did you or your partner(s) use a condom during:

Have not done this during last 30 days	Never	Rarely	Sometimes	Mostly	Always
Never did this sexual activity					CONDOM USE
Oral sex?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vaginal Intercourse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anal Intercourse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(Please mark the appropriate column for each row)

26. Within the **last 30 days**, how often do you think the **typical student at your school** has used a condom during:

The typical student at my school does not participate in this sexual activity	Never	Rarely	Sometimes	Mostly	Always
					CONDOM USE
Oral sex?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vaginal Intercourse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anal Intercourse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(Please mark the appropriate column for each row)

	No	Yes
	Never did this sexual activity	Don't know/Don't remember
27. If you are sexually active, did you use a condom the last time you had:		
Oral sex?	<input type="radio"/>	<input type="radio"/>
Vaginal intercourse?	<input type="radio"/>	<input type="radio"/>
Anal intercourse?	<input type="radio"/>	<input type="radio"/>

28. If you have had vaginal intercourse, what method did you or your partner use to prevent pregnancy the last time? (Select all that apply)

<input type="checkbox"/> Have not had vaginal intercourse	<input type="checkbox"/> Spermicide (e.g. foam)
<input type="checkbox"/> Birth control pills	<input type="checkbox"/> Fertility awareness (calendar, mucous, basal body temperature)
<input type="checkbox"/> Depo Provera (shots)	<input type="checkbox"/> Withdrawal
<input type="checkbox"/> Norplant (implant)	<input type="checkbox"/> Other method
<input type="checkbox"/> Condoms (male or female)	<input type="checkbox"/> Nothing
<input type="checkbox"/> Diaphragm/Cervical cap/Sponge	

29. Within the last school year, if you are sexually active, have you or your partner(s) used emergency contraception ("morning after pill")?

No Yes Don't know Not sexually active

30. Within the last school year, have you unintentionally become pregnant or gotten someone else pregnant?

Have not had vaginal intercourse within the last school year. No Yes Don't know

31. Have you ever been tested for HIV infection?

No Yes Don't know

32. Which of the following best describes you?

Heterosexual Bisexual Unsure Gay/Lesbian Transgendered

33. If you have a credit card(s) how much total credit card debt did you carry last month? That is, what was the total unpaid balance on all of your credit cards (that you are responsible for paying)?

<input type="checkbox"/> None, I don't have any credit cards. I'm not responsible for paying	<input type="checkbox"/> \$1 - \$99	<input type="checkbox"/> \$2,000 - \$2,999
<input type="checkbox"/> None, I pay the full amount each month	<input type="checkbox"/> \$100 - \$249	<input type="checkbox"/> \$3,000 - \$3,999
	<input type="checkbox"/> \$250 - \$499	<input type="checkbox"/> \$4,000 - \$4,999
	<input type="checkbox"/> \$500 - \$999	<input type="checkbox"/> \$5,000 - \$5,999
	<input type="checkbox"/> \$1,000 - \$1,999	<input type="checkbox"/> \$6,000 or more

34. What is your approximate cumulative grade average?

A B C D/F N/A

The next 5 questions ask about weight, nutrition, and exercise.

35. How do you describe your weight?

Very underweight Slightly overweight Slightly underweight Very overweight About the right weight

36. Are you trying to do any of the following about your weight?

I am not trying to do anything Lose weight about my weight Gain weight Stay the same weight

37. Within the last 30 days, did you do any of the following? (Select all that apply)

Exercise to lose weight Diet to lose weight Vomit or take laxatives to lose weight Take diet pills to lose weight I didn't do any of the above

38. How many servings of fruits and vegetables do you usually have per day (1 serving = 1 medium piece of fruit, 1/2 cup chopped, cooked or canned fruits/vegetables, 3/4 cup fruit/vegetable juice, small bowl of salad greens, or 1/2 cup dried fruit)?

I don't eat fruits and vegetables 1-2 3-4 5 or more

(Please mark the appropriate column for each row)

	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
39. On how many of the past 7 days did you:								
Participate in vigorous exercise for at least 20 minutes or moderate exercise for at least 30 minutes?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do exercises to strengthen or tone your muscles, such as push-ups, sit-ups, or weight lifting?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Get enough sleep so that you felt rested when you woke up in the morning?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3211992-3-272

The next question asks about impediments to academic performance.

- Received an incomplete or dropped the course
- Received a lower grade in the course
- Received a lower grade on an exam or important project
- I have experienced this issue but my academics have not been affected
- This did not happen to me/not applicable

44. Within the last school year, have any of the following affected your academic performance? (Please select the most serious outcome for each item below)
- Alcohol use
 - Allergies
 - Assault (physical)
 - Assault (sexual)
 - Attention Deficit Disorder
 - Cold/Flu/Sore throat
 - Concern for a troubled friend or family member
 - Chronic illness (diabetes, asthma, etc.)
 - Chronic pain
 - Death of a friend or family member
 - Depression/Anxiety Disorder
 - Seasonal Affective Disorder
 - Drug use
 - Eating disorder/problem
 - HIV Infection
 - Injury
 - Internet use/computer games
 - Learning disability
 - Mononucleosis
 - Pregnancy (yours or your partner's)
 - Relationship difficulty
 - Sexually transmitted disease
 - Sinus infection/ear
 - Infection/bronchitis/strep throat
 - Sleep difficulties
 - Stress
 - Other

48. What is your weight in pounds?
- | | | | | | | | | | | | | | | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 | 230 | 240 | 250 | 260 | 270 | 280 | 290 | 300 |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
49. Year in school:
- 1st year undergraduate
 - 2nd year undergraduate
 - 3rd year undergraduate
 - 4th year undergraduate
 - 5th year or more undergraduate
 - Graduate or professional
 - Adult special
 - Other
50. Are you a full-time student?
- Yes No

51. How do you usually describe yourself? (Mark all that apply)
- White - not Hispanic (includes Middle Eastern)
 - Black - not Hispanic
 - Hispanic or Latino
 - Asian or Pacific Islander
 - American Indian or Alaskan Native
 - Other

52. Are you an international student? Yes No

53. What is your current relationship status?
- Single
 - Married/domestic partner
 - Engaged or committed dating relationship
 - Separated
 - Divorced
 - Widowed

54. Where do you currently live?
- Campus residence hall
 - Fraternity or sorority house
 - Other university/college housing
 - Off-campus housing
 - Parent/guardian's home
 - Other

55. Are you a member of a social fraternity or sorority? (National Interfraternity Conference, National Panhellenic Conference, or National Pan-Hellenic Council)
- Yes No

56. How many hours a week do you work for pay?
- 0 hours
 - 1-9 hours
 - 10-19 hours
 - 20-29 hours
 - 30-39 hours
 - 40 hours
 - more than 40 hours

57. How many hours a week do you volunteer?
- 0 hours
 - 1-9 hours
 - 10-19 hours
 - 20-29 hours
 - 30-39 hours
 - 40 hours
 - more than 40 hours

58. Do you have any kind of health insurance (including prepaid plans such as HMOs - health maintenance organizations)?
- Yes No Not sure

The last questions ask about demographic characteristics.

45. How old are you? Years
46. What is your sex?
- Female Male
47. What is your height in feet and inches?
- | | |
|--------|------|
| FL | Inch |
| HEIGHT | |
| 5 | 0 |
| 5 | 1 |
| 5 | 2 |
| 5 | 3 |
| 5 | 4 |
| 5 | 5 |
| 5 | 6 |
| 5 | 7 |
| 5 | 8 |
| 5 | 9 |
| 5 | 10 |
| 5 | 11 |
| 5 | 12 |
| 6 | 0 |
| 6 | 1 |
| 6 | 2 |
| 6 | 3 |
| 6 | 4 |
| 6 | 5 |
| 6 | 6 |
| 6 | 7 |
| 6 | 8 |
| 6 | 9 |
| 6 | 10 |
| 6 | 11 |
| 6 | 12 |

PAGE EIGHT

THANK YOU FOR COMPLETING THIS SURVEY



SERIAL #

Appendix B

CSU Human Research Approval

FILE COPY



Research Integrity & Compliance Review Office
Office of Vice President for Research
Fort Collins, CO 80523-2011
(970) 491-1553
FAX: (970) 491-2293

Notice of Approval for Human Research

Principal Investigator: Cathy Kennedy, HES, 1582
Title: Administration of the National College Health Association's College Health Assessment
Protocol #: 03-218H **Funding Source:** N/A
Number of Participants/Records: Remaining 125 participants
Committee Action: **Approval Date:** July 23, 2007 **Expires:** July 23, 2008
IRB Administrator: Janell Barker *Janell Barker*

Consent Process:

The above-referenced project was approved by the Institutional Review Board. Because of the nature of this research, it will not be necessary to obtain a signed consent form; however, all subjects must receive a copy of the approved cover letter printed on department letterhead. The requirement of documentation of a consent form is waived under § __ .117(c)(2) and parental consent is waived under §46.115(d). *No changes may be made to this document without first obtaining the approval of the IRB.*

Investigator Responsibilities:

- It is the responsibility of the PI to immediately inform the Committee of any serious complications, unexpected risks, or injuries resulting from this research.
- It is also the PI's responsibility to notify the Committee of any changes in experimental design, participant population, consent procedures or documents. This can be done with a memo describing the changes and submitting any altered documents.
- Students serving as Co-Principal Investigators must obtain PI approval for any changes prior to submitting the proposed changes to the IRB for review and approval.
- The PI is ultimately responsible for the conduct of the project.
- A status report of this project will be required within a 12-month period from the date of review. Renewal is the PI's responsibility, but as a courtesy, a reminder will be sent approximately two months before the protocol expires. The PI will be asked to report on the numbers of subjects who have participated this year and project-to-date, problems encountered, and provide a verifying copy of the consent form or cover letter used. The necessary continuation form (H-101) is available from the RICRO web page www.ricro.research.colostate.edu
- Upon completion of the project, an H-101 should be submitted as a close-out report.
- If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice. This approval is issued under Colorado State University's OHRP Federal Wide Assurance 0000647.
- **Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.**

Please direct any questions about the Committee's action on this project to me for routing to the Committee. Additional information is available from the Research Integrity & Compliance Review Office web site at <http://ricro.research.colostate.edu>.

Date of Correspondence: October 5, 2007

Appendix C

NCHA Institutional Profile for CSU



Institution of Higher Education Demographic Survey

Data from all participating institutions are aggregated for the comparative studies by various types of institutional characteristics. For that purpose, please furnish the data requested below and return this form with your questionnaires. Because this form is used to control the processing of questionnaires, survey responses cannot be returned until this information is complete. In no instance will your institution be singled out for comparison with others in the aggregated analysis.

Section I. Institutional Characteristics

1. INSTITUTION NAME

Please specify Colorado State University

2. SURVEY PERIOD

Fall or Spring Spring Year 2007

3. STUDENT ENROLLMENT

Total Student Enrollment	<u>25,046</u>
Total Undergraduate Enrollment	<u>18,942</u>
Total Graduate Enrollment	<u>3,514</u>
Total Non-Degree Seeking/Other Enrollment	<u>1524</u>

If separate data are unavailable for undergraduates and graduates, please provide composite data for both in the undergraduate column and check here:

If your institution serves only undergraduates OR graduates, complete the appropriate box and leave the other blank.

Undergraduate

% Female	<u>51.8</u>
% Male	<u>48.2</u>
% White, non-Hispanic	<u>81.6</u>
% Black, non-Hispanic	<u>2.1</u>
% Hispanic or Latino	<u>6.3</u>
% Asian or Pacific Islander	<u>3.1</u>
% Native American or Alaskan Native	<u>1.6</u>
% International	<u>1.7</u>
% Other	<u>3.7</u>

Graduate

% Female	<u>50.1</u>
% Male	<u>49.9</u>
% White, non-Hispanic	<u>68.9</u>
% Black, non-Hispanic	<u>1.3</u>
% Hispanic or Latino	<u>3.8</u>
% Asian or Pacific Islander	<u>2.6</u>
% Native American or Alaskan Native	<u>1.2</u>
% International	<u>14.1</u>
% Other	<u>8.1</u>

4. AMERICAN COLLEGE HEALTH ASSOCIATION AFFILIATION

ACHA Institutional Member (Please specify Institution Member ID #: 74)
 Non-Member Institution

5. INSTITUTIONAL CONTROL

Public
 Private

6. RELIGIOUS AFFILIATION

Yes (Please specify: _____)
 No

Section I, Continued. Institutional Characteristics

7. MINORITY SERVING INSTITUTION STATUS (select all that apply)

For information regarding your IHE's classification as a minority serving institution, please visit <http://www.ed.gov/about/offices/list/ocr/edlite-minorityinst.html>

- Postsecondary Minority Institution
- Historically Black College or University (HBCU)
- High Hispanic Enrollment
- Hispanic Serving Institution (HSI)
- Indian Tribally Controlled College or University
- Alaska Native-Serving Institution
- Native Hawaiian-Serving Institution

8. INSTITUTIONAL TYPE

- Two-year
- Four-year or more
- Other (Please specify: _____)

9. CARNEGIE CLASSIFICATION

For information regarding your classification, visit <http://www.carnegiefoundation.org/classifications/index.asp?kev=782>, find your campus listing, and note the "Basic" Carnegie Classification for your campus below.

Associate's Colleges

- Public Rural-Serving Small
- Public Rural-Serving Medium
- Public Rural-Serving Large
- Public Suburban-Serving Single Campus
- Public Suburban-Serving Multicampus
- Public Urban-Serving Single Campus
- Public Urban-Serving Multicampus
- Public Special Use
- Private Nonprofit
- Private For-profit
- Public 2-year under 4-year Universities
- Public 4-year, Primarily Associate's
- Private Nonprofit 4-year, Primarily Associate's
- Private For-profit 4-year, Primarily Associate's

Baccalaureate Colleges

- Arts and Sciences
- Diverse Fields
- Baccalaureate/Associate's Colleges

Master's Colleges and Universities

- Larger Programs
- Medium Programs
- Smaller Programs

Research Institutions

- Research Universities (very high research activity)
- Research Universities (high research activity)
- Doctoral/Research Universities

Special Focus Institutions

- Faith-Related
- Medical
- Other Health
- Engineering
- Other Technology
- Business
- Art/Music/Design
- Law
- Other

Miscellaneous

- Tribal College
- Classification Pending
- Unclassified

10. NATIONAL COLLEGIATE ATHLETIC ASSOCIATION (NCAA) DIVISION

Please mark highest division applicable to a sport at your institution.

To determine your division membership, please visit <http://web1.ncaa.org/memberLinks/links.jsp>

- Division I
- Division II
- Division III

Section 1, Continued. Institutional Characteristics

11. CAMPUS LOCALE

- Very large city (population over 500,000)
- Large city (population of 250,000 - 499,999)
- Small city (population of 50,000 - 249,999)
- Large town (population of 10,000 - 49,999)
- Small town (population of 2,500 - 9,999)
- Rural community (population under 2,500)

12. CAMPUS HEALTH INSURANCE MODEL

- We offer no form of student health insurance and students are responsible for their own coverage
- Voluntary (Students have the option of purchasing your institution's health insurance plan but are not required to show any proof of insurance to your institution)
- Soft Waiver (Students are mandated to have health insurance coverage comparable to your institution's plan, and if so, they may waive your institutional plan without proof of alternative coverage)
- Hard Waiver (Students are mandated to have health insurance coverage comparable to your institution's plan, and if so, they may waive your institutional plan with proof of alternate coverage)
- Mandatory (All students are mandated to purchase your institution's student health insurance regardless of outside insurance coverage)
- Other (Please specify: _____)

Section 2. Survey Characteristics

1. PURPOSE OF SURVEY

- Pre-test (e.g., before educational program or campus-wide intervention)
- Post-test (e.g., after educational program or campus-wide intervention)
- General assessment of student beliefs, behaviors, and experiences
- Other (Please specify: _____)

2. DATE ADMINISTERED

Start date 1/07 End date 2/07

3. STUDENT SAMPLE CHARACTERISTICS (I surveyed...)

- All of the different types of students who attend my institution
- Only a particular group of students (e.g., undergraduates, freshmen, athletes, medical students, commuters) (Please specify: Students in Health and Wellness Course)

4. INCENTIVES

- Students who completed the ACHA-NCHA were entered into a random drawing for an incentive (Please specify incentive: _____)
- All students who completed the ACHA-NCHA received an incentive (Please specify incentive: _____)
- I did not offer students who completed the ACHA-NCHA an incentive for their participation

5. SURVEY TYPE (I surveyed using...)

- Paper-based surveys (Complete Section 2A on the next page)
- Online/Web-based surveys (Complete Section 2B on the next page)

Section 2A: Paper-based survey characteristics

6A. SAMPLING PROCEDURES

Classroom Sampling

- Surveyed random selection of classes from across institution
- Surveyed other random selection of classes (e.g. all sections of a particular class required by all students)
(Please specify: _____)
- Surveyed non-random selection of classrooms (e.g., classes taught by personal acquaintances)
(Please specify: Required Course for all students offered through Health and Exercise Science Department)

Please specify the number of classrooms surveyed: 7

Mailed Sampling

- Mailed survey to all students at institution
- Mailed survey to all students in a particular subgroup (e.g. commuters, undergraduates, graduates)
(Please specify: _____)
- Mailed survey to random selection of students at institution
- Mailed survey to random selection of students in a particular subgroup (e.g. commuters, undergraduates)
(Please specify: _____)
- Mailed survey to a non-random selection of students (e.g., students who participated in a program)
(Please specify: _____)

Convenience Sampling

- Convenience sample (e.g., students coming to student health, students eating lunch in the student union)
(Please specify: _____)

Other

- Other (Please specify: _____)

7A. SURVEY DISTRIBUTION

How many surveys did you distribute? 1250

Section 2B: Online/Web-based survey characteristics

6B. SAMPLING PROCEDURES

E-Mailed Sampling

- E-mailed survey to all students at institution
- E-mailed survey to all students in a particular subgroup (e.g. commuters, undergraduates, graduates)
(Please specify: _____)
- E-mailed survey to random selection of students at institution
- E-mailed survey to random selection of students in a particular subgroup (e.g. commuters, graduates)
(Please specify: _____)
- E-mailed survey to a non-random selection of students (e.g., students who participated in a program)
(Please specify: _____)

Convenience Sampling

- Convenience sample (e.g., posting survey URL on institution website or on posters)
(please specify: _____)

7B. SURVEY DISTRIBUTION

How many students did you invite to participate? 1250

Check here if you would like ACHA to determine:

Section 3. Data Agreement and Contact Information

Thank you for completing the above information and for helping us better use the ACHA-NCHA survey data in developing normative information for a variety of variables.

The ACHA-NCHA is being used across the nation to assess student health risks, beliefs, behaviors, and consequences. Each participating institution of higher education (IHE) receives a copy of its data file and reports for the purposes of analysis, research, and program planning. Additionally, each participating institution receives an aggregate report with data from all IHEs using random sampling methodologies that participated in the same survey period. The creation of this large national data file and aggregate report allows you to compare your students to a national sample. It also provides the opportunity for a greater understanding of student health, what works to reduce student health risks and consequences, and what changes can be brought about over time. In light of this opportunity, we are asking your permission to analyze, report on, and use the data collected from your students to further both our understanding of student health needs identified by the ACHA-NCHA and the ability of IHEs to meet these needs.

By signing below, I hereby agree to the following statement:

"I, as the ACHA-NCHA program representative at my institution, give the American College Health Association permission to analyze, report on, and otherwise use the aggregate data. I understand that all information in the aggregate data is protected and that the identity of my institution and the students who complete the ACHA-NCHA will remain confidential at all times."

Signature _____ Date _____

Name Deb Morris Title Health Educator, Director Health Promotions

Institution Colorado State University

Phone 970-491-1723 E-mail debra.morris@colostate.edu

Address Colorado State University Health Promotions
Fort Collins, CO 80523

When all sections are complete, please either mail or fax this survey to:



American College Health Association

P.O. Box 28937
Baltimore, MD 21240
410.859.1510 (fax)

Direct all inquiries regarding completion of this survey to:

Mary T. Hoban, Ph.D., CHES
Director, ACHA-NCHA Program Office
410.859.1500 (phone)
mhoban@acha.org

Page 5 of 5

Appendix D

CSU Informed Consent Form



Department of Health and Exercise Science
Fort Collins, Colorado 80523-1582
(970) 491-5081
FAX: (970) 491-0445
<http://www.sahx.colostate.edu/hes>

September 15, 2007

Dear Participant,

The Health Promotion Program at Colorado State University is conducting research to examine various aspects of your health. If you volunteer to participate in this study you will be asked to complete the *American College Health Assessment* during class. The anonymous questionnaire will take approximately 20 minutes to complete. Your decision whether or not to participate in this study will have no impact on your grade in this class. There are a few demographic questions included along with questions that you may find sensitive in nature, e.g., sexual activity, drug and alcohol use. You may skip any question you are not comfortable in answering. If you should feel distressed after completing (or attempting to complete) this assessment, please contact the University Counseling Center at 491-6052, and they will set up an appointment for you to speak with someone.

Although there are no known risks to participating in this research study, the benefits to be gained are that campus health professionals will be provided valuable information to better promote health services to all CSU students.

We would like to thank you for your consideration for involvement in this study and would welcome a phone call if you have any questions. Your consent to participate will be assumed by the completion of the questionnaire.

If the investigator of this study is the instructor of your class, the assessment will be administered by the co-investigator to assure your confidentiality in participation. Questions about participants' rights may be directed to Janell Meldrum at (970) 491-1655.

Sincerely,

A handwritten signature in cursive script that reads "Cathy Kennedy".

Cathy Kennedy, Ph.D.
Director of Health Promotion
Department of Health and Exercise Science
(970) 491-1501

Deb Morris, B.S.N., M.A.
Director of Health Promotion
Hartshorn Health Center
(970) 491-1723

Appendix E

Script for Data Collection

Script

Good morning/afternoon,

I am _____? _____ from the Department of Health and Exercise Science or Hartshorn Health Center. The Health Promotion Program at CSU is conducting research to examine various aspects of your health. If you volunteer to participate in this study you will be asked to complete the *American College Health Assessment* during class. The anonymous questionnaire will take approximately 20 minutes to complete. Your completed questionnaire will then be turned into me. Your decision whether or not to participate in this study will have no impact on your grade in this class. There are a few demographic questions included along with questions that you may find sensitive in nature, e.g., sexual activity, drug and alcohol use. You may skip any question you are not comfortable in answering. If you should feel distressed after completing (or attempting to complete) this assessment, please contact the University Counseling Center at 491-6052, and they will set up an appointment for you to speak with someone.

Although there are no known risks to participating in this research study, the benefits to be gained are that campus health professionals will be provided valuable information to better promote health services to all CSU students.

We would like to thank you for your consideration for involvement in this study and would welcome a phone call if you have any questions. Your consent to participate will be assumed by the completion of the questionnaire.

Thank you for your time.