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The Effect of Exercise on College Students' Overall Health

By
Tanner Steineke

A Thesis Submitted in Partial Fulfillment
of the Requirements for the
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The members of the Honors Thesis Committee appointed
to examine the thesis of Tanner Steineke
find it satisfactory and recommend it be accepted

Dr. Andrew C. Pickett
Assistant Professor of Kinesiology & Sport Management
Director of Committee

Dr. Whitney Lucas-Molitor
Assistant Professor of Occupational Therapy

Mrs. Michelle Turner
Student Counselor

ABSTRACT

The Effect of Exercise on College Students' Overall Health

Tanner Steineke

Director: Andrew Pickett Ph.D.

Introduction: Many individuals are not attaining the World Health Organization and American Heart Association's recommendations for daily physical activity. Physical activity habits are developed during young adulthood and it is therefore important to study barriers to physical activity in college students.

Objectives: Investigate the relationship between college student's physical activity and their overall health.

Methods: Data was collected by circulating an online survey to students on the University of South Dakota campus. Several survey questions were used from the SF-36 and the National College Health Assessment. Measures included mental health, physical activity, overall health, diet, and sleep habits.

Results: Results showed a positive relationship between physical activity and perceived mental and physical health. Physical activity rates declined from high school to college according to self-reported measures. Healthy eating habits were correlated with a higher rate of physical activity and perceived better health. Sleeping habits were not found to be correlated with physical activity rates and perceived health.

Conclusion: I recommend colleges provide more cost effective and accessible physical activity options for students.

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CHAPTER ONE

Introduction

It is widely understood that participation in exercise is essential to a healthy lifestyle. Exercise, along with healthy eating, is of the most important things a person can do to reduce the chance of illness. Regular exercise reduces the risk of health issues such as: stroke, cancer, diabetes, liver and kidney disease, obesity, osteoporosis and brain diseases such as dementia and depression (Wilson, 2010). According to Zeblisky (2019), exercise is “a physical activity that is planned, structured, and repetitive for the purpose of conditioning any part of the body used to improve health and maintain fitness.” There are many ways and many places in which one can perform exercise. Individuals base their decisions to engage in a particular activity on access (the work needed to obtain the activity) and motivation (the reinforcing value of the activity) (Buckworth & Nigg, 2004). Throughout the lifespan, the recommended amount and type of exercise varies.

The World Health Organization (WHO) and American Heart Association (AHA), provide some basic recommendations for the amount of exercise one should perform on a weekly basis (“American Heart Association,” n.d.; World Health Organization, n.d.; Zeblisky, 2019). Generally, for adults, these organizations recommend 150 minutes of moderate intensity physical activity or 75 minutes of vigorous physical activities weekly. Moderate intensity is defined as increasing your heart rate to 60-70 percent of your maximal heart rate (i.e your age in years subtracted from 220) or 3-6 METs (ratio of your working metabolic rate to your resting metabolic rate). Vigorous activity can be described as increasing your heart rate to 70-85 percent of your maximal heart rate or greater than 6 METs (Zeblisky, 2019).

Determining the appropriate amount and type of physical activity for different individuals remains difficult. For example, the Office for Disease Prevention and Health promotion (ODPHP) suggests that children and adolescence should perform 60 minutes or more of physical activity every day. The 60 minutes should include aerobic activities, muscle-strengthening activities, and bone-strengthening activities. However, the ODPHP echoes the higher levels previously outlined for adults. For additional health benefits, ODPHP recommendations suggest individuals increase their aerobic physical activity to 300 minutes per week of moderate intensity, or 150 minutes of vigorous activity. Adults should also do muscle-strengthening activities that are moderate or high intensity on 2 or more days a week. Finally, the ODPHP suggests older adults who can no longer perform 150 minutes of moderate intensity per week due to chronic illness should perform as much physical activity as conditions allow. Particular to older adults, guidelines encourage performing activities that increase balance to reduce risk of falling (“Summary 2008 Physical Activity Guidelines Health.gov,” n.d.). Thus, at each stage of life recommended level of physical activity change.

There are a variety of ways to achieve these recommended levels of physical activity, including: jogging, lifting weights, going to aerobic classes, and swimming. It is important to differentiate types of activity, as many daily activities (e.g., walking your dog or house cleaning) are not strenuous enough to qualify as moderate intensity and, therefore, would not count towards weekly recommendations. Jogging is commonly recommended as a form of exercise due to its relatively low cost to participate and scalability (Zeblisky, 2019). However, many communities have local facilities that provide swimming pools, weights, and other exercise equipment so one could perform a variety of exercises to reach suggested activity levels.

In particular, college students face a number of barriers to physical activity, including newness of their personal autonomy, time constraints, and financial limitations. Unfortunately, these factors contribute to a highly sedentary lifestyle among college students (Buckworth & Nigg, 2004). College students have a new and increased amount of responsibility for their own life decisions and health. This is particularly true of first year students, who are moving away from home, experiencing autonomy for the first time, and must choose to engage in healthy behaviors themselves (Butler, Black, Blue, & Gretebeck, 2004).

Students also have many time commitments. In order to be successful, students must spend large amounts of time completing coursework and studying (Buckworth & Nigg, 2004). According to Buckworth and Nigg's (2004) study, college students spent 13.25 hours per week studying. Many college students spend additional time on their computers searching the web or watching television (Buckworth & Nigg, 2004). Buckworth and Nigg's (2004) study shows that students spent 16.52 hours per week on the computer or watching television. Such a sedentary lifestyle is unhealthy for college students and is a primary contributor to the phenomena known as the "Freshman 15." This refers to the common weight gain students experience during the first year of college caused both by a sedentary lifestyle and increased consumption of unhealthy foods (Butler et al., 2004, Hodge, Jackson, & Sullivan, 1993).

Performing exercise not only helps keep students physically fit, but it also has mental health benefits (Manley, 1997; Pascoe & Parker, 2019; Snedden et al., 2019). Exercising allows students to release stress in a healthy way. This stress release helps keep the mind, and brain, at ease. Exercising at school and community provided gyms also provides students social interaction with similar, like-minded people. Thus, physical activity may help reduce depression and anxiety, as it gives students a group of people to talk to about issues in life.

It is important to examine college students' health-related behaviors, as research suggests habits developed in early adulthood are likely to be carried on throughout the lifespan (Sallis, 2009; Stone, McKenzie, Welk, & Booth, 1998; "Youth Risk Behavior Surveillance System Data Adolescent and School Health CDC," 2019). These include both exercise and dietary habits. Therefore, this study examined the relationship between exercise and the physical and mental health of college students. Specifically, in this work, I first examined the impact of physical activity on the overall health of college students. I then compared college students' physical activity habits to their prior high school behaviors. Finally, I explored the relationship between physical activity and other healthy behaviors (i.e., eating a balanced diet, sufficient sleep). To achieve these purposes, I administered a survey to students at the University of South Dakota (n=91), assessing physical activity and other health related behaviors. Results of the survey are presented and discussed.

CHAPTER 2

Literature Review

Physical Activity Impact on Health

Physical activity plays a major role in a healthy lifestyle. The many benefits of physical activity are well documented; however, many Americans do not participate in sufficient exercise to maintain a healthy lifestyle (Telama, Yang, Laakso, & Viikari, 1997). Evidence clearly shows that regular physical activity improves physiological and psychological health (Kilpatrick, Hebert, & Bartholomew, 2005). People of all ages, both male and female, benefit from regular activity (Manley, 1997). The role of physical activity for the promotion of health is globally recognized (Clemente, Nikolaidis, Martins, & Mendes, 2016). Americans can substantially improve their health and quality of life by including moderate amounts of physical activity in their daily lives. Even for those who are already regularly engaging in moderate amounts of activity, additional benefits may be gained by further increases in activity level (Manley, 1997).

Exercise and nutrition can be of importance in the prevention of illness and the enhancement of health (Stone et al., 1998). Diseases that are prevented by participation in physical activity include stroke, cancer, diabetes, liver and kidney disease, osteoporosis and even brain diseases such as dementia and depression (Wilson, 2010). Significant health benefits can be obtained by including a moderate amount of physical activity on most, if not all, days of the week (Manley, 1997). Higher levels of physical activity are associated with lower mortality rates for both older and younger adults (Manley, 1997). Physical activity reduces the risk of mortality and of coronary heart disease, hypertension, colon cancer, and diabetes mellitus. Physical activity also improves mental health and is important for the health of muscles, bones, and joints (Manley, 1997). Physical inactivity has been associated with the risk of several chronic diseases

and health conditions, especially obesity (Booth, Gordon, Carlson, & Hamilton, 2000; Buckworth & Nigg, 2004).

Mental health. Physical activity has a positive impact on an individual's mental health (Snedden et al., 2019). Physical activity is often an effective universal depression intervention (Pascoe & Parker, 2019). Regular participation in physical activity also appears to reduce depression and anxiety, improve mood, and enhance ability to perform daily tasks throughout the life span (Manley, 1997). An increasing body of evidence indicates that physical activity and exercise are effective for improving mental states and preventing mood disorders (Pascoe & Parker, 2019). Some research also suggests being physically fit helps people maintain their cognitive abilities as they age (Stone et al., 1998). During the aging process, physical activity might represent a potential treatment for neuropsychiatric disorders and cognitive impairment, helping delay the onset of neurodegenerative processes (Deslandes et al., 2009). Exercise normalizes the brain's stress response and biologically, exercise seems to give the body a chance to practice dealing with stress (Stone et al., 1998).

Impact on Physical Health. The body responds to physical activity in ways that have important positive effects on musculoskeletal, cardiovascular, respiratory, and endocrine systems (Manley, 1997). People of all ages, both male and female, undergo beneficial physiologic adaptations to physical activity (Manley, 1997). Exercise makes human bodies stronger, because it increases the blood supply to our brains (Stone et al., 1998). Physical activity has a positive impact on autonomic regulation of the heart. With more physical activity, there was an increased heart rate variability (HRV) (Tornberg et al., 2019). The increased energy expenditure that accompanies regular physical activity contributes to more efficient function of various systems,

weight maintenance, reduced risk of several degenerative diseases, reduced risk of mortality, and overall improvement of quality of life (Tornberg et al., 2019).

Physical Inactivity

General Population. Despite common knowledge that exercise is healthy, more than 60 percent of American adults are not regularly active (Manley, 1997). There is evidence that the population is growing increasingly older and that inactivity increases with age (Phoenix & Bell, 2019). Over time, individuals tend to perform lower amounts of physical activity. In one study on physical activity levels, participants' exercise levels were tracked at several time points following an intervention. At the two-year follow up, exercise levels remained moderate to high for total volume of exercises. However, as time between follow ups increased, such as at 22 years, the levels of activity decreased (Rütten et al., 2001). Over half of all college students report a decrease in physical activity following graduation (Calfas, Sallis, Lovato, & Campbell, 1994). Epidemiological evidence indicates that the level of physical activity declines from high school to college, and activity patterns in college populations are generally insufficient to improve health and fitness (Douglas et al., 1997). Cardiovascular fitness in adults decreases with age. This decline is not linear as after the age of 45, fitness declined at an accelerated rate (Jackson, Sui, Hébert, Church, & Blair, 2009). Compared to adults and adolescence, university students were less active (Clemente et al., 2016).

College Students. There are many reasons students don't reach the recommended amount of physical activity daily. For example, students perceive a lack of time due to other responsibilities and commitments (Conroy, Elavsky, Doerksen, & Maher, 2013). Although college students have specific time constraints related to their academic schedules, they also have considerable discretionary time (Buckworth & Nigg, 2004). However, sedentary behaviors such

as reading, studying, and computer use can compete with exercise when individuals are making choices about how to spend their discretionary time (Buckworth & Nigg, 2004).

As such, many students are not participating in the recommended amount of physical activity. Studies have shown that participation in physical activity declines during adolescent and into one's college years (Buckworth & Nigg, 2004; Sallis, 2009; Stone et al., 1998). Consistent with this, first year college students generally participate in more physical activity than upperclassmen (Buckworth & Nigg, 2004). This participation exists for all forms of physical activity, rates of which decline as age increases (Manley, 1997). Over the school age years, a consistent decline in physical activity is seen, with males decreasing about 2.7% per year and female decreasing about 7.4% per year (Sallis, 2009). Conversely, sedentary behaviors increase with age, filling an increasingly large portion of students' days. For example, upperclassmen report higher levels of computer usage than younger students, which is negatively related to physical activity levels (Buckworth & Nigg, 2004).

Despite the many clear benefits of an active lifestyle, lack of physical activity is a significant health problem in the college population (Kilpatrick et al., 2005). A potential health risk comes with an inadequate physical activity among college students (Wang, 2019). Only about one-half of U.S young people (ages 12-21 years) regularly participate in vigorous physical activity (Manley, 1997). Fifty-seven percent of male and 61% of female college students reported that they performed no vigorous or moderate exercise on at least 3 of the previous 7 days (Buckworth & Nigg, 2004). That is, more than half of students reported activity levels well below recommended minimums for their age group. Conversely, only 38% of college students participate in regular vigorous activity, and only 20% participate in regular moderate activity (Douglas et al., 1997).

Importance of Understanding College Student Health Behaviors

It is important for college students to perform physical activity because of their increasingly heavy load through young adulthood. However, physical activity declines dramatically during adolescence (Manley, 1997). Exercise habits are hard to change. If exercise habits are established at a young age, there is a high chance that they continue into adulthood (Telama et al., 2005). High levels of physical activity at ages 9 to 18, especially when continuous, significantly predicted a high level of adult physical activity (Telama et al., 2005). There is some evidence that participation in organized sport at a young age is a good predictor of physical activity in adulthood (Tammelin, Näyhä, Hills, & Järvelin, 2003; Telama et al., 1997, 2005). Fitness in children and adolescents seems to account for physical activity engaged in adults, which may indicate that vigorous fitness-oriented exercise at a young age is (Barnekow-Bergkvist, Hedberg, Janlert, & Jansson, 1996; Beunen et al., 2004).

College students consist of a group with unique characteristics during a crucial period of life, immediately after adolescence. They undergo emotional, physiological and environmental changes influencing their consumer habits and lifestyle aspects such as physical activity (Clemente et al., 2016). The abrupt change with regards to behavior and lifestyle may come from leaving the well-controlled environment of high school to independent habits of college (Clemente et al., 2016). Healthy behaviors decline dramatically during the transition to young adulthood. These declines are thought to be associated with increased independence and decreased monitoring by parents (Frech, 2012). Many other factors influence physical activity in adulthood, such as education, occupation, living environment, marital status, having children, health attitudes, and perceived weight (Telama et al., 2005).

Physical Health. Students develop unhealthy exercise and eating habits and therefore many gain weight during their college years. One quarter of students gained weight during their freshman year of college (Wengreen & Moncur, 2009). That number increases to 70% of students when adding in their sophomore year of college (Racette, Deusinger, Strube, Highstein, & Deusinger, 2008). The National Collegiate Health Risk Survey revealed that 1 in 5 college students is overweight (“Youth Risk Behavior Surveillance System Data Adolescent and School Health CDC,” 2019). Research has shown that college freshmen who begin their tenure at a university gain weight (Hodge et al., 1993; Hovell, Mewborn, Randle, & Fowler-Johnson, 1985; Megel, Wade, Hawkins, Norton, & et al, 1994). Nationwide, 20.5 percent of college students are overweight and obese (“Youth Risk Behavior Surveillance System Data Adolescent and School Health CDC,” 2019).

Decreases in physical activity may have been a major cause of weight gain in college students (Butler et al., 2004). Although caloric intake significantly decreased, a significant increase occurred in bodyweight parameters that may be attributed to significant decreases in total physical activity (Butler et al., 2004). One such alteration in lifestyle associated with increased body weight is the transition of leaving home to attend college. This relocation involves changes in the social and physical environments as well as cognitive and behavioral adaptations, which may impact dietary patterns and physical activity levels (Butler et al., 2004). This suggests that a reduction in physical activity was primarily responsible for the change in body weight (Butler et al., 2004).

Mental Health. Negative impacts of stressful events on health declined as exercise and nutrition levels increased (Brown & Siegel, 1988; Feist & Brannon, 1990). Physical activity and sports have great potential to increase children’s self-esteem and motivation (Stone et al., 1998).

Exercise can help reduce the harmful effects of stressors when performed at moderate intensities (Deslandes et al., 2009). Significant differences were observed between low, medium, and high exercise groups on the mental health scales, indicating better mental health for those who engage in more exercise (Tyson, Wilson, Crone, Brailsford, & Laws, 2010). Strength training exercise was positively associated with perceived health and modestly negatively associated with depression, anxiety, and suicidal ideation. Vigorous and moderate exercise was significantly negatively associated with depression (Adams, Moore, & Dye, 2007).

Relationship between Adolescent and Later Adult Health Behaviors

Habits of and attitudes towards physical activity developed during childhood and adolescence are assumed to continue through adulthood (Meredith & Dwyer, 1991; Simons-Morton, Parcel, O'Hara, Blair, & Pate, 1988). Many adult health behaviors are established during late adolescence and early adulthood ("Youth Risk Behavior Surveillance System Data Adolescent and School Health CDC," 2019), so the decline in physical activity in adolescence and young adulthood is a disturbing trend (Sallis, 2009; Stone et al., 1998). Subjects who engaged in regular physical activity during adolescence were more likely to be adequately active in adulthood (Azevedo, Araújo, Silva, & Hallal, 2007). The results show that the transition from adolescence to adulthood is, on average, a period of decline in physical activity, but with the decline levelling off into middle adulthood (Kjønniksen, Torsheim, & Wold, 2008). Research shows that many health-related habits developed in early adulthood are carried on throughout the lifespan (Sallis, 2009; Stone et al., 1998; "Youth Risk Behavior Surveillance System Data Adolescent and School Health CDC," 2019). These include both exercise and dietary habits. Therefore, it is important to study the health-related habits of college students, as they are likely to continue later in life.

Given the importance of physical activity as part of a healthy lifestyle, particularly for college students, I aimed to explore several important relationships. Consistent with previous literature, I hypothesized the following:

H1: Regular physical activity will be related to better self-perceived overall health (H1a), as well as scale-measured mental health (H1b).

H2: College students will engage in lower overall levels of physical activity than they did in high school (H2).

H3: College students' physical activity levels will be related to healthy diet (H3a) and sleep habits (H3b).

CHAPTER 3

Methods

Participants were recruited via the online SONA system at the University of South Dakota. The SONA system is a database for researchers to recruit students to participate in their study. The system allows participants to remain private and anonymous to the researchers. Some professors use this site to offer credit and/or extra credit to their students. Although the professors can see which students participated in a study, researchers are unable to do so.

Participants

Participants were 91 undergraduate students at the University of South Dakota. Participation was voluntary and all the students consented to take part in the study. The sample was primarily white (n=87; 95.6%), and included 1 African American (1.1%), 2 American Indian or Alaska Native (2.2%), 2 Asians (2.2%), 1 Native Hawaiian or Pacific Islander (1.1%), and 1 Hispanic (1.1%). Females outnumbered males in the sample (n=70, 76.9%; and n=21, 23.1%, respectively). The age distribution ranged from 18 to 27 years, with a mean age of 19.77 (SD=1.585). The sample was primarily freshman (n=42; 46.2%), and included 24 sophomores (26.4%), 16 juniors (17.6%), and 9 seniors (9.9%).

Measures

A number of measures were used to test mental health, physical activity, overall health, diet and sleep habits.

Mental Health. Mental health was measured by using items from the Short Form 36. The Short Form 36 is a set of generic, coherent, and easily administered quality-of-life measures. These measures are now widely utilized by managed care organizations and by Medicare for routing monitoring and assessment of care outcomes in adult patients (Monica & California

90401-3208, n.d.). The SF-36 was first developed in 1992 and was much shorter. Many updates have been made through the years (Ware & Sherbourne, 1992). A sample item from the SF-36 is: “Within the last year, how often did you feel things were hopeless?” Participants marked one of the following: Never, 1-3 times, 4-6 times, 7-9 times, 10 or more times. For my sample the internal consistency of these items was acceptable ($\alpha=.82$).

Physical Activity. Physical Activity was measured by using items from the National College Health Assessment. The National College Health Assessment is a nationally recognized research study that can assist you in collecting precise data about students’ health habits, behaviors, and perceptions (“NCHA Home,” n.d.). Physical activity items ask participants to document their levels of moderate, vigorous, and strength building physical activities. The internal consistency of the physical activity items was acceptable, both for current participation and physical activity levels in high school ($\alpha=.87$, $\alpha=.88$, respectively).

Overall Health. Overall Health was assessed using a single item. The validity of using only a single-item question for simple concepts with one, easily understood domain is well documented. Single item health measures have been shown to be acceptably reproducible and reliable (DeSalvo et al., 2006), while also being less burdensome and item consuming for participants (Zimmerman et al., 2006). I used an item from the National College Health Assessment: “Considering your age, how would you describe your overall health?” Participants responses ranged from 1 (very poor) to 6 (Excellent).

Diet. Diet was also assessed using a single item the National College Health Assessment: “Do your meals include all of the major food groups (Carbohydrates, Dairy, Protein, Fruits, Vegetables, and Grains)?” Participants marked responses on a continuum, ranging from 1 (none of my meals do) to 5 (All of my meals do).

Sleep Habits. Finally, sleep habits were assessed using a single item from the National College Health Assessment: “In the last week, how many days did you get enough sleep so that you feel rested when you woke up in the morning?” Participants marked the number of days, from 0 to 7.

Hypotheses 1 and 3 were tested using linear regression techniques, while hypothesis 2 employed a paired samples *t*-test.

CHAPTER 4

Results

Hypothesis 1 stated that physical activity will be related to better self-perceived overall health (H1a) and mental (H1b) health. Bivariate correlations between study variables are presented in Table 1. Both the hypothesized relationships between physical activity with overall health ($F_{[1,89]}=32.40, p<.001$) and mental health ($F_{[1,88]}=5.32, p=.02$), were supported by the data. Physical activity accounted for 27% of the variance in overall health and 6% of variance in mental health.

Hypothesis 2 stated that college students will engage in lower overall levels of physical activity than they did in high school. This hypothesis was supported by the data ($t_{[90]}=-6.01, p<.001$).

Hypothesis 3 stated that college students' physical activity levels will be related to a healthy diet (H3a) and sleep habits (H3b). While H3a was supported by the data ($F_{[1,89]}=7.90, p=.006$), H3b was not supported ($F_{[1,89]}=2.74, p=.10$). Physical activity level accounted for 8% of the variance in college students' diet.

Table 1. Descriptive Statistics and Bivariate Correlations

Name	<i>M</i>	<i>SD</i>	<i>α</i>	Correlations						
				1	2	3	4	5	6	
1. Current Physical Activity	2.84	1.50	.87	--						
2. Overall Health	3.96	.71	--	.48**	--					
3. Mental Health	3.34	.81	.82	.30**	.25**	--				
4. High School Physical Activity	4.02	1.37	.88	.31**	.00 ^{NS}	.05 ^{NS}	--			
5. Balanced Diet	3.29	.87	--	.27**	.27**	.16 ^{NS}	-.05 ^{NS}	--		
6. Sleep Habits	3.72	1.90	--	.47**	.06 ^{NS}	.27*	.18 ^{NS}	.06 ^{NS}	--	

Note: ** $p < .01$; * $p < .05$; ^{NS} Not Statistically Significant

CHAPTER 5

Discussion

Physical inactivity, particularly of college-age individuals, is an increasingly salient issue all over the world, given that many physical activity habits are developed during late adolescence and young adulthood. It is important for college students to create healthy habits related to exercise because physical inactivity can alleviate many health issues. In this study, I found support for physical activities' positive impact on self-perceived overall health. My results showed that those who participated in adequate physical activity perceived that they were healthier than their peers. This is consistent with existing literature which states that those who exercise more often live longer and live a healthier life (Clemente et al., 2016). Therefore, my findings add to the existing literature surrounding the relationship between physical activity and overall health.

I also found support for physical activities' positive impact on mental health. Physical activity was found to decrease depression in college students. Again, this was similar to existing literature, which largely supports a positive relationship between regular exercise participation and mental health (Adams et al., 2007; Brown & Siegel, 1988; Deslandes et al., 2009; Feist & Brannon, 1990; Stone et al., 1998; Tyson et al., 2010). Again, it is important to continuously document such relationships, and my work adds to this knowledge.

In line with hypothesis 2, my results showed that college students engage in lower overall levels of physical activity than they did in high school. The literature states that levels of physical activity decreases as a person becomes older (Calfas et al., 1994; Phoenix & Bell, 2019; Rütten et al., 2001). Earlier work also suggests physical activity habits are established during late adolescence and early adulthood (i.e. the college years) (Azevedo et al., 2007; Calfas et al.,

1994; Kjønniksen et al., 2008; Meredith & Dwyer, 1991; Sallis, 2009; Simons-Morton et al., 1988; Stone et al., 1998; “Youth Risk Behavior Surveillance System Data Adolescent and School Health CDC,” 2019). My results further support the established literature that shows that physical activity decreases with age.

My results showed that physical activity is related to a healthy diet for students at the University of South Dakota. Results from this study show that college students who exercise more also tend to eat a healthier diet. Earlier research has explored college students’ gain weight during their first two years on campus. In particular, this body of work suggests that college students gain weight for two primary reasons: a decrease in physical activity and an increased intake of high caloric food items (Butler et al., 2004; Hodge et al., 1993; Hovell et al., 1985; Megel et al., 1994; Wengreen & Moncur, 2009, 2009; “Youth Risk Behavior Surveillance System Data Adolescent and School Health CDC,” 2019). Interestingly, in my data, these two behaviors are related, such that students who engage in activity also make healthier dietary choices. This is particularly important as the rate of obesity in America has increased over the last several decades (“Youth Risk Behavior Surveillance System Data Adolescent and School Health CDC,” 2019).

Contrary to hypothesis 3b, the results showed that there was not a statistical relationship between sleep habits and physical activity. In earlier work with adults, researchers have found a positive relationship between sleep quality and physical activity (Kaldırımçı et al., 2017). However, my findings were not consistent with this work, instead suggesting that physical activity and sleep habits were not related in my sample. This could be because of many other factors impacting sleep habits, particularly for college students. These factors could include

partying, studying, and socializing, among others (Kaldırımçı et al., 2017). Further work should be done to better understand the sleep habits of college students.

The results found in this study align very closely to the prior base of knowledge found in the literature. My results support the findings of earlier literature suggesting that physical activity does have a positive impact on overall (mental and physical) health. Of concern, my results also suggest that physical activity rates decline throughout the lifespan, more specifically from high school to college. Further, I found that those who perform adequate amounts of physical activity also consume a healthier diet. The results show that sleep habits do not correlate with the amount of physical activity an individual performs. From these results, I recommend that colleges and workplaces improve their rewards for participating in physical activity.

Implications

Based on my results, I recommend colleges expand physical activity options for students. In particular, colleges need to address student barriers to activity, such as cost, time, variety of options, and accessibility.

First, physical activity options need to be cost effective, since students generally do not have large amounts of disposable income. For example, this could mean that memberships to on-campus wellness centers or gyms be free or included in the cost of tuition. Eliminating the cost of a membership may influence students to visit the wellness center/gym more often. Colleges should also make sure that their wellness centers/gyms are located in an accessible place to all students. Thus, I believe an ideal location for a wellness center would be in the middle of campus. Students may consider the cost of driving or walking to the gym as outweighing the benefits of attending. Conversely, if the gym is located closer to the dormitories, students may visit more often.

Another major barrier to college student activity is time. College students have busy schedules with classes, homework/studying, and some have jobs. Wellness centers/gyms at colleges need to make sure that their operating hours are flexible and fall during times that college students are free and able to visit. Colleges could also offer more student services to help develop time management skills and give students the capacity to schedule their day in a way that includes time at the gym.

People find enjoyment in a variety of physical activities and colleges need to take that into account when deciding what options to offer. Offering a wide variety of classes, such as Zumba or Water Aerobics, allows students to pick and choose options that give them enjoyment. Other options may include free-standing gym equipment for students to choose from, including both strength building and aerobic exercise options. Additionally, I suggest that colleges should develop a more holistic wellness focus in facilities. Specifically, wellness includes more than just exercise, but also mental health, dietary choices, and sleep habits. Although my results did not show a correlation between sleep habits and physical activity, getting enough sleep is very important. Therefore, colleges and universities should be investing in programs to help students exercise more, but also to develop other healthy habits.

Limitations

As with all research, my work had limitations. Although several findings were statistically significant, the sample size (n=91) is small compared to other studies done on the same topic. Increasing the sample size would improve the significant values and help the researchers align this data over a larger group of people. Further, the survey that collected data for this study was uploaded to an online database of other studies. This leads to a voluntary response limitation from the students, which may affect responses. Finally, students may be

untruthful in an online survey as no one is watching them. Most people tend to give answers that make themselves look better. An online survey also gives students the chance to randomly select answers without putting thought into the questions. Again, these possibilities could skew results.

Future Directions

Based on prior research and my research added together I believe that this topic could use more research. This study provides a number of areas for discussion. What daily activities can be determined as physical activity? What is the role of functional fitness in physical activity? Functional fitness includes strength building activities that an individual does during their everyday routine. These activities do not require going to a gym. Could this be where college students participate in hidden physical activity?

I believe more research can be done on functional fitness' role on physical activity rates for college students. Perhaps students do not consider walking to class with a 20-pound backpack or walking up three flights of stairs exercise. This could be done by doing an experimental research project to test VO_2 max of students during their daily routines. More research could be done on college aged students who do not attend college. These individuals may be having an increased independence for the first time, however, without the time constraints that college students have. Will their physical activity levels be similar to college students?

CHAPTER 6

Conclusion

This study investigated the relationship between college students' physical activity levels and its impact on their overall health. Using sleep habits, eating habits, and perception of overall health as measures, I was able to find a positive relationship between physical activity and overall health (mental and physical). College students self-reported that they were less active in college than while in high school. Results from this study align with what was found in prior literature. In accordance to my findings, I recommend that colleges provide more easily accessible, cost efficient, and a higher variety of physical activity options for students.

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APPENDIX

IRB Approval Letter

IRB Approval effective from: 2/22/2019
IRB Approval not valid after: 2/21/2022
USD IRB

UNIVERSITY OF SOUTH DAKOTA
Institutional Review Board
Informed Consent Statement

Title of Project: Effects of Physical Activity on College Students
Principle Investigator: Drew Pickett, A311H Sanford Coyotes Sport Center, Vermillion, SD
57069

(605)-658-5552 Drew.Pickett@usd.edu

Other Investigators: Whitney Lucas-Molitor, 366 Sanford Coyotes Sport Center, Vermillion, SD
57069

Michele Turner, H M Cook House, Vermillion, SD 57069
Tanner Steineke, Student, Vermillion, SD 57069

Purpose of the Study:

The purpose of this research study is to explore how physical activity effects the overall health of college students. You are invited to participate in this study because you are a student at the University of South Dakota.

Procedures to be followed:

Once finishing reading this document and asking any questions you may have, participants will answer 15 questions on an anonymous online survey.

Risks:

This survey asks personal questions about physical, mental, and emotional well-being, including depression and thoughts of suicide. Answering these questions may cause discomfort. If you would like to talk to someone about your feelings regarding this study, you are encouraged to contact The University of South Dakota's Student Counseling Center at 605-677-5777 which provides counseling services to USD students at no charge. **We have no way to link your responses with your identity, so if you have thoughts of harming yourself, please seek immediate help from the counseling center.**

Benefits:

There are no benefits in participating in this study. However, we hope that in the future we may know more about the effects of exercise on overall well-being.

Duration:

It will take approximately 10 minutes to complete the questions.

Statement of Confidentiality:

The survey does not ask for any information that would identify who the responses belong to. Therefore, your responses are recorded anonymously. If this research is published, no information that would identify you will be included since your name is in no way linked to the responses.

All survey responses that we receive will be treated confidentially and stored on a secure survey. However, given that the surveys can be completed on any computer (e.g., personal, work, school), we are unable to guarantee the security of the computer on which you choose to enter your responses. As a participant in our study, we want you to be aware that certain “key logging” software programs that can be used to track or capture data that you enter and/or websites that you visit.

Right to Ask Questions:

The researchers conducting this study are Dr. Drew Pickett, Dr. Whitney Lucas-Molitor, Michele Turner, and Tanner Steineke. You may have questions you have now. If you later have questions, concerns, or complaints about the research, please contact Dr. Pickett at (605)658-5222.

If you have any questions regarding your rights as a research subject, you may contact the University of South Dakota’s Office of Human Subjects Protection at (605)677-6184. You may also call this number with complaints, or concerns about the research. Please call this number if you cannot reach research staff, or you wish to talk with someone who is an informed individual who is independent of the research team.

Compensation:

You may be offered extra credit for participation in this research study. If you choose not to be in this study, you may obtain extra credit by participating in another SONA study (if applicable) or by asking your professor for other options. Please discuss your options with your course instructor.

Voluntary Participation:

You do not have to participate in this research. You can stop your participation at any time. You may refuse to participate or choose to discontinue participation at any time without losing any benefit to which you are otherwise entitled.

You do not have to answer any questions you do not wish to answer.

Completion of the survey implies that you have read the information in this form and consent to participate in the research.

Please keep this form for your records or future reference.

Copy of Survey Items

Effect of Exercise on College Students

Start of Block: Block 1

Q1 You are being asked to complete this research by the University of South Dakota:

Purpose of the Study: The purpose of this research study is to explore how physical activity effects the overall health of college students.

Procedures to be followed: Once finishing reading this document and asking any questions you may have, participants will answer questions on an anonymous online survey.

Items on this survey have been adopted from both the National College Health Assessment (https://www.acha.org/NCHA/NCHA_Home) and the Medical Outcomes Study: Short Form 36 Questionnaire (https://www.rand.org/health-care/surveys_tools/mos/36-item-short-form.html).

Risks: This survey asks personal questions about physical, mental, and emotional well being. Answering these questions may cause discomfort. If you would like to talk to someone about your feelings regarding this study, you are encouraged to contact The University of South Dakota's Student Counseling Center at 605-677-5777 which provides counseling services to USD students at no charge.

Benefits: You may be offered extra credit for participation in this research study. If you choose not to be in this study, you may obtain extra credit by participating in another SONA study (if applicable) or by asking your professor for other options. Please discuss your options with your course instructor.

Duration: It will take approximately 10 minutes to complete the questions.

Statement of Confidentiality: The survey does not ask for any information that would identify who the responses belong to. Therefore, your responses are recorded anonymously. If this research is published, no information that would identify you will be included since your name is in no way linked to the responses. All survey responses that we receive will be treated confidentially and stored on a secure survey. However, given that the surveys can be completed on any computer (e.g., personal, work, school), we are unable to guarantee the security of the computer on which you choose to enter your responses. As a participant in our study, we want you to be aware that certain "key logging" software programs that can be used to track or capture data that you enter and/or websites that you visit.

Compensation: You may be offered extra credit for participation in this research study. Please discuss with your course instructors.

Voluntary Participation: You do not have to participate in this research. You can stop your participation at any time. You may refuse to participate or choose to discontinue participation at any time without losing any benefit to which you are otherwise entitled. You do not have to answer any questions you do not wish to answer. Completion and return of the survey implies that you have read the information in this form and consent to participate in the research.

Right to Ask Questions: The researchers conducting this study are Dr. Drew Pickett, Dr. Whitney Lucas-Molitor, Michele Turner, and Tanner Steineke. If you later have questions,

concerns, or complaints about the research, please contact Dr. Pickett at (605) 658-5552 or Drew.Pickett@usd.edu. If you have any questions regarding your rights as a research subject, you may contact the University of South Dakota's Office of Human Subjects Protection at (605) 677-6184. You may also call this number with complaints, or concerns about the research. Please call this number if you cannot reach research staff, or you wish to talk with someone who is an informed individual who is independent of the research team.

Q2 By clicking below you agree with the above and consent to continue this survey.

I agree (1)

End of Block: Block 1

Start of Block: Block 2

Q3 Considering your age, how would you describe your overall health?

Very Good (1)

Good (2)

Fair (3)

Poor (4)

Very Poor (5)

Q4 Compared to high school, how would you rate your health in general now?

- Much better now than during high school (1)
 - Somewhat better now than during high school (2)
 - About the same (3)
 - Somewhat worse than during high school (4)
 - Much worse than during high school (5)
-

Q5 How would you rate your physical fitness compared to others your age?

- Very good (1)
 - Good (2)
 - Alright (3)
 - Bad (4)
 - Very bad (5)
-

Q6 Indicate if you have any of the following which may influence your health or ability to engage in physical activity.

- Severe illness (1)
 - Physical disability (3)
 - Other health problem(s) (4)
 - None of the above (2)
-

Q7 How do you describe your weight?

- Very underweight (1)
 - Slightly underweight (2)
 - About the right weight (3)
 - Slightly overweight (4)
 - Very overweight (5)
-

Q8 Do your meals include all of the major food groups (Carbohydrates, Dairy, Protein, Fruits, Vegetables, Grains)?

- All of my meals do (1)
 - Most of my meals do (2)
 - Some of my meals do (3)
 - A few of my meals do (4)
 - None of my meals do (5)
-

Q9 In **the last week**, how many days did you do the following?

	7 (1)	6 (2)	5 (3)	4 (4)	3 (5)	2 (6)	1 (7)	0 (8)
Participate in vigorous exercise (80% or more of maximal effort) for at least 20 minutes (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participate in moderate exercise (50-80% of maximal effort) for at least 30 minutes (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Perform exercises to gain strength or tone your muscles, such as push-ups, sit-ups, or weight lifting (4)	<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 feel rested when you woke up in the morning (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q10 While in **high school**, during a one week period, how many days did you:

	7 (1)	6 (2)	5 (3)	4 (4)	3 (5)	2 (6)	1 (7)	0 (8)
Participate in vigorous exercise (80% or more of maximal effort) for at least 20 minutes (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participate in moderate exercise (50-80% of maximal effort) for at least 30 minutes (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Perform exercises to gain strength or tone your muscles, such as push-ups, sit-ups, or weight lifting with exercises lasting at least 45 minutes (2)	<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 feel rested when you woke up in the morning (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q11 Within **the last school year** how often did you:

	Never (1)	1-3 times (2)	4-6 times (3)	7-9 times (4)	10 or more times (5)
Feel things were hopeless (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feel exhausted (not from physical activity) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Felt so depressed that it was difficult to function (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seriously considered attempting suicide (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q12 While **in high school** during an academic school year, how often did you:

	Never (1)	1-3 times (2)	4-6 times (3)	7-9 times (4)	10 or more times (5)
Feel things were hopeless (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feel exhausted (not from physical activity) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Felt so depressed that it was difficult to function (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seriously considered attempting suicide (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q13 Please rank the following items described in the SF-36 using the scale below:
 How much of the time during the **past 30 days** did you:

	All of the time (1)	Most of the time (2)	A good bit of the time (3)	Some of the time (4)	A little of the time (5)	None of the time (6)
Did you feel full of pep? (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you been a very nervous person? (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you felt so down in the dumps that nothing could cheer you up? (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you felt calm and peaceful? (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you have a lot of energy? (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you felt downhearted and blue? (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you feel worn out? (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you been a happy person? (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you feel tired? (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q14

Please rank the following items described in the SF-36 using the scale below:

While in **high school**, during a 30 day period, how often did you:

	All of the time (1)	Most of the time (2)	A good bit of the time (3)	Some of the time (4)	None of the time (5)
Did you fell of pep? (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you been a very nervous person? (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you felt so down in the dumps that nothing could cheer you up? (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you felt calm and peaceful? (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you have a lot of energy? (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you felt downhearted and blue? (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you feel worn out? (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you been a happy person? (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you feel tired? (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q15 Have you ever been diagnosed with depression?

- Yes (1)
 - No (2)
-

Q16 How would you rate your quality of life in relation to your psychological or emotional well-being?

- Very good (1)
 - Good (2)
 - Alright (3)
 - Bad (4)
 - Very bad (5)
-

Q17 Have any of the following behaviors been a part of your lifestyle?

- Smoking (1)
- Drinking in excess (2)
- Using illegal drugs (3)
- Self harm (4)
- Eating excessively (5)
- Eating too little (6)
- None of the above (7)

End of Block: Block 2

Start of Block: Block 3

Q18 How many hours a week do you workout?

Q19 Approximately how many hours a day are you at the gym?

Q20 What do you do most often for exercise?

- Lift weights (1)
- Walk/run (2)
- Swim (3)
- Dance (4)
- Yoga (5)
- Team Sport (6)
- Other (7)

Q21 Do you feel like you get too little exercise, too much exercise, or just the right amount of exercise?

- Too little (1)
 - Too much (2)
 - Just the right amount (3)
 - Not sure (4)
-

Q22 If you are currently not exercising regularly, what is holding you back?

- No desire to work out (1)
 - Don't have the time (2)
 - Want someone to go with (3)
 - Other (4)
-

Q23 "I think exercise helps relieve my stress."

- Strongly disagree (1)
 - Somewhat disagree (2)
 - Not sure (3)
 - Somewhat agree (4)
 - Strongly agree (5)
-

Q24 What makes exercise fun for you?

Q25 "I think exercise is necessary for a healthy lifestyle."

- Strongly disagree (1)
 - Somewhat disagree (2)
 - Not sure (3)
 - Somewhat agree (4)
 - Strongly agree (5)
-

Q26 Do you participate in less, more, or about the same exercise now as compared to while in high school?

- More (1)
- Less (2)
- About the same (3)

End of Block: Block 3

Start of Block: Block 4

Q27 What is your age?

Q28 What grade are you in?

- Freshman (1)
 - Sophomore (2)
 - Junior (3)
 - Senior (4)
 - Graduate School (5)
-

Q29 What is your sex?

- Male (1)
 - Female (2)
-

Q30 Choose one or more races that you consider yourself to be:

- White (1)
 - Black or African American (2)
 - American Indian or Alaska Native (3)
 - Asian (4)
 - Native Hawaiian or Pacific Islander (5)
 - Other (6) _____
-

Q31 Are you now serving in the Armed Forces?

- Yes (1)
 - No (2)
-

Q33 Information about income is very important to understand. Would you please give your best guess? Please indicate the answer that includes your entire household income in (previous year) before taxes.

- Less than \$10,000 (29)
- \$10,000 - \$19,999 (30)
- \$20,000 - \$29,999 (31)
- \$30,000 - \$39,999 (32)
- \$40,000 - \$49,999 (33)
- \$50,000 - \$59,999 (34)
- \$60,000 - \$69,999 (35)
- \$70,000 - \$79,999 (36)
- \$80,000 - \$89,999 (37)
- \$90,000 - \$99,999 (38)
- \$100,000 - \$149,999 (39)
- More than \$150,000 (40)

End of Block: Block 4
