

EXPANDING THE STUDY OF ECOLOGICAL BARRIERS TO PHYSICAL ACTIVITY ON  
A COLLEGE CAMPUS: A MIXED METHODS APPROACH

A Dissertation by

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Submitted to the Department of Psychology  
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Wichita State University  
in partial fulfillment of  
the requirements for the degree of  
Doctor of Philosophy

May 2019

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## DEDICATION

“Nothing can be rightly known if God be not known; nor is any study well managed, not to any great purpose, if God is not studied. We know little of the creature till we know it as it stands related to the Creator: single letters, and syllables uncomposed, are no better than nonsense. He who overlooketh Him who is the ‘Alpha and Omega, the beginning and the ending,’ and seeth not him in all who is the All of all, doth see nothing at all. All creatures, as such, are broken syllables; they signify nothing as separated from God.”

-Richard Baxter

## ACKNOWLEDGEMENTS

Admittedly, I began my career naïve about what it would take to see this degree to completion, and I certainly underestimated the help I would need to get there. In fact, I have many people to recognize and to thank for the myriad of ways I was shown faith, hope, and love over the past seven years. It is my prayer that you have felt acknowledged and thanked long before reading this letter. First, thank you to my husband, Jeffrey, for the countless instances of calm, counsel, and company you provided to me as I pursued this goal. I think you deserve an honorary degree for being by my side pretty much the whole time. Additionally, thank you for serving as the editor for my writing on this work, as well as several others in my career. I have become the writer I pride myself to be because of you (you can attest—you've seen my baseline!), and now that I am done hogging your talents for myself, I am hopeful that you are entering into a season where you will be able to offer 'the work of your hands' to others in widespread and meaningful ways.

Thank you to my more recent colleagues at RTI International and to my former colleagues at Wichita State's Community Engagement Institute who never made me feel like I had to choose between my career and my education. A particular thank you to Dr. Nicole Freund and Dr. Sarah Jolley for the innumerable questions you both have answered, and for never making me feel like less of a person for having the questions in the first place.

Thank you, Dr. Julia Siwierka and Dr. Anna Turosak for the friendship, the advice, and the push to finally finish my degree. Honestly, I wasn't really sure, at least on a practical level, how to get to the finish line. However, I always finished our baking days feeling like I had the 'shot in the arm' that I needed to do the next step toward graduation.

Thank you to my Community Research, Assessment, and Methodology (CRAM) research labmates from 2012-2018 and to my advisor, Dr. Charles Burdsal, for all the opportunities you gave me to grow as a survey researcher and methodologist. Thank you to the co-researchers who took the time to provide valuable data for this project, and who were happy to do so.

Thank you, Sandy Ranney for being my grad school “Mom” and friend; for giving me the right blend of coaching and tenderness to get through some tough seasons both in and out of school.

Quite appropriately, as a now-bonified Community Psychologist, there are also many other friends, family, and interdependent factors to acknowledge for helping make this privilege even possible. Thank you to my community of friends in Wichita who provided respite during one of the most stressful seasons of my life thus far.

Thank you to my former research advisor, Dr. Fred Volk, for introducing me in Research Methods 111 to the ways that research methods can be used to change peoples’ lives, and for even telling me that Community Psychology was even a ‘thing.’ Thank you for encouraging me to never discount my talents—there are enough people that will do that—and for sharing with me that Dr. Friberg called me “scrappy” when she heard I got into graduate school; you have no idea how many times that conversation rang in my ears when I felt like the deck was stacked against me.

Thank you to my parents, who brought me up in a home where I was encouraged to dream. I was privileged enough to chase those dreams, but you both also gave me one of the greatest gifts a person could ever receive: a worldview in which anything was possible and one where I believed I could help make it happen.

Finally, I want to acknowledge all the reasons that ever delayed me finishing—fear, doubt, regret, perfectionism, procrastination, competing priorities, health, relationships, etc. It may seem strange for those reading for me to give these things any space in this paper, but if studying this topic has taught me anything, it's that there are a lot of reasons that we don't do the things that we want or should. May we find the reasons for doing far outweigh those for not.

## ABSTRACT

Overweight and obesity are arguably the most formidable health epidemics of our time. Although a smaller percentage of young adults experience obesity compared to any other adult age grouping, young adults who are not set up to prevent the onset of overweight and obesity are at risk of a lifelong health struggle. Fortunately, engagement in regular physical activity has been associated with the prevention of obesity. The 2008 physical activity guidelines recommend adults attain at least 150 minutes of moderate physical activity or 75 minutes of vigorous physical activity (or a combination of the two) every week; however, rising obesity rates suggest engaging in physical activity is becoming harder to do. College and university students are not exempt from the difficulties of incorporating physical activity into their routines. This study used mixed methods to conduct a comprehensive examination of perceived ecological barriers to physical activity undergraduate students experience. Results from a Midwestern university indicated most undergraduates meet the physical activity guidelines; however, students still indicated several ecological barriers to physical activity. Quantitative results indicated the top barriers, despite whether students met physical activity guidelines, are (1) ‘the amount of coursework I have’ and (2) ‘how much time being physically active takes away from my responsibilities (e.g., schoolwork, employment, familial commitments, etc.).’ Although these constructs presented themselves in the interviews, qualitative results indicated the top barriers are (1) Issues with the built environment, (2) Formality of physical activity, and (3) Socio-cultural influence. Stakeholders who are interested in the prevention of overweight and obesity during and after college can use these findings to develop interventions and to encourage universities to ‘buy in’ to the design of healthier campuses for their students. Future research should move toward more action-oriented research; specifically, evaluation of said interventions.

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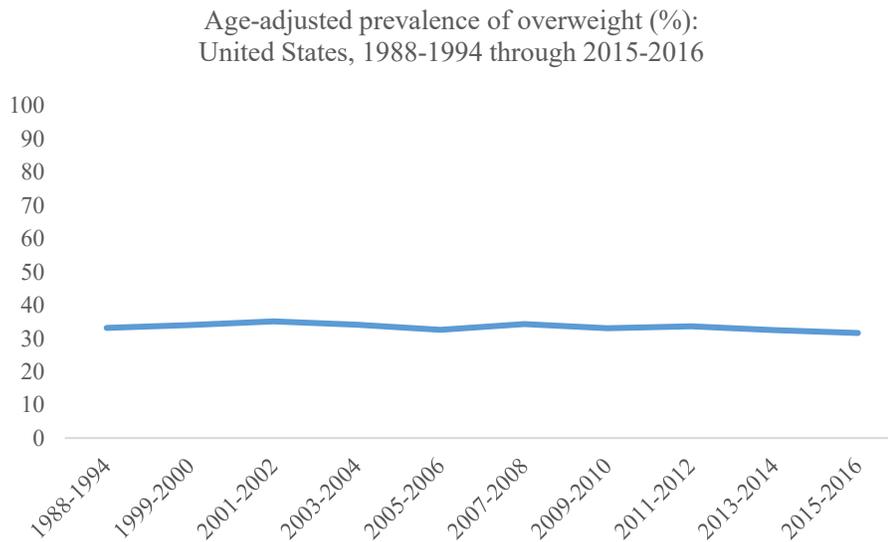
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# CHAPTER 1

## INTRODUCTION

### 1.1 Overweight and Obesity: Public Health Problems

Overweight and obesity are arguably the most formidable health epidemics of our time, affecting millions of adults in the United States each year. Since 1988,<sup>1</sup> the prevalence (age-adjusted) of adults aged 20 and over considered overweight (Body Mass Index [BMI] = 25.0 – 29.99) has stayed relatively stable, ranging from 31.6% – 35.1% and averaging 33.4% (Center for Disease Control and Prevention [CDC] National Center for Health Statistics [NCHS], 2018) (Figure 1). The most recent estimates (2015-2016) indicate 31.6% of the U.S. adult population is considered overweight.



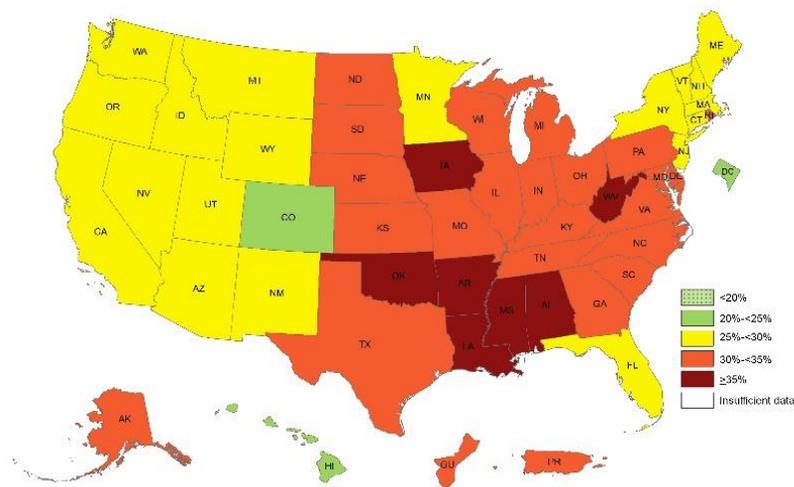
*Figure 1.* Age-adjusted prevalence of overweight adults (aged 20 and over) (CDC, 2018)

Overweight is the precursor to obesity, which is also known as excess adiposity (U.S. Department of Health and Human Services [USDHHS] National Institutes of Health [NIH],

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<sup>1</sup> This is the first reporting period in which prevalence was calculated including adults over the age of 74.

n.d.). Similar to overweight, obesity is currently a national epidemic that has risen steadily over the past several decades. The United States Center for Disease Control and Prevention [CDC] reported from 1988-1994<sup>2</sup> that 22.9% of adults aged 20 and over (age-adjusted) were obese (BMI  $\geq$  30.0). Most recent estimates from 2015-2016 demonstrate obesity prevalence has nearly doubled since then—39.6% (age-adjusted) of adults aged 20 and over nationwide are considered obese (CDC NCHS, 2018; 2017a; 2017b). Similarly, obesity is a serious problem among adults in Kansas (Figure 2). Although less than the national average, 32.2% of Kansas adults qualified as obese (CDC Behavioral Risk Factor Surveillance System [BRFSS], 2017a; 2017b).



*Figure 2.* Prevalence of self-reported obesity among U.S. adults by state and territory (CDC BRFSS, 2017a)

Beyond the impact obesity has nationally and locally, obesity affects some groups even more significantly. Even at an age when one is considered ‘at their prime,’ nearly 36% (age-adjusted) of young adults (aged 20-39) are considered obese. Still, the health condition is least

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<sup>2</sup> This is the first reporting period in which prevalence was calculated including adults over the age of 74.

prevalent among young adults compared to all other adult age groups (CDC NCHS, 2017a). Nevertheless, a uniquely steep climb in obesity occurs between adolescence and young adulthood, which is a cause of national concern. Not surprisingly, results from the National Institutes of Health (NIH) (2006) National Longitudinal Study of Adolescent Health, Add Health, report that by the time individuals reach early adulthood, most youth in the United States have already begun the poor practices that contribute to overweight and, ultimately, obesity (e.g., lack of physical activity, poor dietary habits). In turn, overweight/obesity during young adulthood represents a frightening lifelong trajectory. As a result, health professionals have identified young adulthood as a critical developmental period for the practice and the maintenance of healthy behaviors throughout one's lifetime. Furthermore, obesity is more prevalent among women (41.1%, age-adjusted) compared to men (37.9%, age-adjusted). Lastly, members of ethnic/racial minorities are disproportionately affected by obesity compared to Non-Hispanic Whites/Caucasians. More specifically, obesity is most prevalent among Non-Hispanic African American/Black adults (aged 20 and over) (46.8%, age-adjusted) and Hispanic adults (aged 20 and over) (47%, age-adjusted) (CDC NCHS, 2017a).

## **1.2 Defining Overweight/Obesity**

Since overweight and obesity are such widespread concerns, using common language to describe what constitutes as such is one of the most important steps toward their prevention and their treatment (Harvard Chan School of Public Health, n.d.-a). The following definition from the CDC (2017a) serves as one of the most highly recognized and widely used: "weight that is higher than what is considered as a healthy weight for a given height is described as overweight or obese." Beyond a common definition of overweight and obesity, standard procedures are used to identify weight that is overweight or obese. Body Mass Index (BMI), or the ratio of weight to

height, is the most commonly utilized tool for screening overweight and obesity (Harvard Chan School of Public Health, n.d.-b); it is calculated using the following formula: weight (kg)/height (m<sup>2</sup>) or weight (lb)/height (in<sup>2</sup>) multiplied by 703 (CDC, 2015a). Table 1 depicts the graded classifications identified by the World Health Organization (WHO) in 1997 that have since been used to classify BMI, and Table 2 depicts the graded classifications used to classify obesity. The varying classifications of obesity are used to categorize risk of disease associated with BMI (CDC, 2017a; USDHHS NIH, n.d.). Although use of BMI to define overweight and obesity has been scrutinized for being a crude measurement of body fat (Ashwell, Gunn, & Gibson, 2012), it is still a widely used metric due to its correlation with more direct measures of body fat (e.g., Densitometry, Air-Displacement Plethysmography, Dilution Method, Dual Energy X-ray Absorptiometry, Computerized Tomography, and Magnetic Resonance Imaging), as well as its correlation with adverse health risks and outcomes (CDC, 2017d; Harvard Chan School of Public Health, n.d.-b).

Table 1

<i>Classifications of BMI</i>	
BMI Level	Classification
<18.5	Underweight
18.5—24.99	Normal
25.0—29.99	Overweight
30.0+	Obese

Table 2

<i>Classifications of Obesity</i>	
BMI Level	Classification
30.0—34.99	Class 1
35.0—39.99	Class 2
40+	Class 3

### **1.3 Burden Associated with Overweight and Obesity**

There are several reasons stakeholders are concerned with increasing trends in overweight and obesity. Among those concerns are those associated with health and the economy. Stakeholders' motivation for concerns with these impacts differ among on various groups; however, these impacts give community psychologists particular concern over individual and collective well-being, quality of life, and equity.

#### **1.3.1 Health Issues**

Overweight and obesity is an issue of national concern, largely because it is linked to several health issues that may affect quality of life (Figure 3), as well as mortality. Research has demonstrated a strong connection between obesity and several cardiovascular risks, such as hypertension, high cholesterol, and diabetes (CDC, 2017b; CDC, 2015b). In turn, increased cardiovascular risks often lead to cardiovascular disease (Bastien, Poirier, Lemieux, & Despres, 2014), such as coronary heart disease (which is currently the leading cause of mortality in the United States) (CDC 2017c). Additionally, obesity has contributed to several other leading causes of death among Americans, including cancer, respiratory disease, stroke, gall bladder disease, osteoarthritis, and sleep apnea (WHO, 2000; USDHHS NIH, 1998, n.d.-b).

Beyond indirectly contributing to many health conditions and causes of death, research demonstrates obesity may also be directly related to mortality. In 2014, the USDHHS NIH

reported extreme obesity might shorten life expectancy by as much as 14 years. Furthermore, after limiting confounding variables (i.e., reported pre-existing chronic health conditions, smoking), a global review of the association BMI and mortality from the Global BMI Mortality Collaboration (2016) suggested overweight and obesity are associated with all-cause mortality. Although researchers have not been able to determine exactly how much life expectancy is lost because of overweight and obesity, many continue to collect evidence that overweight and obesity is indirectly and directly linked to mortality (Chang, Pollack, & Colditz, 2013; Olshansky et al, 2005; Fontaine, Redden, Wang, Westfall, & Allison, 2003).

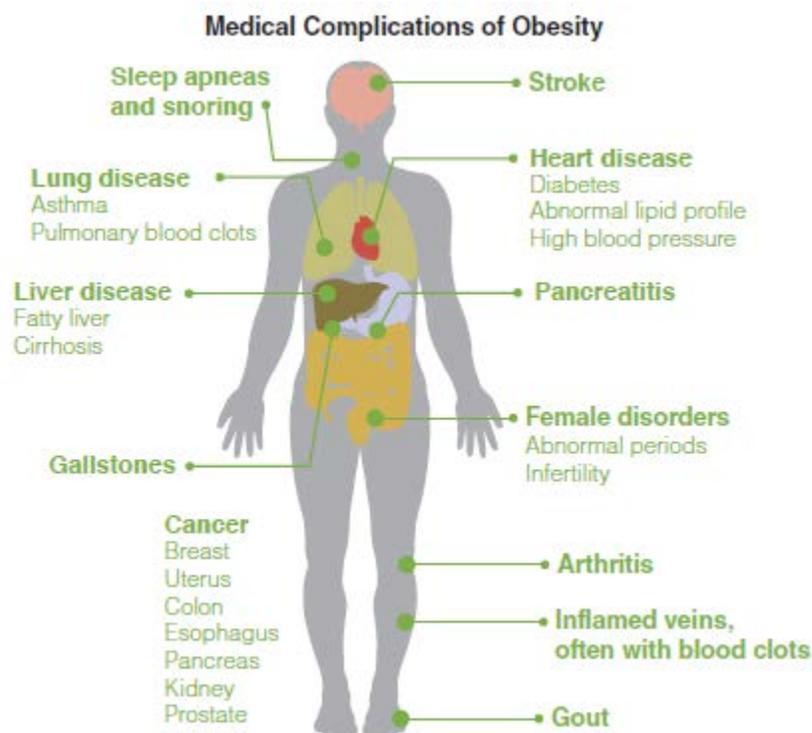


Figure 3. Medical complications of obesity (CDC, n.d.)

### 1.3.2 Economic Costs

Obesity is also a national concern due to its negative economic impacts; primarily through substantial direct and indirect costs. Direct costs are those associated with “medical

resource utilization” (Bocuzzi, 2003, p. 63). Therefore, direct costs include any spending on preventive-, diagnostic-, and treatment-related healthcare services (e.g., inpatient and outpatient health services, surgery, laboratory tests, pharmaceuticals) (Bocuzzi, 2003; Harvard Chan School of Public Health, n.d.-c). For decades, health economists have tried pinpointing the cumulative direct costs associated with overweight and obesity (Finkelstein, Trogon, Cohen, & Dietz, 2009; Transande, Liu, Fryer, & Weitzman, 2009; Thorpe, Florence, Howard, & Peter, 2004; Finkelstein et al., 2003; Kortt, Langley, & Cox, 1998); however, their methods and inclusion criteria (i.e., what co-morbidities to include, whether to include direct costs associated with both overweight and obesity, measures of medical spending, population(s) examined, etc.) have differed. As a result, so have their estimates. For example, in the U.S., reports have estimated annual direct healthcare costs for obesity-related conditions to be \$86 billion (Finkelstein, Trogon, Cohen, & Dietz, 2009), \$147 billion (CDC, n.d.), and \$209 billion (Cawley & Meyerhoefer, 2012). Regardless of the differences in estimated total direct healthcare costs associated with obesity-related issues, obesity-related health issues represent a substantial amount of spending in the U.S. every year. In fact, Cawley and Meyerhoefer (2012) estimated total obesity-related spending accounts for nearly 21% of healthcare expenditures. On an individual level, Finkelstein, Trogon, Cohen, & Dietz (2009) found obese adults spent 42% more on direct healthcare costs compared to those adults considered in a normal weight range, averaging \$1,429 more in spending per year. Even higher estimates, like those calculated in Cawley and Meyerhoefer (2012), suggest per capita direct healthcare costs were 150% higher for those with obesity compared to those in a normal weight range, an average of \$2,741 more each year.

In addition to disproportionate direct healthcare costs, obesity is also related to several indirect costs. Indirect costs (i.e., non-medical costs) are commonly understood as any “resource forgone as a result of a health condition” (Trogon, Finkelstein, Hylands, Dellea, & Kamal-Bahl, 2008). Overweight- and obesity-related indirect costs manifest themselves in many ways, including but not limited to absenteeism, health insurance expenditures, disability payments and disability insurance premiums, reduced productivity, early retirement, and premature mortality (Hammond & Levine, 2010). Among these indirect costs, in a meta-analysis of indirect costs associated with obesity, absenteeism was the most frequently cited (Trogon et al., 2008). Obesity-related absenteeism occurs when an individual is absent from his/her work due to an obesity-related medical condition. In total, these absences cost employers an estimated \$6.4 billion annually (Finkelstein et al., 2009). Additionally, obesity often causes disruptions in productivity in the workplace. Finkelstein and colleagues (2009) explain these disruptions cost an estimated one-month’s salary for every obese individual—or nearly \$30 billion annually. While these are merely examples of the indirect costs of obesity, they nevertheless demonstrate the need to prevent obesity in the U.S.

#### **1.4 Physical Activity as Prevention**

The negative individual and collective impacts discussed above point to the need for the prevention of overweight and obesity. Fortunately, experts have been long-interested in identifying factors associated with BMI status. Although overweight and obesity prevention are multi-faceted issues, and there are several factors associated with weight status, one of the most highly recognized prevention strategies for overweight and obesity is engaging in routine physical activity (Mayo Clinic, 2015; CDC, 2015c; CDC, 2011; USDHHS, 1996) more

specifically, preventing overweight and obesity requires engaging in enough physical activity to offset caloric intake.

#### **1.4.1 Additional Benefits to Physical Activity**

In addition to contributing to overweight and obesity prevention, there are also many other benefits associated with engaging in routine physical activity (Penedo & Dahn, 2005; USDHHS, 1996). Among those benefits are an improved sense of mental, emotional, and cognitive health. Physical activity has a demonstrated a positive effect on mental health, particularly with anxiety (Anderson & Shivakumar, 2013; Wipfli, Rethorst, & Landers, 2008), stress (ADAA, n.d.; Mayo Clinic, 2018), and the prevention of mental disorders (Zschucke, Gaudlitz, & Ströhle, 2013; Saxena, Ommeren, Tang, & Armstrong, 2009), such as posttraumatic stress disorder (Manger & Motta, 2005), social anxiety (Jazaieri, Goldin, Werner, Ziv, & Gross, 2012), depression (Rebar et al., 2015; Rimer, et al., 2012), bipolar disorder (Wright, Everson-Hock, & Taylor, 2009), eating disorders (Sundgot-Borgen, Rosenvinge, Bahr, & Schneider, 2002), and schizophrenia (Acil, Dogan, & Dogan, 2008). Physical activity has also demonstrated positive effects on cognition (Ratey & Loehr, 2011), particularly in old age (Kramer & Erikson, 2007; Lautenschlager & Almeida, 2006; Dik, Deeg, Visser, & Jonker, 2003).

#### **1.4.2 Physical Activity Guidelines**

Irrefutably, there are many benefits associated with engaging in regular physical activity (United States Department of Agriculture [USDA], 2015). To achieve many of these benefits, however, it is suggested individuals must participate in a designated frequency, intensity, and duration of physical activity. Hence, several health organizations have published physical activity guidelines, or requirements, to direct Americans toward achieving these benefits. Prior to

further discussion related to the physical activity guidelines, however, the use of the term ‘physical activity’ should be noted. For many, the term ‘exercise’ may seem a more salient term when discussing physical health; however, the two terms are separate health behaviors. Physical activity is defined as any movement that elevates the heart rate above its normal resting state; “it is anything that makes you move your body and burn calories” (American Heart Association [AHA], 2016). Although exercise achieves this same biological response, *exercise* is considered strictly intentional and repetitious, whereas *physical activity* also encompasses more unintentional and everyday movements that increase the heart rate (Gray, 2017). Furthermore, engagement in physical activity is often associated with different outcomes than engagement in exercise. More specifically, engagement in physical activity is typically done with the goal of *health*, whereas exercise is done with the goal of *physical fitness* (Caspersen, Powell, & Christenson, 1985). Although exercise is considered physical activity, physical activity is not always considered exercise (Table 3). Therefore, for the purposes of this paper, the primary focus will be on *physical activity* and its effects on individual and collective health.

Table 3

*Elements of Physical Activity and Exercise (Caspersen, Powell, & Christenson, 1985)*

Physical Activity	Exercise
1. Bodily movement via skeletal muscles	1. Bodily movement via skeletal muscles
2. Results in energy expenditure	2. Results in energy expenditure
3. Energy expenditure (kilocalories) varies continuously from low to high	3. Energy expenditure (kilocalories) varies continuously from low to high
4. Positively correlated with physical fitness	4. Very positively correlated with physical fitness
	5. Planned, structured, and repetitive bodily movement
	6. An objective is to improve or maintain physical fitness component(s)

The American Heart Association (AHA) (1972, 1975) and the American College of Sports Medicine (ACSM) (1978, 1990) were among the first organizations to identify physical activity guidelines. These guidelines (i.e., *Exercise Testing and Training of Healthy Adults*; *Exercise Testing and Training of Individuals with Heart Disease or at High Risk for its Development*), however, were identified as a framework for training and optimizing *exercise* performance—“it was about intensity of exercise, increasing aerobic capacity, increasing performance” (USDHHS Office of Disease Prevention and Health Promotion [ODPHP] & Triano, 2016). In time, research indicated the physical activity necessary to attain health benefits might have different characteristics than the physical activity necessary to optimize performance. As such, organizations became more interested in understanding and identifying guidelines specific to physical activity for public health concerns (USDHHS Office of Disease Prevention and Health Promotion [ODPHP] & Troiano, 2016).

The CDC in collaboration with the American College of Sports Medicine (ACSM) (1995) later identified physical activity guidelines for public health reasons. The CDC/ACSM broadened the previous recommendations by additionally recognizing the benefits of moderate physical activity. In addition, these guidelines identified the benefits associated with total accumulated physical activity: “This evidence suggests that amount of activity is more important than the specific manner in which the activity is performed (i.e., mode, intensity, or duration of the activity bouts)” (Pate et al., 1995, p. 705). Therefore, these guidelines now declared physical activity conducted in intermittent, short duration was just as acceptable as less frequent, longer-duration physical activity.

In 2008, the federal government published physical activity guidelines for the first time, and they contain the current recommendations (i.e., *The Physical Activity Guidelines for*

*Americans*) (USDHHS ODPHP, 2008; USDHHS ODPHP & Piercy, 2017). According to these guidelines, adults (i.e., 18-64 years) need a combination of aerobic and muscle-strengthening activities to maintain health. More specifically, adults need a minimum of either 150 minutes (i.e., 2 hours, 30 minutes) of *moderate-intensity* aerobic activity per week or 75 minutes (i.e., 1 hour, 15 minutes) of *vigorous-intensity* aerobic activity, as well as muscle-strengthening activities twice a week. Adults may also meet the guidelines by participating in an equivalent combination of moderate- and vigorous-intensity aerobic activity (e.g., 60 minutes of vigorous-intensity and 30 minutes of moderate-intensity). Further, it should be noted adults are not required to complete the recommended level of physical activity all at one time. Rather, adults may still achieve the recommendations, as well as the accompanying health benefits, so long as they engage in at least 10 minutes of physical activity at a time (USDHHS ODPHP, 2008).

### **1.4.3 Prevalence of Physical Activity**

#### **1.4.3.1 Healthy People 2020: Meeting Objective 2.1**

Following the release of *The 2008 Physical Activity Guidelines for Americans*, the Healthy People 2020 coalition developed physical activity objectives to increase the proportion of adults who meet current federal physical activity guidelines for aerobic physical activity. According to objective PA-2.1 (i.e., Increase the proportion of adults who engage in aerobic physical activity of at least moderate intensity for at least 150 minutes/week, or 75 minutes/week of vigorous intensity, or an equivalent combination), adult physical activity rates were targeted to increase from 43.5% in 2008 to 47.9% by 2020—which would reflect a 10% increase. Even though adults exceeded this goal in 2011 (48.8%), still nearly half of persons 18 years and over are not engaging in enough physical activity per week. The most recent data from 2017

demonstrates 54.1% of adults (18+ years) meet objective PA-2.1 and physical activity rates were higher for young adults aged 18-24 years (61.6%) (Healthy People 2020, 2017).

Table 4

*Adult Groups Meeting the Physical Activity Guidelines in 2017 (Healthy People 2020, 2017)*

Age	%	Meets HP 2020 PA-2.1
18-24	61.6	Y
25-44	60.1	Y
45-54	54.0	Y
55-64	49.0	Y
65-74	45.4	N
75-84	37.2	N
85+	21.9	N

### 1.4.3.2 Young Adults

Young adults aged 18-24 have the highest rate of meeting the physical activity guidelines compared to any other adult age group (Table 4). Even so, the physical activity rates for young adults in comparison to the other adult age groups demonstrate that, as people age, they are less likely to engage in the recommended level of physical activity. Further, regular physical activity tends to decrease more during late adolescence and early adulthood compared to the declines experienced in childhood and early adolescence (Corder et al., 2017; Gordon-Larsen, Nelson, & Popkin, 2004). In fact, Corder and colleagues' (2017) meta-analysis of young adult physical activity studies found physical activity declines by 7% per year during adolescence, as opposed to declining just 4% per year in other life stages. Though specific life events may precipitate declines in physical activity (e.g., cohabitating, marrying, or having a child), the overall physical activity levels maintained through young adulthood do not tend to decline again until after mid-

adulthood (30-64 years) (Nelson et al., 2008). As such, young adulthood is conceptually the ‘first stop’ to either a physically active or a physically inactive lifestyle.

### **1.4.3.3 College Students**

College and university students represent a large segment of the young adult population (Leslie et al., 1999). Although the American College Health Association (ACHA) National College Health Assessment (NCHA-II) does not measure physical activity in direct alignment with *The Physical Activity Guidelines for Americans* (2008),<sup>3</sup> data suggests most American college and university students do not engage in frequent, and perhaps not enough, physical activity. As of Fall 2018, only 21% of students participate in at least 30 minutes of moderate physical activity 5 or more days a week; and only 16% of students participate in at least 20 minutes of vigorous intensity physical activity 4 or more days a week. Furthermore, female students tend to be less physically active compared to male students. More specifically, 20% of female students participate in 5 or more days of moderate physical activity compared to 24% of male students (Table 5). A similar pattern was shown for vigorous exercise; only 15% of female students participate in 4 or more days of vigorous physical activity compared to 21% of male students (Table 6) (ACHA, 2018). These statistics suggest most college and university students do not regularly participate in physical activity; additionally, female students, as a whole, participate in less physical activity than male students. Therefore, the need to understand why many individuals do not participate in the recommended level of physical activity is rapidly expanding, especially for those enrolled in college or university. As a result, college and university students are frequently the target of health behavior studies.

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<sup>3</sup> The NCHA-II reports the number of days students engage in 30 minutes or more of moderate intensity cardio or aerobic exercise and the number of days students engage in 20 minutes or more of vigorous intensity cardio or aerobic exercise.

Table 5

*“On how many of the past 7 days did you do moderate intensity cardio or aerobic exercise for at least 30 minutes?” (ACHA NCHA-II, Fall 2018)*

	Female		Male		Unknown		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
0 days	3299	26	1265	21	39	33	4772	24.5
1 day	1794	14	807	13	16	13	2679	13.8
2 days	2219	17	971	16	12	10	3280	16.8
3 days	1882	15	927	15	12	10	2890	14.8
4 days	1085	9	574	10	12	10	1717	8.8
5 days	1190	9	616	10	14	12	1876	9.6
6 days	587	5	320	5	6	5	924	4.7
7 days	769	6	538	9	9	8	1342	6.9

Note: Percentages in the female and male columns are rounded.

Table 6

*“On how many of the past 7 days did you do vigorous intensity cardio or aerobic exercise for at least 20 minutes?” (ACHA NCHA-II, Fall 2018)*

	Female		Male		Unknown		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
0 day	6139	48	2053	34	53	46	8537	43.9
1 days	2037	16	1004	17	18	16	3125	16.1
2 days	1628	13	899	15	12	10	2593	13.3
3 days	1157	9	783	13	10	9	2004	10.3
4 days	600	5	447	7	7	6	1074	5.5
5 days	603	5	368	6	6	5	998	5.1
6 days	393	3	251	4	5	4	653	3.4
7 days	247	2	211	4	4	4	470	2.4

Note: Percentages in the female and male columns are rounded.

## 1.5 Understanding Barriers to Physical Activity: Past Approaches

The fact that many American college students are not getting enough physical activity is an issue of concern for many health-conscious stakeholders, especially considering the known benefits associated with physical activity. As a result, stakeholders have sought to identify the factors that best explain why individuals, particularly college and university students, do not engage in the recommended level of physical activity. Among those factors used to explain this phenomenon are ‘perceived barriers’ to physical activity. Perceived barriers have roots in the Health Belief Model (Rosenstock, 1974), “an explanatory model” for the likelihood of performing preventive health behaviors (Von Ah, Ebert, Ngamvitroj, Park, & Kang, 2004). Perceived barriers are defined as “beliefs about obstacles to performing a behavior, and the negative aspects (both tangible and psychological costs) of adopting a health behavior” (Skinner, Tiro, & Champion, 2015, p. 78).

Although perceived barriers are only one component of the Health Belief Model, they are common interests of researchers. Perceived barriers are frequently studied because they are arguably the most influential component of the Health Belief Model (Von Ah et al., as cited in King, Vidourek, English, & Merianos, 2014). Perceived barriers may be the most influential component because, without them, the model paints an incomplete picture. Only the lens of perceived barriers allows us to fully understand why individuals can *believe* they are at risk for overweight and obesity, *understand* how serious overweight and obesity are, and *know* physical activity is an effective method of prevention of overweight and obesity—and yet still not engage in physical activity. The importance of perceived barriers is further highlighted in the research literature (King, Vidourek, English, & Merianos, 2012; Von Ah et al., 2004; Grubbs & Carter, 2002).

There are three main conceptual approaches used to identify possible barriers to physical activity: (1) individual-level, (2) environmental-level, and (3) ecological. Each approach suggests what sources are responsible for perceived barriers related to physical activity. In turn, each approach guides the development of respective interventions for physical activity promotion.

### **1.5.1 Individual-level Approach**

Early research and intervention used to increase physical activity focused exclusively on individual-oriented factors. More specifically, they focused on the biological, cognitive, and affective influences surrounding the individual and his/her “choice” to be active (King, Stokols, Talen, Brassington, & Killingsworth, 2002). The individual-level approach assumes individuals have the power to control their behavior provided they possess the necessary combination of resources, skills, and motivation (Giles-Corti & Donovan, 2002, p. 1974). Consequently, individual-level interventions are designed to improve an individual’s resources, abilities, and cognitions related to physical activity and health. Theoretical frameworks, such as the previously mentioned Health Belief Model (Rosenstock, 1974), the Theory of Reasoned Action (Ajzen & Fishbein, 1980), the Transtheoretical Model (Prochaska & DiClemente, 1983), and the Theory of Planned Behavior (Ajzen, 1991), have been used to guide this approach and to understand physical activity behavior (King, et al., 1992; Godin, Valois, & Lepage, 1993; Blue, 1995; Johnson et al., 2008; Kwan, Bray, & Ginis, 2009).

The individual-level approach has been criticized, however, because it over-emphasizes the individual while failing to consider the context within which health behavior takes place (Giles-Corti & Donovan, 2002; McLeroy, Bibeau, Steckler, & Glanz, 1988). In doing so, it suggests individual deficit (e.g., genetics, motivation level, etc.) is the sole cause of ill health,

and people remain unhealthy out of belligerence in heeding recommended treatment actions (Airhihenbuwa, Ford, & Iwelunmor, 2014). As a result, the individual-level approach often becomes a disguise for blaming the victim:

[It] minimizes the importance of evidence about the environmental assault on health. It instructs people to be individually responsible at a time when they are becoming less capable as individuals of controlling their total health environment. Although environmental factors are often recognized as “also relevant,” the implication is that little can be done about an ineluctable, technological, and industrial society... What must be questioned is both the effectiveness and the political uses of a focus on life-styles and on changing individual behavior without changing social structure and processes (Crawford, as cited in McLeroy et al., 1988, p. 256).

In return, individuals become less empowered to live healthy and physically active lives. They are often pressured to perform difficult or impossible health-conscious behaviors while having their hands (sometimes unknowingly) tied, and then they are shamed for not having done the right thing(s) to make themselves healthy (Ball, 2006). Consequently, researchers have expanded the scope of their examination of barriers to include more environmental influences.

### **1.5.2 Environmental-level Approach**

In response to the individual-level approach, researchers began to seek effective health solutions through acknowledging a broader array of potential determinants of health—ones that are often not within individuals’ loci of control. As a result, the environmental-level approach to understanding barriers to physical activity emerged. This approach operates under the notion that environments (e.g., physical, social, and/or cultural) can either help or hinder behavior (e.g., physical activity) (Germain & Bloom, 1991). More specifically, environments that maintain

resources for physical activity increase the likelihood that community members will engage in physical activity, while those that lack resources decrease the likelihood (Sallis, Johnson, Calfas, Caparosa, & Nichols, 1997). Therefore, the environmental-level approach seeks to understand the specific ways in which physical, social, and/or cultural environments act as either facilitators of, or barriers to, physical activity.

### **1.5.2.1 Physical Environment**

Examination of the relationship between health and the physical environment(s) in which people reside has been of interest for several decades, particularly among the urban design and urban planning disciplines (Heath et al., 2006; Frank, Engelki, & Schmid, 2003; Saelens, Sallis, Black, & Chen, 2003; Handy, Boarnet, Ewing, & Killingsworth, 2002). Physical environments, or ‘built environments,’ are defined as any places designed or built by humans (e.g., buildings, grounds around buildings, layout of communities, transportation infrastructure, parks, trail systems, etc.) (Sallis, Floyd, Rodriguez, & Saelens, 2012). The places designed or built by humans have long played important roles in both negative and positive health behaviors and health outcomes. Frank and colleagues (2003) writes:

The communities where Americans live are important contributors to current public health problems. Simultaneously, they can also be the source of important solutions to these problems. Communities can be designed to make physical activity in them possible and even desirable...[the] central goal is to develop a better understanding of the ways in which the features of the built environment serve to encourage or discourage health-promoting behaviors (p. 8).

Despite the built environment’s strong influence on physical activity, and consequently physical health, health professionals do not often control its design. Thus, it is has become an

important and, frankly, necessary endeavor for stakeholders to understand the ways in which various physical environments help and/or hinder population health. As a result, researchers and health professionals examine characteristics associated with unhealthy physical environments which can be modified to promote physical activity and to prevent obesity.

### **1.5.2.2 Social Environment**

In addition to the physical environment, individuals' social environments also have a demonstrated influence on health behaviors and outcomes (Cassel, 1976; Germain & Bloom, 1991), including those related to physical activity and obesity (Carron, Hausenblas, & Mack, 1996; Treiber et al., 1991; Leslie, Owen, Salmon, Bauman, Sallis, & Lo, 1999). At the heart of social environments is an understanding that behaviors do not occur in isolation across a population, but rather most behaviors are socially patterned and often occur together. In understanding how our behavior is influenced by our social environment, McNeill and colleagues (2006) identified three social factors most commonly cited in the body of research literature: (1) interpersonal relationships (i.e., both the number of social relationships and the perception of feeling connected), (2) social inequalities (i.e., the unequal distribution of resources based on social status, such as due to socioeconomic position, racial discrimination), and (3) neighborhood and community characteristics (i.e., characteristics of the place in which one lives, including social cohesion) (Institute of Medicine [US] Committee on Health and Behavior, 2001; McNeill, Kreuter, & Subramanian, 2006). The Institute of Medicine (2003) writes:

The social environment influences behavior by shaping norms; enforcing patterns of social control (which can be health promoting or healthy damaging); providing or not providing environmental opportunities to engage in particular behaviors; and reducing or

producing stress, for which engaging in specific behaviors might be an effective short-term coping strategy (p. 7).

In the same way, social environments have the potential to influence beliefs and perceptions (e.g., perceived barriers) related to health, physical activity, and obesity.

### **1.5.2.3 Cultural Environment**

Cultural environments, or the culture(s) we ‘adopt,’ also have an impact on health behaviors and outcomes. Caprio and colleagues (2008) defined culture as the learned system of shared understandings that shape behavior. Within a culture are the shared understandings related to obesity and overweight, including its cause, significance, and treatment or prevention. In turn, these shared understandings influence physical activity by shaping individuals’ attitudes (i.e., beliefs and perceptions) regarding weight, health, and body size (Airhihenbuwa et al., 2014). For example, a culture may shape an individual’s belief that it is healthier to engage in rest after work than deliberate physical activity. Similarly, a culture may shape an individual’s perception that a particular weight status is attractive, eventually leading to either physically active or inactive behaviors. Consequently, “culture influences preferences for and opportunities to engage in physical activity” (Caprio et al., 2008, p. 2215).

The environmental approach cannot produce physical activity behavior on its own. Ultimately, healthy behaviors happen when individuals are motivated and empowered to make healthy choices, and when environments and policies encourage and support the maintenance of those healthful choices:

Education about healthful choices when environments are not supportive is believed to produce weak and short-term effects on behavior. Yet, providing plenty of vegetables,

sidewalks, or accessible condoms is no guarantee that people will make use of those resources (Sallis & Owen, 2015, p. 44).

Therefore, current research has acknowledged the utility of combining multiple approaches to help explain the various factors that influence people to engage in physical activity.

### **1.5.3 Ecological Approach**

Historically, many have examined individual-level (i.e., intrapersonal) and environment-level (i.e., interpersonal, environmental) factors associated with physical activity either in isolation or dichotomously (i.e., one versus the other). More contemporary approaches claim, however, in order to effectively change physical activity behavior, one must assess multiple levels of influence simultaneously (Huang, Drewnowski, Kumanyika, & Glass, 2009; McNeill et al., 2006). Sallis and colleagues (2012) explain, “Motivating a person to change in an environment that poses many barriers is not expected to be very effective, nor is providing a supportive environment in the absence of educational interventions to promote use of those environments” (p. 729). Consequently, the literature has applied an even broader framework: an ecological approach.

Ecological approaches to health behavior are those that seek to understand behavior in the context of the interrelationships between humans and their environments. As such, ecological approaches extend the framework from intrapersonal, physical, and socio-cultural environments to also include influences from the broader community, organizations, and policies (Sallis & Owen, 2015). These approaches suggest that in order to have a meaningful impact, and to ultimately sustain changes in human behavior, interventions must address multiple levels of influence. Therefore, research using an ecological approach is designed to examine multiple factors at various levels (i.e., intrapersonal, interpersonal, socio-cultural, policy) with the

intention of identifying those most associated with, or predictive of, behavior. To clarify, the ecological approach, similar to individual and environmental approaches, does not identify one theory or model to explain an entire facet of human behavior (e.g., physical activity). Rather, it provides a foundation by which researchers can integrate multiple theories to develop a multi-level explanation for that behavior.

### **1.5.3.1 Ecological Model of Health Promotion Interventions**

One ecological model frequently used in health research is McLeroy, Bibeau, Steckler, and Glanz's (1988) Ecological Model of Health Promotion Interventions. Inspired by Urie Bronfenbrenner's Social Ecological Theory (1979), this model outlines multiple influences which shape behavior. More specifically, this model identifies five domains which influence one's behavior: (1) intrapersonal, (2) interpersonal, (3) institutional, (4) community, and (5) public policy (Figure 4). Table 7 includes definitions and examples of each domain (ACHA, n.d.). The inclusion of each domain in this model represents how a myriad of possible factors, not just the individual, coalesce to influence any one behavior. Consequently, health researchers continue to choose this model as a foundation of physical activity research.

Using the Ecological Model of Health Promotion Intervention, the current study seeks to assess a list of perceived barriers to physical activity that represents a broad range of domains. In particular, this study examines perceived barriers to physical activity representing the intrapersonal, interpersonal, institutional, and community domains. In turn, the hope for the study is to identify which barriers are perceived to be most influential to health behavior on a college campus. This information gives us the potential to learn more about which domains students view, either consciously or unconsciously, most hindering to their health. In summary,

this study is an intrapersonal examination of ecological factors contributing to physical activity behavior on a college campus.

Table 7

*Definitions and Examples of Contexts in Ecological Model of Health Promotion Interventions (ACHA, n.d.)*

Context/Barrier Type	Definition	Examples
Intrapersonal	Characteristics of the individual such as knowledge, attitudes, behavior, self-concept, skills, and developmental history.	Includes gender, religious identity, racial/ethnic identity, sexual orientation, economic status, financial resources, values, goals, expectations, age, genetics, resiliency, coping skills, time management skills, health literacy and accessing health care skills, stigma of accessing counseling services.
Interpersonal	Formal and informal social networks and social support systems, including family, work group, and friendship networks.	Includes roommates, supervisors, resident advisors, rituals, customs, traditions, economic forces, diversity, athletics, recreation, intramural sports, clubs, Greek life.
Institutional	Social institutions with organizational characteristics and formal (and informal) rules and regulations for operations.	Includes campus climate (tolerance/intolerance), class schedules, financial policies, competitiveness, lighting, unclean environments, distance to classes and buildings, noise, availability of study and common lounge spaces, air quality, safety.
Community	Relationships among organizations, institutions, and informational networks within defined boundaries.	Includes location in the community, built environment, neighborhood associations, community leaders, on/off-campus housing, businesses (e.g., bars, fast food restaurants, farmers markets), commuting, parking, transportation, walkability, parks.

TABLE 7 (continued)

Public Policy	Local, state, national, and global laws and policies	Includes policies that allocate resources to establish and maintain a coalition that serves a mediating structure connecting individuals and the larger social environment to create a healthy campus. Other policies include those that restrict behavior such as tobacco use in public spaces and alcohol sales and consumption and those that provide behavioral incentives, both positive and negative, such as increased taxes on cigarettes and alcohol. Additional policies relate to violence, social injustice, green policies, foreign affairs, the economy, global warming.
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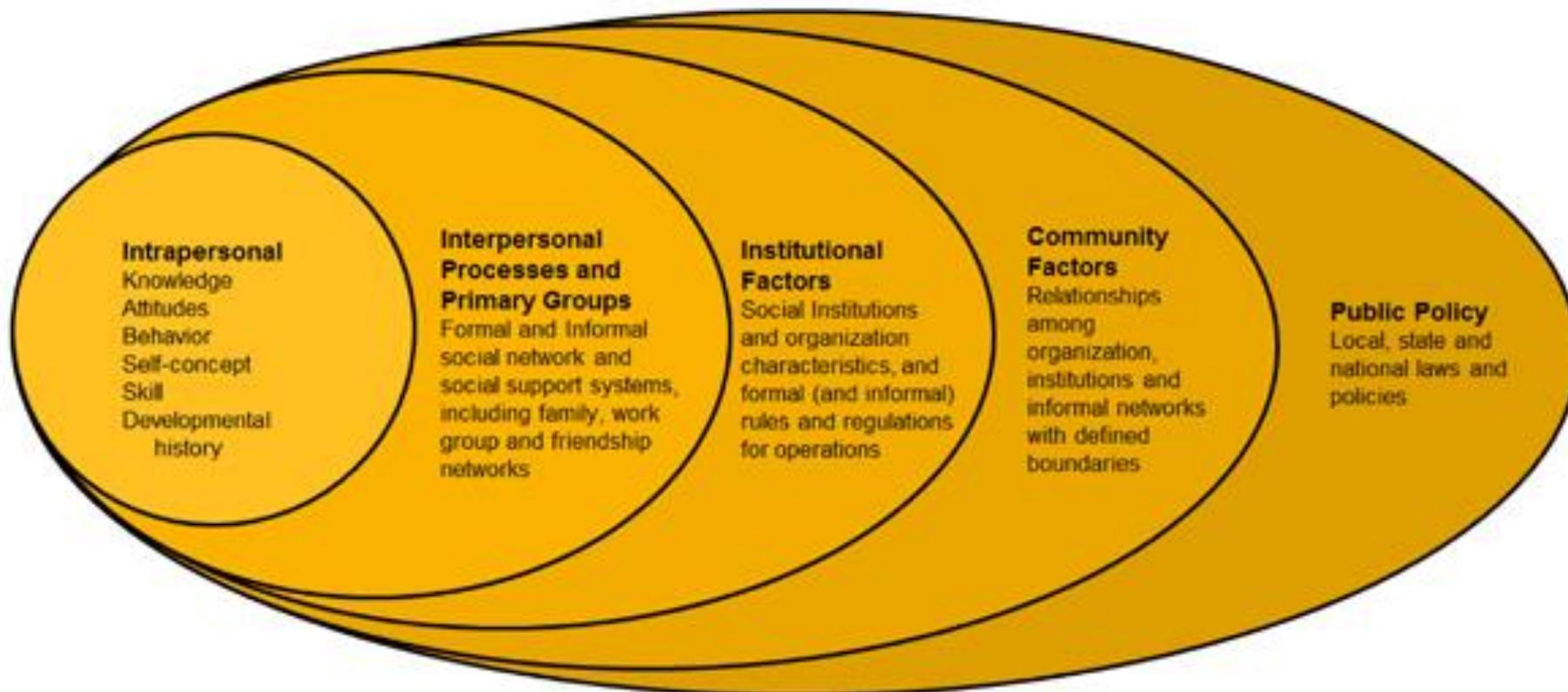


Figure 4. Ecological Model of Health Promotion Interventions (McLeroy et al., 1988)

## **1.6 Past Barriers to Physical Activity Research**

Previous researchers have used these three theoretical approaches to varying degrees and with different methodologies to examine the direct relationship between perceived barriers and physical activity. Although perceived barriers to physical activity have been studied across multiple populations, this review is limited to studies that have examined perceived barriers to physical activity among college/university students.

### **1.6.1 Unspecified Framework**

Silliman, Rodas-Fortier, and Neyman (2004) researched the diet habits, exercise habits, and perceived barriers associated with following a healthy lifestyle among U.S. college students. Among the perceived barriers examined were perceived barriers to exercise. The purpose of this study was to get a snapshot of health-related behaviors on a college campus. As such, barriers to exercise were not explored in depth. Nevertheless, the most commonly cited barrier to exercise was “lack of time.” Other commonly cited barriers to exercise included “lack of motivation” and “lack of willpower.” Despite having discovered reasons students did not engage in exercise, no comparisons were made to examine the influence of barrier scores on actual exercise habits. As a result, little was discovered regarding the influence of perceived barriers on college students’ health behavior.

Brown (2005) evaluated the relationship between perceived benefits and perceived barriers to exercise among college students using the Exercise Benefits/Barriers Scale (EBBS) (Sechrist, Walker, & Pender, 1985). In total, he examined 14 barriers to physical activity (Table 8). Individual barrier scores were summed to create a total perceived barriers score. Correlational analyses did not demonstrate a reliable association between perceived barriers and physical activity.

Table 8

*Exercise Benefits/Barriers Scale (EBBS) Items (Sechrist et al., 1985)*

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Barrier Items
1. Exercising takes too much of my time.
2. Exercise tires me.
3. Places for me to exercise are too far away.
4. I am too embarrassed to exercise.
5. It costs too much to exercise.
6. Exercise facilities do not have convenient schedules for me.
7. I am fatigued by exercise.
8. My spouse (or significant other) does not encourage exercising.
9. Exercise takes too much time from family relationships.
10. I think people in exercise clothes look funny.
11. My family members do not encourage me to exercise.
12. Exercise takes too much time from my family responsibilities.
13. Exercise is hard work for me.
14. There are too few places for me to exercise.

Factor analyses yielded a 7-factor solution accounting for approximately 38% of variance in physical activity. However, only two of the seven factors included perceived barriers (i.e., fatigue, facility obstacles);<sup>4</sup> the remaining five factors were perceived benefits. Fatigue and facility obstacles accounted for approximately 10% of variance in physical activity. Regardless, correlational analyses did not demonstrate a reliable association between either of the two perceived barriers factors and physical activity. Therefore, it was concluded that perceived barriers, or at least those examined in this study, did not have a significant impact on college students' physical activity.

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<sup>4</sup> The items loading on the Fatigue factor were items 2, 3, 6 from Table 8 and the items loading on the Facility Obstacles factor were items 7, 13, 14 from Table 8.

As part of building a profile of physical activity among university students in Egypt, El-Gilany and colleagues (2011) studied perceived barriers to physical activity/sports participation. A unique feature of this study was respondents were asked to classify perceived barriers based on whether they were considered “permanent barriers,” “temporary barriers,” or “not a barrier.” In total, 25 types of barriers were assessed (Table 9).<sup>5</sup> Nearly 94% of students reported at least one barrier to physical activity. The top permanent barriers were: (1) “time limitation,” (2) “lack of accessible and suitable sports places,” and (3) “lack of safe sporting places.” The top temporary barriers were: (1) “not interested in sports,” (2) “time limitation,” and (3) “have other important priorities.” Despite having measured perceived barriers to physical activity/sports participation, this study did not examine the relationship between perceived barriers and physical activity behavior. Nor did this study assess the ‘strength’ of each barrier. Therefore, we do not know the degree to which students perceived themselves to be prohibited by each factor.

Table 9

*Total List of Barriers Assessed in El-Gilany et al. (2011)*

Barrier Items
1. Time limitation
2. Lack of accessible and suitable sports place
3. Lack of safe sporting places
4. Lack of support and encourage from others
5. Lack of friends to encourage me
6. Have other important priorities
7. Lack of sports programme that suits my physical fitness
8. Not interested in sports
9. Lack of motivation
10. High cost

<sup>5</sup> Names of barriers are as they appear in the source journal.

TABLE 9 (continued)

11. Lack of sports skills
12. Fear of failure in sports competition
13. Fear of injury
14. Fear of deterioration of physical illness
15. No person caring for my family
16. Feeling tired on physical activity
17. Ignorance about benefits of sports
18. Prefer to not attend to sports places
19. Lack or low physical power
20. Feeling of inability to practice sports adequately
21. Objection of parents
22. Body cannot tolerate physical activity
23. Previous failure in sports competition
24. Unsuitable (hot or cold) weather
25. Previous bad experience with physical sports activity

Kulavic, Hultquist, and McLester (2013) examined difference in perceived barriers to physical activity between traditional students (i.e., students 18-22 years) and nontraditional students (i.e., students 23 years and above). In total, seven perceived barriers were examined using the Barriers to Being Active Quiz (CDC, 1999): (1) “lack of energy,” (2) “lack of willpower,” (3) “lack of time,” (4) “lack of resources,” (5) “lack of skill,” (6) “fear of injury,” and (7) “social influence.” Table 10 demonstrates the barriers traditional students and nontraditional students perceive as most to least prohibiting. Overall, lack of energy, lack of willpower, and lack of time were considered the top barriers to physical activity in this study, despite none of the barrier categories receiving a mean score of over five (a score less than five suggests the category is not an important barrier for an individual to overcome). Further,

significant differences between students were only demonstrated for three out of the seven barriers: (1) “lack of resources,” (2) “lack of skill,” and (3) “fear of injury.” Ultimately, fear of injury was the only barrier category to reliably predict physical activity between traditional and nontraditional college students.

Table 10

*Hierarchy of Barriers for Traditional and Nontraditional Students  
(Highest to Lowest) in Kulavic et al. (2013)*

Type of Student	
<u>Traditional Students</u>	<u>Nontraditional Students</u>
1. Lack of energy	1. Lack of time
2. Lack of willpower	2. Lack of energy
3. Lack of time	3. Lack of willpower
4. Social influence	4. Social influence
5. Lack of resources	5. Lack of resources
6. Lack of skill	6. Lack of skill
7. Fear of injury	7. Fear of injury

Öcal (2014) studied constraints on leisure time physical activity among Turkish university students. Constraints were defined and measured using the 38-item Leisure Time Physical Activity Constraints Scale (LTFA-C) developed by Öcal (2012). The constraints were categorized into eight dimensions (Table 11).

Table 11

*Leisure Time Physical Activity Constraints Scale (LTFA-C) Items Organized  
Into Factors in Öcal (2014)*

Barrier Factors
1. body perception (i.e., “negative feelings regarding one’s own body related to anxiety over other people’s perceptions”)
2. facility (i.e., “limits on space and infrastructure appropriate to the nature of any chosen physical activity”)
3. family (i.e., “limits to support provided by family members”)

TABLE 11 (continued)

4. income (i.e., “limitations on finances required to participate in physical activity”)
5. skill perception (i.e., “fear of failure to adequately perform the movements/techniques required for physical activity”)
6. society (i.e., “difficulties in finding or meeting up with individual friends or groups in order to participate in physical activity”)
7. time (i.e., “limitations to leisure time available”)
8. willpower (i.e., “emotional weaknesses that lead to withdrawal from activity programs”)

Researchers assessed whether mean scores on any of the eight dimensions were related to gender, age, program type (i.e., daytime education v. evening education), relationship status, work status (i.e., non-working v. part-time), or BMI level. Most notably, results indicated significant differences between gender and scores on the facilities and willpower dimensions; males reported more constraint in facility compared to females, and females reported more constraint in willpower compared to males. Table 12 demonstrates the hierarchy of constraints listed from highest to lowest. Nevertheless, the mean values for perceived constraints among both females and males were largely between “partially disagree” and “partially agree” for all eight constraints. This suggests that students may have been relatively neutral in their experience of constraint to leisure time physical activity. The relationship between perceived constraints to leisure-time physical activity and physical activity behavior was not examined; however, results from this study did not find a significant association between perceived constraints to leisure-time physical activity and BMI level.

Table 12

*Hierarchy of Constraints for Females and Males (Highest to Lowest) in Öcal (2014)*

Gender	
<u>Females</u>	<u>Males</u>
1. Society	1. Society
2. Income	2. Income
3. Time	3. Time
4. Willpower	4. Facility
5. Facility	5. Willpower
6. Skill Perception	6. Skill Perception
7. Family	7. Family
8. Body Perception	8. Body Perception

Awadalla and colleagues (2014) studied perceived barriers to physical activity among health college students in Saudi Arabia. The list of possible perceived barriers used in El-Gilany and colleagues (2011) was also used in this study (Table 9). Seventy-five percent of inactive students reported at least one barrier to physical activity. Additionally, physically inactive students reported more perceived barriers to physical activity ( $M = 4.4$ ) compared to physically active students ( $M = 3.2$ ). The top barriers among physically inactive and physically active students were: (1) “time limitations,” (2) “lack of accessible and suitable sports places,” (3) “have other important priorities.” Similar to El-Gilany and colleagues (2011), despite having measured perceived barriers to physical activity, this study did not examine the relationship between perceived barriers and physical activity behavior. Nor did this study assess the ‘strength’ of each barrier. Therefore, we do not know the degree with which students perceived themselves to be prohibited by each factor.

### 1.6.2 Internal v. External Framework

Within the body of perceived barriers to physical activity research among college and university students, there is research that intentionally juxtaposes the individual and environmental approaches by organizing perceived barriers into two categories: (1) internal and (2) external. Often, this is done to specifically examine the relative influence of *internal* versus *external* perceived barriers. Internal, or personal, perceived barriers are often conceptualized as cognitions about one's self that prevent or deter individuals from engaging in physical activity. In comparison, external perceived barriers are cognitions about any factor outside of one's self that prevent or deter an individual from engaging in physical activity.

Daskapan and colleagues (2006) studied perceived barriers to physical activity among inactive Turkish university undergraduates. In total, researchers examined 12 barriers to physical activity (Table 13).<sup>6</sup> Researchers divided the barriers into internal and external barriers. Within internal barriers, there were three categories: (1) "lack of energy (items 1 & 2)"; (2) "lack of motivation (items 3 & 4)"; and, (3) "lack of self-efficacy (items 5 & 6)." Within external barriers, there were also three categories: (1) lack of resource (items 7 & 8), (2) lack of social support, (items 9 & 10), and (3) lack of time (items 11 & 12). The sum external barriers score was significantly higher than the sum internal barriers score, which suggested students do not engage in physical activity due to external reasons more so than individual reasons. The highest external barrier category score was "lack of time," and "lack of energy" was the highest internal barrier category score. Even so, the barrier which received the highest rating was "I have no leisure time for exercise because of my busy lesson schedule." Researchers also looked at barrier

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<sup>6</sup> Some items may have been translated from Turkish to English; they appear as they are written in the source journal.

scores based on gender. Results demonstrated that female students participated in less physical activity compared to male students. Additionally, there were gender differences in the mean perceived barriers scores—male undergraduates reported higher barriers to physical activity compared to female undergraduates. Despite these differences in barrier scores, and differences in gender, this study excluded ‘active’ students; therefore, no comparisons were made to examine the influence of barrier scores on physical activity behavior.

Table 13

*Total List of Barriers Assessed in Daskapan et al. (2006)*

Barrier Items
1. I’ve been thinking about exercise is difficult and too tiring.
2. I have never energy as much as to able to do exercise.
3. I’ve been thinking about other recreational activities with my friends are more entertaining than exercise.
4. I have not been thinking about exercise has positive effects on my health
5. I’ve been worried about my looks when I exercise.
6. I have not been thinking about my about my ability to exercise.
7. There is not fitness center that I could get to.
8. I have no exercise equipment at home that I use.
9. My family or friends do not encourage me to exercise.
10. My parents give academic success priority over exercise.
11. I have no leisure time for exercise because of my busy lesson schedule.
12. I have no leisure time for exercise because of my social and family responsibilities.

Gómez-López and colleagues (2010) studied perceived barriers to physical activity among Spanish university students who “never practiced physical and sport activities in their spare time.” In total, researchers examined 12 barriers to physical activity (Table 14). Based on factor analysis, researchers divided the barriers into three dimensions: (1) “external-lack of time

(items 1-3)”; (2) “internal (items 4-7)”; and, (3) “external-lack of social support (items 8-10).” Items 11 and 12 did not load onto any factors. Altogether, the three factors accounted for 49.6% of the variance in responses. The reliability of the external-lack of social support barriers were low; therefore, analyses were not conducted using this dimension. Without this factor, external barriers-lack of time and internal barriers accounted for 38.7% of the variance in responses; individually, external barriers-lack of time accounted for more variance than internal barriers (27.4% and 11.3%, respectively). Additionally, there were differences between female students and male students in external barriers-lack of time. As a result, the authors concluded the results demonstrated that the external barriers were more important than internal barriers.

Table 14

*Total List of Barriers Assessed in Gómez-López et al. (2010)*

Barrier Items
1. I leave work very tired.
2. I do not have any time.
3. There are no facilities nearby and/or appropriate.
4. I don't like physical activity.
5. I don't see its use. I don't see any benefits.
6. Laziness and apathy.
7. I think I am not capable.
8. My parents did not do any sport.
9. My parents did not let me.
10. My friend didn't do any sport.
11. Due to health
12. I was not taught in the centre of studies

### 1.6.3 Ecological Framework

Eben and Brudzynski (2008) examined perceived motivations and barriers to exercise among university students in the US. Researchers used open-ended responses to solicit reasons students did not exercise and to understand perceived barriers from an ecological framework. In total, researchers identified 34 higher order themes. Among those themes, the most frequently cited reasons (ranging from 15%-70%) students do not engage in exercise (listed in order) were: (1) “no time,” (2) “laziness,” (3) “other priorities,” (4) “no motivation,” (5) “no energy/tired,” and (6) “dislike exercising in public.” The remaining 28 higher order themes were cited among less than 10% of respondents ( $n = 240$ ). Nevertheless, the number and variety in the higher order themes identified demonstrated there are several multi-level factors that impact students’ decisions to engage in exercise.

Lovell and colleagues (2010) examined the perceived benefits and barriers to exercise among non-exercising, female university students in the United Kingdom. Similar to Brown (2005), researchers used Sechrist and colleagues’ (1987) Exercise Benefits/Barriers Scale (EBBS) to look at 14 barriers in all (Table 8). Among the items participants agreed most with were “Places for me to exercise are too far away,” “Exercise tires me,” and “Exercise is hard work for me,” while the item participants disagreed most with were “I am too embarrassed to exercise.” The items fell across four subscales of barriers: (1) “exercise milieu,” (2) “time expenditure,” (3) “physical exertion,” and (4) “family discouragement.” The categories are listed in order from experienced as the greatest barrier to the least barrier: physical exertion, time expenditure, exercise milieu, and then family discouragement. Physical exertion was rated significantly higher than the other barriers, and this was the only statistically significant difference in mean barrier scores. Although the authors did not explicitly divide these categories

between ‘internal’ and ‘external’ barriers, the results demonstrated that internal factors (i.e., physical exertion, time expenditure, exercise milieu) were perceived as a greater barrier than external factors (i.e., family discouragement).

Using the Health Belief Model, King and colleagues (2014) studied the influence of perceived benefits, barriers, and cues on vigorous physical activity among university students. Students were asked to select from a list of 16 items<sup>7</sup> which were perceived as barriers to vigorous physical activity. Table 15 includes the barriers examined listed in order of most frequently selected to least frequently selected by participants. A majority of respondents perceived school workload, lack of motivation, and job as barriers to vigorous physical activity. Furthermore, correlational analyses demonstrated, the more perceived barriers to engaging in vigorous physical activity one identified, the lower that person’s engagement in vigorous physical activity.

Table 15

*Hierarchy of Barriers Cited in King et al. (2014)*

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Barrier Items
1. School workload
2. Lack of motivation
3. Job
4. Lack of sleep
5. Want to do other things with my time
6. No exercise partner
7. Inactive friends
8. Do not enjoy exercising
9. Social invitations/parties
10. Too hung over to exercise

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<sup>7</sup> 15 items plus 1 ‘other’ item

TABLE 15 (continued)

11. Lack of knowledge about how to exercise/workout
12. Embarrassed to exercise with others
13. Lack of place to exercise
14. Current health problems
15. Other
16. Do not think exercising is important

Rodenbaugh (2016) used PhotoVoice methods to conduct an examination of barriers and facilitators to physical activity among university students majoring in exercise science.

University students were asked to take photos representing barriers to physical activity on campus. Photos of barriers were organized into themes. Results demonstrated the top barriers to physical activity were: (1) “transportation (i.e., campus shuttle, limited parking)”; (2) “concern for safety (i.e., dangerous sidewalks, strangers on and traffic near campus, poor lighting)”; and, (3) “poor supporting infrastructure (i.e., forced elevator use, unused green space).” Comments from students demonstrated that they felt as though the university either encouraged sedentary behavior or discouraged active behavior through the barriers identified.

Anjali and Sabharwal (2018) used an ecological framework to explore the perceived barriers to physical activity among college students in New Delhi, India. Data was collected using focus groups. Comments were organized into three broad themes: (1) personal barriers, (2) social barriers, and (3) environmental barriers. Table 16 includes the themes and subthemes identified in this study. Once the comments within each theme were counted, most comments related to personal barriers, followed by environmental barriers, and then social barriers. These results demonstrated personal barriers and environmental barriers were most salient to focus group participants, and, thus, perhaps most influential. This study, however, was qualitative in

nature, and so the strength of the relationship between perceived barriers and physical activity behavior was undetermined. Regardless, this study demonstrated college students are deterred from physical activity for many reasons and at multiple levels of influence.

Table 16

*Themes and Subthemes in Anjali & Sabharwal (2018)*

Theme/Subtheme	Items
<u>Theme 1: Personal Barriers</u>	
Subtheme 1: Health-related	-Lack of energy/sleep -Stress -Physical ailments/discomfort
Subtheme 2: Not health-related	-Time constraints -Lack of knowledge/skills -Inertia (i.e., boredom, procrastination, lack of self-discipline, indolence) -Lack of self-efficacy
<u>Theme 2: Environmental Barriers</u>	
	-Built/physical environment -Lack of resources/opportunities -Weather -Financial cost -Internet & technology -Regulatory environment -Lack of availability/accessibility of facilities

TABLE 16 (continued)

Theme 3: Social Barriers

- Family control/discouragement
- Gender Typing
- Peer pressure/discouragement
- Verbal bullying/intimidation

**1.6.3.1 McLeroy and colleagues (1988) Ecological Model**

Gyurcsik and colleagues (2004) used McLeroy and colleagues' (1988) ecological framework to examine barriers to vigorous physical activity among Canadian students transitioning into their first year of a university. In addition to examining the impact of intrapersonal, interpersonal, institutional, community, and public policy barriers, researchers also examined the impact of the physical environment on students' behavior. Students were asked to name up to five barriers to vigorous physical activity, and researchers coded each barrier into one of the framework's ecologies. The most frequent category of barriers referenced was institutional barriers, followed by intrapersonal barriers and then interpersonal barriers. Within institutional barriers, the most frequently cited barriers related to "school workload too high to allow for physical activity," "studying for exams," and "job cuts into physical activity time."

In total, this comprehensive review of existing research demonstrates that college and university students cite a myriad of barriers or constraints to physical activity. Although the review suggests the importance of external barriers over internal barriers, the list of examined external barriers in each study remains narrow in scope. Furthermore, broader barriers (i.e., beyond individual and external factors) are frequently excluded from the study of physical activity. Therefore, past research has left us with an incomplete picture of the barriers college students perceive as prohibiting physical activity. Therefore, additive research on college and

university campuses should seek to examine as many of these factors as possible to gain the best understanding as to what barriers students do and do not experience, and to what degree they experience them. This study seeks to contribute to the body of research in this area by expanding the number of perceived barriers under review and examining how an ecological array of barriers influence physical activity.

## CHAPTER 2

### METHODS

#### 2.1 Purpose of the Study

The primary goal of this study was to explore perceived barriers to physical activity on a college campus. Although the researcher did not have any hypotheses associated with this study, there were two foci for the exploratory study. One specific focus was to examine the degree to which several ecological barriers, based on McLeroy and colleagues' (1988) model, are associated with college undergraduates' levels of physical activity. More specifically, the researcher wanted to know whether these ecological factors directly influence undergraduate students' level of physical activity. A second focus of this study was to broaden the range of perceived barriers to physical activity examined in one study.

Although physical activity among college students has been a rising concern for several decades, a comprehensive examination of ecological barriers is missing from the current body of research. In the past, studies have been limited in two primary ways. First, while several studies have assessed multiple barriers, the barriers examined often do not encompass all the ecologies that may influence students (Allison, Dwyer, & Makin, 1999; De Bourdeaudhuji, Sallis, & Vandelanotte, 2002). Second, many studies have relied on free association to discuss what perceived barriers affect students' physical activity (Gyurcsik et al., 2004). As such, we now know that there are many categories of perceived barriers that hinder individuals' physical activity, but we do not know what barriers individuals perceive as *most* hindering. Therefore, as a function of achieving the two primary foci of this study, the design of this research sought to

expand both the ecological ‘reach’ and the number of barriers assessed on a college campus in one study.

Furthermore, the researcher utilized mixed methods to ensure a comprehensive examination of barriers. First, the researcher utilized a structured assessment of barriers such that students were asked to evaluate deterrents of physical activity from the same array of barriers, rather than solely those most salient at the time of reporting. Additionally, the researcher utilized semi-structured interviews to provide deeper meaning to the quantitative data and to capture discussion of barriers which might have been missed during the survey. Increasing overweight and obesity rates in the U.S. suggest there is still much to be done in trying to increase and maintain physical activity. It is assumed a more exhaustive assessment of ecological barriers which affect college students’ physical activity, such as this study, will equip decision-makers to address more possible determinants of health behavior in their pursuit of fostering a healthier student population. As King and colleagues (2002) explain, “[T]o achieve the greatest leverage or positive impact on physical activity levels among community members, multiple environmental modifications should be combined into composite (multi-faceted) interventions” (p. 21).

Although the intent of this research is to generalize the findings to undergraduates whenever appropriate, the researcher also hoped to identify commonalities experienced among Wichita State University [WSU] undergraduates so as isolate the specific barriers they experience in this setting. In this way, this study functions as both research of undergraduate behavior and an evaluation of a university’s ability to encourage students to engage in healthy behaviors. This evaluation lends itself to identifying specific ways the university can address particular issues and concerns its students may have. As Gyurcsik and colleagues (2004) explain,

“once barriers are identified, tailored interventions can then be developed, which should contain specific components aimed at alleviating these barriers...” (p. 131).

## **2.2 Research Questions**

The following research questions served as a guide for achieving the purposes of this study:

1. Does physical activity influence BMI level—Is there a relationship between WSU undergraduates’ physical activity and BMI?
2. Does meeting the PA guidelines make a difference on BMI level—Is there a difference in undergraduates’ BMI level between those who meet recommended level of physical activity and those who do not?
3. What is the current proportion of undergraduates that are engaged in recommended level of physical activity?
4. Are there differences between the undergraduates who meet the recommended level of physical activity and those who do not?
5. What are the top barriers to physical activity experienced by undergraduates?
6. Are there differences in the degree to which undergraduates experience barriers to physical activity?
7. Does one’s barriers to activity score influence how much physical activity they engage in—Is there a relationship between WSU undergraduates’ experiences of barriers and physical activity?

8. What are students' perceptions regarding their comfort with being physically active on campus?
  - a. Where are the geographic locations on campus that make undergraduates feel comfortable engaging in physical activity?
  - b. Where are the geographic locations on campus that make undergraduates feel uncomfortable engaging in physical activity?

### **2.3 Mixed Methods Approach**

While many methodologies may have adequately explored the research questions, the researcher chose a mixed methods approach. Although there are several definitions for 'mixed methods research' (Creswell & Plano Clark, 2018), Johnson and colleagues (2007) define mixed methods as:

the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the purposes of breadth and depth of understanding and corroboration (p. 123).

The researcher chose a mixed methods approach for three reasons: (1) to be able to obtain a degree of generalizability of undergraduates' experiences with physical activity on campus while also providing deeper explanation of those shared experiences, (2) to triangulate the data obtained, and (3) to invite the population into the research process by representing their voices in this study (Tariq & Woodman, 2013).

### **2.4 Ethical Procedures**

The appropriate documentation was submitted to the Institutional Review Board (IRB) for review in early Spring 2018; IRB approval was granted prior to any data collection. All

survey participants provided their consent online. Interview participants were provided with a written informed consent document at the initiation of the interview and all provided verbal assent prior to beginning the interview. Additionally, all interview participants agreed to being audio recorded.

## **2.5 Recruitment and Sample**

### **2.5.1 Recruitment and Sample for the Survey**

Participants were students currently enrolled as university undergraduates during the Spring 2018 semester. The researcher randomly selected 2,500 students from the WSU undergraduate population to participate in the study. In March 2018, the researcher sent each student in the sampling frame an initial e-mail containing both a brief description of the study and the hyperlink to the questionnaire using Qualtrics software (Qualtrics, Provo, UT). The researcher sent two additional follow-up e-mails in April 2018 before ending the recruitment stage of this study.

As students voluntarily opened the confidential link to complete the survey, they were enrolled in the study. After enrolling, students were asked if they qualify for the study by meeting the following criteria: (1) they must have read and agreed to the informed consent presented in the introduction section of the questionnaire and (2) they must be at least 18 years of age. If students did not meet either of these criteria, the survey was terminated. The students who met these criteria were directed to begin the series of questions that composed the questionnaire.

### **2.5.2 Recruitment and Sample for the Interviews**

During the survey stage of the research, respondents were asked to indicate the degree to which a list of factors have or have not deterred them from being physically active on Wichita State's main campus using a 11-point scale (0 = "Does not deter me at all"; 5 = "Somewhat

deters me”; 10 = “Deters me a lot”) [Appendix A]. If a participant reported that any one of the factors deterred them from being physically active with a value of at least “3”, they were asked if they would like to further discuss the things that make it difficult to participate in physical activity on campus. Beginning in late April 2018, the researcher approached interested participants via e-mail to begin recruitment for qualitative data collection. Initially, interested participants were asked to participate in a focus group; however, due to lack of response, the researcher changed qualitative data collection methodologies to semi-structured interviews. The researcher believed that the function of the qualitative data collection—to corroborate the results obtained via quantitative methods and to invite participants into the research process—was not compromised, despite the change in methodology. The researcher suspected that the timing of qualitative data collection was the primary reason for lack of response (i.e., scheduling occurred in close proximity to undergraduates’ final exam schedule).

Interviews were held in early May 2018. During the interviews, the researcher asked a series of questions; however, the researcher did not govern participants’ responses. Therefore, interviews ranged from approximately 30-90 minutes each. All but one of the interviews<sup>8</sup> were audio recorded for the purposes of documentation and data analysis. The researcher took handwritten notes during the interviews, and, following the interviews, the researcher listened to the audio recordings to supplement the notes. The notes served as the raw data for analysis.

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<sup>8</sup> The audio recording during the first interview was interrupted and thus, the researcher does not have a saved audio recording for one of the participants.

## 2.6 Instruments and Procedures

### 2.6.1 Questionnaire Development

For this study, the researcher composed an original web-based questionnaire to comprehensively assess the undergraduate behaviors and perceptions related to physical activity on WSU's main campus [Appendix A]. After review of previous literature to identify previously examined barriers to physical activity, the initial online questionnaire was drafted. Specifically, the questionnaire contained questions about students': physical activity behavior (i.e., number of minutes of moderate physical activity, number of minutes of vigorous physical activity); perceptions regarding physical activity in general and on campus; BMI level; and, perceptions of barriers to physical activity on campus. Additionally, the researcher gathered demographic information, including but not limited to: year of birth; gender; race; academic classification; and, housing status (i.e., on-campus or off-campus).

As a particularly notable feature of the questionnaire, respondents were asked to indicate on two identical, yet independent, maps of main campus the approximate geographic locations in which they felt *comfortable* and *uncomfortable* engaging in physical activity. While responding to the survey, students were shown the most current map of campus available (Wichita State University [WSU], 2018). The legends and color coding were stripped from this map to attempt to keep it as visually neutral as possible; however, students were provided with the corresponding names for all the abbreviated buildings/facilities on the map [Appendix A]. Students could select up to 10 locations (represented by pixels) on each map using the Qualtrics heat map question type. Once selections were made, students were then able to provide a short description of the reason(s) they felt either comfortable and/or uncomfortable in those locations.

### **2.6.1.1 Cognitive Interviewing and Pre-testing of the Survey**

To gather the perceptions of the initial instrument among the population under examination, undergraduates enrolled in the Fall 2016 semester were recruited to participate in a cognitive interview of the instrument. Cognitive interviewing is commonly defined as:

the administration of draft survey questions while collecting additional verbal information about the survey responses, which is used to evaluate the quality of the response or to help determine whether the question is generating the information that its author intends (Beatty & Willis, 2007, p. 287).

Students were recruited from a General Psychology course in exchange for research participation credits, which were applied toward their course requirement. Six undergraduate students (4 females, 2 males) in total participated in cognitive interviews. Primarily using the Retroactive Think-Aloud method during the cognitive interviews (Blair & Presser, 1993), students were asked to complete the questionnaire; while doing so, participants were instructed to individually note any observations related to the questionnaire's content, wording, and/or format. These observations were then discussed with the researcher, and the comments elicited were used to make relevant changes to the instrument. The revised questionnaire was then distributed to the researcher's graduate student cohort for another round of pre-testing before being finalized for data collection.

### **2.6.2 Interview Question Development**

After survey data was collected, the researcher developed interview questions [Appendix B]. The questions were designed to complement and to expound on the data received via the questionnaire. Therefore, the researcher conducted preliminary quantitative data analysis to develop targeted questions about phenomena observed in the survey data. Overall, the interview

questions were designed to stimulate open-ended discussion about participants' experiences with physical activity on campus. In so doing, the questions were used as a mechanism for gathering further insight regarding the perceived barriers to physical activity undergraduates experience on campus.

## CHAPTER 3

### RESULTS

#### 3.1 The Survey

As mentioned previously, the researcher chose a mixed methods approach to data collection. As a result, the researcher engaged in both quantitative and qualitative data analyses. For quantitative analysis, the researcher conducted both descriptive and inferential statistics to better understand the barriers associated with physical activity among WSU undergraduates. All quantitative data analyses were completed using SPSS statistical software, version 21.

##### 3.1.1 Survey Sample

Of the 2,500 undergraduates sampled, 10% responded to the survey ( $n = 257$ ). The following respondents, however, were excluded from analyses for at least one of the following reasons: (1) they did not agree to the informed consent form ( $n = 5$ ); (2) indicated they were under the required age of 18 ( $n = 3$ ); or, (3) they answered a total of less than three questions ( $n = 9$ ). As such, the final sample consisted of 240 participants between 19 and 61 years of age ( $M = 24$ , median = 22,  $SD = 6.6$ ). As such, the response rate of overall valid responses was 9.6%.

The majority of participants were female, between the ages of 18 and 24 years of age, Non-Hispanic Caucasian/White, and lived off-campus. Additional demographic information for the study sample can be found in Table 17. Demographic information for the WSU undergraduate population based on the Spring Census has been included in Table 8, when available, for comparison. According to the Spring Census, the mean age of WSU undergraduates in the Spring 2018 semester was 24 (median = 22). The mean number of enrolled

hours among WSU undergraduates in the Spring 2018 semester was 11 credit hours (median = 12 credit hours).

Table 17

*Demographic Characteristics of Final Sample Compared to WSU Undergraduate Population (WSU, Spring 2018)*

Demographic		Final Undergraduate Sample		WSU Undergraduate Population	
<u>Variable</u>	<u>Label</u>	<u>n</u>	<u>%</u>	<u>N</u>	<u>%</u>
Total Enrollment		240	--	10903	--
Gender (n = 159)					
	Female	95	60	5822	53
	Male	63	40	--	--
	Prefer Not to Say	1	<1	--	--
Age (n = 152)					
	18-24	111	73		
	25-44	37	24		
	45-54	3	2		
	55-64	1	1		
Race/Ethnicity (n = 157)					
	Non-Hispanic White/Caucasian	97	62	6615	61
	Hispanic	31 <sup>9</sup>	20	1257	12
	Asian	14	9	751	7
	Black or African American	6	4	633	6
	Biracial (2 races)	5 <sup>10</sup>	3		
	Other or Unspecified	1 <sup>11</sup>	<1	1074	10
	Multiracial (3+ races)	1 <sup>12</sup>	<1	487	5
	American Indian or Alaska Native	2	<1	75	<1

<sup>9</sup> Added 5 individuals to the previous Hispanic totals based on individuals who indicated they were Hispanic, either by selecting 'Other Race' and specifying or by indicating they were Hispanic in Q42. Reclassified this category from Hispanic White/Caucasian to simply Hispanic to reflect that this category now contains multi-racial representation.

<sup>10</sup> Reclassified 1/6 of the individuals who said 'Biracial' because indicated they were Hispanic.

<sup>11</sup> Reclassified 4/5 of the individuals who said 'Other' because 3/5 indicated they were Hispanic. 1/5 indicated they were Indian.

<sup>12</sup> Reclassified 2/3 of the individuals who said 'Multiracial' because indicated they were Hispanic.

Table 17 (continued)

	Native Hawaiian or Pacific Islander	0	0	11	<1
<b>Ethnic/Racial Minority Status</b> ( <i>n</i> = 157)					
	Non-Hispanic White/Caucasian	97	62	6615	61
	Non-White/Caucasian <sup>13</sup>	60	38	4288	39
<b>Academic Classification</b> ( <i>n</i> = 160)					
	Freshman (0-29 credit hours)	28	18	1407	13
	Sophomore (30-59 credit hours)	37	23	1948	18
	Junior (60-89 credit hours)	50	31	2456	23
	Senior (90+ credit hours)	45	28	4356	40
	Other	--	--	736	7
<b>Housing Status</b> ( <i>n</i> = 160)					
	On-campus	24	15	n/a	n/a
	Off-campus	136	85	n/a	n/a

### 3.2 Theoretical Thematic Analysis

For qualitative analysis, the researcher conducted ‘theoretical thematic analysis’ (Braun & Clark, 2006) of the interview notes to identify aggregate themes. Altogether, thematic analysis was completed similarly to the phases outlined in Nowell and colleagues (2017). First, the researcher familiarized herself with the data. The researcher read over the initial hand-written notes and then re-listened to the available interview recordings to insert additional comments, quotes, and descriptions that had been inadvertently left out of the notes during the interviews. Second, the researcher coded the data. The coding process began with the initial production of

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<sup>13</sup> Includes the following racial/ethnic categories: Hispanic, Asian, Black or African American, Biracial, Other or Unspecified, Multiracial, American Indian or Alaska Native, and Native Hawaiian or Pacific Islander.

codes, also known as ‘First Cycle coding’ (Saldana, 2016). First Cycle codes were identified, and then the researcher engaged in ‘Second Cycle coding’ with the purpose of reorganizing the codes into smaller categories (Saldana, 2016). For each round of coding, the researcher reviewed the codes on a separate occasion and modified those she believed to be miscoded. Once the data was fully coded, the researcher began the third phase of thematic analysis: sorting the codes into themes. Codes and themes were identified inductively (i.e., “[T]he themes identified are strongly linked to the data themselves and may bear little relation to the specific questions that were asked of the participants” (Nowell et al., 2017, p. 8)). Fourth, the researcher reviewed and refined the identified themes, again addressing any inadequacies in the coding and theming as they arose. Lastly, the themes were defined and named. All themes were written and compared against the data to ensure they represented the participants’ voices. During this stage, the researcher engaged in ‘peer debriefing’ (Lincoln & Guba, 1985) to ensure validity of theme names and inclusion criteria.

### **3.2.1 Interview Sample**

Of the 154 participants who were asked whether they would like to participate in a focus group, 25% (n = 38) responded “yes.” Starting mid-April 2018, the researcher contacted these participants via e-mail to begin recruiting focus group participants. As mentioned previously, due to lack of response, the researcher adapted the plan for qualitative data collection from focus groups to semi-structured interviews. In total, the researcher held face-to-face interviews with seven participants about their experiences with physical activity on WSU’s campus during May 2018. Demographics of the interviewees are in Table 18.

Table 18

*Interviewee Demographics (n = 7)*

Demographic		
<u>Variable</u>	<u>Label</u>	<u>n</u>
Gender	Female	4
	Male	3
Age	18-24	5
	25-44	1
	45-54	1
	55-64	0
Race/Ethnicity	Non-Hispanic White/Caucasian	3
	Hispanic	2
	Asian	0
	Black or African American	0
	Biracial (2 races)	1
	Other or Unspecified	1
	Multiracial	0
	American Indian or Alaska Native	0
	Native Hawaiian or Pacific Islander	0
Ethnic/Racial Minority Status	Non-Hispanic White/Caucasian	3
	Non-White/Caucasian <sup>14</sup>	4
Academic Classification	Freshman (0-29 credit hours)	1
	Sophomore (30-59 credit hours)	2
	Junior (60-89 credit hours)	2
	Senior (90+ credit hours)	2

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<sup>14</sup> Includes the following racial/ethnic categories: Hispanic, Asian, Black or African American, Biracial, Other or Unspecified, Multiracial, American Indian or Alaska Native, and Native Hawaiian or Pacific Islander.

TABLE 18 (continued)

Housing Status		
	On-campus	6
	Off-campus	1

### 3.3 Research Questions

#### 3.3.1 Research Question 1: Is there a relationship between physical activity and BMI level?

Using participants' self-reported height in inches and weight in pounds, the researcher used the Center for Disease Control and Prevention's (CDC) formula<sup>15</sup> to calculate respondents' total BMI level (n.d.-b). The total BMI of respondents ( $n = 224$ ) ranged from 10.9 to 44.4 ( $M = 25.5$ , median = 24.2). Tables 19 and 20 include the number and percentage of respondents who fall into each of the BMI and obesity classifications.

Table 19

*Classification of Survey Respondents' BMI (n = 224)*

BMI Level	Classification	n	%
<18.5	Underweight	9	4
18.5 – 24.99	Normal	116	52
25.0 – 29.99	Overweight	54	24
30.0+	Obese	45	20

Note: Percentages were rounded.

Table 20

*Survey Respondents' Obesity Classification (n = 45)*

BMI Level	Classification	n	%
30.0 – 34.99	Class 1	30	67
35.0 – 39.99	Class 2	8	18
40.0+	Class 3	7	16

Note: Percentages were rounded.

<sup>15</sup>  $703 \times \text{weight (lbs)} / [\text{height (in)}]^2$

After reporting their height and weight, respondents were asked to watch a short video produced by the CDC (2012) that defines ‘moderate physical activity’ and ‘vigorous physical activity.’ To ensure participants who chose not to watch the video also had a framework for defining ‘moderate physical activity’ and ‘vigorous physical activity,’ short definitions (taken verbatim from the short video) and examples of like activities were provided in the question text. Participants were asked to separately indicate their current engagement in both minutes of moderate physical activity and vigorous physical activity during a typical week. Participants’ reported values for vigorous physical activity were scaled to moderate physical activity<sup>16</sup> and were combined with reported values for moderate vigorous physical activity to calculate the total number of minutes engaged in physical activity. Therefore, all analyses related to total number of minutes engaged in physical activity is technically scaled in reported moderate physical activity. As mentioned previously, there were five participants who were statistical outliers (i.e., z-scores higher than +/- 3.29); these participants were removed from analyses where total number of minutes of physical activity was either the independent or dependent variable. Overall, participants’ ( $n = 172$ ) reported total physical activity ranged from 0 to 2,100 minutes per week ( $M = 528$  minutes per week or 8.8 hours each week;  $SD = 442.4$ ).

The relationship between undergraduates’ physical activity (as measured by total number of minutes engaged in moderate physical activity) and BMI level was investigated using the Pearson product-moment correlation coefficient. There was a weak, negative correlation between

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<sup>16</sup> By multiplying values by 2.

the two variables:  $r = -.19$ ,  $n = 169$ ,  $p = .014$ ,  $r^2 = .04$ ,<sup>17</sup> with higher engagement in physical activity (i.e., more minutes) associated with lower BMI levels.

### **3.3.2 Research Question 2: Is there a difference in BMI level between those who meet the CDC's recommended level of physical activity?**

Beyond wanting to know whether higher levels of physical activity are associated with lower BMI levels, the researcher wanted to know whether students who meet the physical activity guidelines generally experience lower BMI. An independent-samples t-test was conducted to compare BMI levels between undergraduates who do and do not meet the physical activity guidelines. The Levene's test for equality of variances was not significant ( $p = .54$ ) and equal variances were assumed. There was a significant difference in BMI levels for those undergraduates who do meet the physical activity guidelines ( $M = 25.2$ ,  $SD = 5.8$ ) and those who do not meet the guidelines ( $M = 27.8$ ,  $SD = 6.3$ );  $t(167) = -2.3$ ,  $p = .02$ , two-tailed. The magnitude of the differences in the means (mean difference =  $-2.6$ , 95% *CI*:  $-4.8$  to  $-.4$ ) was large (eta squared =  $.178$ ).

### **3.3.3 Research Question 3: What is the current proportion of undergraduates that are engaged in the CDC's recommended level of physical activity?**

Overall, the majority of respondents met the physical activity guidelines (Table 20). Furthermore, Table 21 demonstrates most undergraduates met the physical activity guidelines, regardless of sex, ethnic/minority status, school classification (i.e., year in school), or housing status. Notably, a higher percentage of males (84%) met the guidelines compared to females (76%). Additionally, the percentage of undergraduates who meet the physical activity guidelines

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<sup>17</sup> Even with the statistical outliers ( $n = 5$ ) included in analysis, there was a significant correlation:  $r = -.16$ ,  $n = 173$ ,  $p = .04$ ,  $r^2 = .03$

seemingly decreases as students progress through school; 92% of freshman met the guidelines whereas only 70% of seniors met the guidelines.

Table 21

*Number and Percent of Respondents Who Meet the Physical Activity Guidelines*

Demographics		Meet PA guidelines			
<u>Variable</u>	<u>Label</u>	<u>Yes</u>		<u>No</u>	
		<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
	Overall ( <i>n</i> = 172)	137	80	35	20
Sex	Female ( <i>n</i> = 89)	68	76	21	24
	Male ( <i>n</i> = 57)	48	84	9	16
Ethnic/Racial Minority Status	Non-Hispanic White/Caucasian ( <i>n</i> = 91)	73	80	18	20
	Non-White/Caucasian ( <i>n</i> = 54)	42	78	12	22
Academic Classification	Freshman (0-29 credit hours) ( <i>n</i> = 25)	23	92	2	8
	Sophomore (30-59 credit hours) ( <i>n</i> = 34)	26	77	8	23
	Junior (60-89 credit hours) ( <i>n</i> = 49)	41	84	8	16
	Senior (90+ credit hours) ( <i>n</i> = 40)	28	70	12	30
Housing Status	On-campus ( <i>n</i> = 24)	19	79	5	21
	Off-campus ( <i>n</i> = 129)	104	81	25	19

### **3.3.4 Research Question 4: Are there differences between the undergraduates who meet the CDC's recommended level of physical activity and those who do not?**

#### **3.3.4.1 Sex.**

A Chi-square test for independence (with Yates Continuity Correction) was conducted to see if the proportion of male undergraduates who meet the physical activity guidelines is the same as the proportion of female undergraduates who meet the guidelines. The results of the test indicated no significant association between gender and meeting the physical activity guidelines,  $X^2(1, n = 146) = .9, p = .35, \text{phi} = .09$ .

#### **3.3.4.2 Racial/Ethnic Minority Status.**

A Chi-square test for independence (with Yates Continuity Correction) was conducted to see if the proportion of Non-Hispanic White/Caucasian undergraduates who meet the physical activity guidelines is the same as the proportion of racial/ethnic minority undergraduates who meet the guidelines. The test indicated no significant association between ethnic/racial minority status and meeting the physical activity guidelines,  $X^2(1, n = 145) = .02, p = .89, \text{phi} = .03$ .

#### **3.3.4.3 Academic Classification.**

A Chi-square test for independence (with Yates Continuity Correction) was conducted to see if the proportion of undergraduates who meet the physical activity guidelines differs by academic classification (i.e., Freshman, Sophomore, Junior, Senior). The test indicated no significant association between academic classification and meeting the physical activity guidelines,  $X^2(3, n = 148) = 5.4, p = .15, \text{Cramer's } V = .19$ .

#### **3.3.4.4 Housing Status.**

A Chi-square test for independence (with Yates Continuity Correction) was conducted to see if the proportion of undergraduates who live on-campus and meet the physical activity

guidelines is the same as the proportion of undergraduates who live off-campus and meet the guidelines. The results of the test indicated no significant association between housing status and meeting the physical activity guidelines,  $X^2(1, n = 148) = .00, p = 1.0, \phi < .01$ .

### **3.3.5 Research Question 5: What are the top barriers to physical activity experienced by undergraduates?**

#### **3.3.5.1 Survey Results.**

In total, undergraduate students were asked to indicate the degree to which a list of 30 ecological barriers deterred them from being physically active on WSU's main campus. Table 22 depicts the means for each barrier to physical activity explored in this study. The barriers have been ordered by their mean values—from highest to lowest—to depict the factors students perceived were the greatest deterrents to physical activity overall (range: .6 – 6.7). Table 23 depicts the means for each barrier to physical activity explored based on respondents who met the physical activity guidelines (range: .6 – 6.4). Table 24 depicts the means for each barrier to physical activity explored based on respondents who did not meet the physical activity guidelines (range: 0 – 8.3). Regardless of whether respondents did or did not meet the physical activity guidelines, the top barriers were “the amount of coursework I have” and “how much time being physically active takes away from my responsibilities (e.g., schoolwork, employment, familial commitments, etc.),” and the bottom barriers were “my racial/ethnic culture (e.g., beliefs, norms, practices)” and “my religious culture (e.g., beliefs, norms, practices).”

Table 22

*Barriers to Physical Activity for All Respondents (Rounded to Nearest Tenth)*

Barrier Items	<i>n</i>	<i>Mean</i>	<i>Standard Deviation</i>
The amount of coursework I have	148	6.7	3.0
How much time being physically active takes away from my responsibilities (e.g., schoolwork, employment, familial commitments, etc.)	150	6.7	3.1
The atmosphere of the places where I can be physically active	126	5.4	3.2
How much time being physically active takes away from what I like to do in my free time (e.g., hanging out with friends, student activities)	131	5.0	3.4
The weather outside	129	4.8	2.9
The financial cost (e.g., membership fees, clothing, equipment)	110	4.6	3.5
How self-conscious I feel when I am physically active	111	4.6	3.2
The condition of the places where I can be physically active (i.e., how up-to-date, how maintained)	11	4.5	3.4
The operating hours of campus recreation facilities (e.g., Heskett Center, Intramural fields)	118	4.2	3.2
The number of places I can be physically active	114	3.9	3.1
How competitive I feel the opportunities to be physically active are	105	3.9	3.1
How skilled I think I am in the ways to be physically active	99	3.8	3.0
The outdoor lighting on campus (before dawn or after dusk)	107	3.6	3.4
The variety of physical activity options	99	3.5	3.2
My body (e.g., weight, physical disability, etc.)	98	3.5	3.3
The physical layout of campus	99	3.3	3.2
The availability of WSU police	88	3.0	3.5
My peers (e.g., friends, classmates)	94	2.9	3.3
How aware I am of possible places where I can be physically active	80	2.6	3.0
The visual appearance of campus	89	2.5	3.0
My family members (e.g., parents, siblings, spouse)	84	2.5	3.3
The air quality of campus	85	2.1	2.7

TABLE 22 (continued)

How concerned I am with getting physically or medically injured while being physically active	82	2.1	2.7
Campus rules or policies	84	2.0	2.8
The access to quality childcare on campus	78	2.0	3.4
The availability of the WSU shuttle system	80	2.0	3.0
How safe I feel it is to be physically active	79	2.0	2.9
My personal or family medical history	79	1.9	2.7
My racial/ethnic culture (e.g., beliefs, norms, practices)	69	0.9	2.1
My religious culture (e.g., beliefs, norms, practices)	68	0.6	1.6

Table 23

*Barriers to Physical Activity for Respondents Who Meet Physical Activity Guidelines Rounded to Nearest Tenth)*

Barrier Items	<i>n</i>	<i>Mean</i>	<i>Standard Deviation</i>
The amount of coursework I have	108	6.4	2.9
How much time being physically active takes away from my responsibilities (e.g., schoolwork, employment, familial commitments, etc.)	109	6.4	3.1
The atmosphere of the places where I can be physically active	94	5.4	3.2
How much time being physically active takes away from what I like to do in my free time (e.g., hanging out with friends, student activities)	94	4.7	3.0
The weather outside	95	4.6	3.3
The financial cost (e.g., membership fees, clothing, equipment)	82	4.6	3.5
How self-conscious I feel when I am physically active	81	4.5	3.4
The condition of the places where I can be physically active (i.e., how up-to-date, how maintained)	80	4.3	3.2
The operating hours of campus recreation facilities (e.g., Heskett Center, Intramural fields)	80	4.1	3.1
The number of places I can be physically active	85	3.9	3.0
How competitive I feel the opportunities to be physically active are	84	3.8	3.1
How skilled I think I am in the ways to be physically active	75	3.5	3.5
The outdoor lighting on campus (before dawn or after dusk)	74	3.4	3.2
The variety of physical activity options	70	3.4	2.8
My body (e.g., weight, physical disability, etc.)	74	3.1	2.9
The physical layout of campus	71	3.1	3.1
The availability of WSU police	65	2.9	3.3
My peers (e.g., friends, classmates)	71	2.7	3.2
How aware I am of possible places where I can be physically active	60	2.4	2.8
The visual appearance of campus	63	2.3	3.1
My family members (e.g., parents, siblings, spouse)	63	2.2	2.9
The air quality of campus	66	2.2	2.7

TABLE 23 (continued)

How concerned I am with getting physically or medically injured while being physically active	64	2.0	2.5
Campus rules or policies	59	1.8	3.1
The access to quality childcare on campus	59	1.7	2.6
The availability of the WSU shuttle system	61	1.6	2.4
How safe I feel it is to be physically active	60	1.6	2.2
My personal or family medical history	62	1.6	2.5
My racial/ethnic culture (e.g., beliefs, norms, practices)	53	0.7	1.9
My religious culture (e.g., beliefs, norms, practices)	54	0.6	1.7

Table 24

*Barriers to Physical Activity for Respondents Who Do Not Meet Physical Activity Guidelines (Rounded to Nearest Tenth)*

Barrier Items	<i>n</i>	<i>Mean</i>	<i>Standard Deviation</i>
The amount of coursework I have	30	8.3	2.9
How much time being physically active takes away from my responsibilities (e.g., schoolwork, employment, familial commitments, etc.)	31	7.8	2.7
How much time being physically active takes away from what I like to do in my free time (e.g., hanging out with friends, student activities)	27	6.5	2.8
The weather outside	26	5.3	2.9
How self-conscious I feel when I am physically active	24	5.2	3.2
The financial cost (e.g., membership fees, clothing, equipment)	20	5.1	3.9
The atmosphere of the places where I can be physically active	21	4.9	3.4
The operating hours of campus recreation facilities (e.g., Heskett Center, Intramural fields)	24	4.9	3.5
How skilled I think I am in the ways to be physically active	24	4.6	3.3
My body (e.g., weight, physical disability, etc.)	22	4.5	3.7
The condition of the places where I can be physically active (i.e., how up-to-date, how maintained)	20	3.7	3.1
The physical layout of campus	18	3.7	3.8
The number of places I can be physically active	21	3.6	2.8
The variety of physical activity options	16	3.5	3.3
My peers (e.g., friends, classmates)	17	3.3	3.6
My family members (e.g., parents, siblings, spouse)	14	3.3	4.0
How aware I am of possible places where I can be physically active	15	3.2	3.2
How concerned I am with getting physically or medically injured while being physically active	19	3.2	3.2
The availability of the WSU shuttle system	13	3.1	3.9
The outdoor lighting on campus (before dawn or after dusk)	24	3.1	3.1
My personal or family medical history	14	3.0	3.8
The availability of WSU police	16	2.9	3.7

TABLE 24 (continued)

The visual appearance of campus	16	2.7	3.5
How competitive I feel the opportunities to be physically active are	17	2.6	3.2
How safe I feel it is to be physically active	17	2.6	3.6
The air quality of campus	16	2.4	3.3
The access to quality childcare on campus	14	2.0	3.8
Campus rules or policies	15	1.2	2.2
My racial/ethnic culture (e.g., beliefs, norms, practices)	12	1.0	1.9
My religious culture (e.g., beliefs, norms, practices)	10	0.0	0.0

### 3.3.5.2 Interview Results.

The data obtained by semi-structured interviews was intended to provide more context toward understanding the perceived barriers to physical activity on WSU’s main campus. Additionally, they were conducted to triangulate the data obtained via survey. In total, ten main themes were identified from the data ( $n = 634$  comments). Overall, the themes discovered were: (1) Issues with the Built Environment; (2) Formality of Physical Activity; (3) Socio-Cultural Influences; (4) Convenience; (5) Cognitions; (6) Unfamiliarity; (7) Competing Priorities; (8) Individual Factors; (9) Cost; and, (10) Weather. Of these themes, 3 were considered ‘major themes’ and 7 were considered ‘minor themes’ based on the frequency in which they were mentioned during interviews. Table 25 outlines each theme, the number of comments associated with that theme, and an example of raw data making up this higher order theme.

Table 25

*Major and Minor Themes and Examples of Each Theme (Valid Responses n = 634)*

Theme Type	Theme Title	n	%	Example of Raw Data
Major	Issues with the Built Environment	139	22%	“[The Heskett Center] Looks like an office/educational building which is confusing,” “Assumes the facilities on campus will be busy”
Major	Formality of Physical Activity	128	21%	“Any form of exercise,” “Treadmills/ellipticals” “Other peer doesn’t do any physical activity on campus,”
Major	Socio-Cultural Influences	100	16%	“Females are expected to look good/attractive but not expected to be physically active”
Minor	Convenience	74	12%	“Time/cost of time it takes away from other things,” “Has gym in apartment complex with all equipment” “WSU is seen as an academic area, not a physical activity area specifically,”
Minor	Cognitions	49	8%	“It’s painful”
Minor	Unfamiliarity	48	8%	“Not very familiar with Heskett Center and what it has to offer,” “Truer barriers are not knowing what you’re doing”
Minor	Competing Priorities	34	5%	“Studying will get in the way,” “They are very busy and have a lot demanding from them”
Minor	Individual Factors	23	4%	“Students want to just relax after doing so much at the end of the day,” “Largely dependent on their personality”
Minor	Cost	22	4%	“Clothing on top of costs,” “Financial cost”
Minor	Weather	8	1%	“Doesn’t want to walk over to campus when it’s cold,” “...especially in the rain”

Note: Percentages are rounded.

### 3.3.5.2.1 Major Themes

The three major themes were: (1) Issues with the Built Environment; (2) Formality of Physical Activity; and, (3) Socio-Cultural Influence.

#### *Major Theme 1: Issues with the Built Environment.*

The most prevalent theme in the qualitative data was mention of Issues with the Built Environment ( $n = 139$ ). Several points were made throughout the interviews about the ways in which students perceived the campus' physical and built environment deterring them from being physically active. In fact, this theme was by far the most complex as it included a wider array of facets compared to any other theme. As a result, the researcher included criteria in this theme if they could be categorized into one of the following two subthemes: (1) issues with campus recreation facilities (e.g., Heskett Center, sport complexes) or (2) issues with the campus design.

The first subtheme includes issues with recreation facilities. Of all the comments associated with Issues with the Built Environment, most related to issues with campus recreation facilities ( $n = 73$ ). More specifically, most comments related to issues with campus recreational facilities pertained to the Heskett Center. There were several facets of issues with campus recreational facilities, including: atmosphere ( $n = 12$ ); appearance ( $n = 10$ ); crowded ( $n = 10$ ); exclusive to certain students ( $n = 8$ ); staff ( $n = 8$ ); unavailable to use ( $n = 6$ ); size ( $n = 5$ ); hours ( $n = 5$ ); out-of-date ( $n = 3$ ); mirrors ( $n = 3$ ); location ( $n = 2$ ); and, unfriendly policies ( $n = 1$ ). Table 26 outlines each subtheme, the categories of criteria, and examples of raw data making up this subtheme.

Table 26

*Subtheme 1: Issues with Campus Recreation Facilities (Valid Responses n = 73)*

Categories of Criteria	Examples
Atmosphere	“Men have sense of ownership over space” “The spaces to be physically active on campus (i.e., the Heskett Center) have largely been used by students or are affiliated with WSU”
Appearance	“Looks like an office/educational building which is confusing” “The overall feeling [among students] is that Heskett Center is run-down”
Crowded	“Assumes the facilities on campus will be busy”
Exclusive to Certain Students	“Not sure what’s available to students”
Staff	“Staff [at Heskett] less available to help with equipment” “Students not acknowledged, staff at Heskett don’t know them compared to YMCA where they build relationships”
Unavailable to Use	“Doesn’t do much now because rock climbing was main type of physical activity on campus and it’s no longer available” “Their kind of easy to do but accessibility-wise, there’s always a time that the Heskett Center is going to close or sometimes it’s being utilized [by other things]”
Size	“[Need] larger space”
Hours	“Extended hours for classes (predictable hours not changing from semester to semester, more times available)”
Out-of-Date	“Heskett Center needs equipment updates (especially compared to the YMCA)” “Needs safety updates (e.g., floors have cracked tiles, germs, facilities damaged by termites)”
Mirrors	“Mirrors in the weight room (feels weird with mirrors)”
Location	“Heskett is in a central location; not totally out of the way”
Unfriendly Policies	“Dog-friendly space at apartment complex gym; suspects that you cannot bring the dog to campus facility”

The remaining comments fell under the second subtheme: issues with campus design (n = 65). Unlike issues with campus recreational facilities, this theme is not limited to a particular set of buildings. Rather, these comments encompassed features of the campus as a whole. The issues with campus design include: lack variety of physical activity activities (n = 17); safety (n = 12); limited in activities (n = 10); number of outside/open spaces (n = 8); number of facilities (n = 7); parking (n = 7); intended spaces (n = 2); and, size (n = 2). Table 27 outlines each subtheme, the categories of criteria, and an example of raw data making up this subtheme.

Table 27

*Subtheme 2: Issues with Campus Physical Environment (Valid Responses n = 65)*

Categories of Criteria	Examples
Lack variety of activities	“Need more activities at the Heskett Center; [WSU] needs to realize that ‘we aren’t just a baseball/basketball school”
Safety	“Doesn’t walk on the out-skirts of campus” “Doesn’t want to deal with a situation based on hearing about news reports
Limited in activities	“Campus not conducive for certain types of physical activity” “Heskett has equipment; therefore, caters to more structured workouts”
Number of outside/open spaces	“Get outside, we have beautiful campus” “More open areas”
Number of facilities	“Can’t have the areas for physical activity just in one spot”
Parking	“Walk is pretty far when you park” “Need to improve parking by making more parking available”
Intended Locations	“Not terrible but not the goal in how they designed the school”
Size	“The campus itself isn’t big enough to get exercise”

*Major Theme 2: Formality of Physical Activity.*

The second major theme of the interviews was the Formality of Physical Activity ( $n = 128$ ). At no point during the interviews did the researcher provide a definition for what was meant by ‘physical activity.’ However, students frequently provided examples of what behaviors they associate with physical activity and the areas in which they engage in physical activity on- and off-campus. In doing so, students often remarked about stereotypical, or what the researcher considered ‘formal,’ physical activities (e.g., lifting weights, running) and areas to be physically active (e.g., YMCA, apartment gym). In fact, students rarely mentioned more informal examples of physical activity (e.g., walking from classes, taking the stairs rather than the elevator). The activities and locations for physical activity mentioned were more confined to Caspersen and colleagues’ (1985) definition of ‘exercise’ (i.e., deliberate, structured, repetitious bodily movements) (Table 3). In fact, when asked about issues related to physical activity on campus, students frequently incorporated terms like “exercise” or “workout” into their responses rather than “physical activity.” During one interview, a student mentioned,

“I think it’s important to actually have a time where you’re going to a gym or a facility and actually working on certain aspects and very much straining those aspects with a goal in mind...It’s actually going to a facility, using equipment to reach particular fitness goals. To me, that’s what working out is, that’s what physical activity is.”

Although students did not explicitly say their conceptualization of physical activity acted as a barrier to physical activity, the saliency of these conceptualizations demonstrated undergraduates had a largely limited view of what constitutes ‘physical activity.’ As a result, undergraduates experience further constriction in trying to incorporate activities that fit into their conceptualization of physical activity into their daily routine. Being constricted in this manner

was evident even as other themes emerged; the other barriers identified also centered around their definitions and notions of what is considered physical activity and where it is appropriate to engage in such behavior. The following are examples of how the Formality of Physical Activity presented itself in the emergence of the other themes:

- Issues with the Built Environment (e.g., “The Heskett is less modern [than the YMCA]”);
- Socio-Cultural Influences (e.g., “I usually would go workout with a friend by running around campus, going to Heskett, lifting weights, playing basketball, running around the track...”);
- Convenience (e.g., “Student don’t have a lot of extra time, they don’t want to spend free time in the gym.”);
- Cognition (e.g., [Students experience] “misconceptions of getting ‘too bulky’ by working out.”);
- Unfamiliarity (e.g., [Students] “don’t know where to go or where to get supplies/equipment.”);
- Competing Priorities (e.g., “Doesn’t want to give up time to sleep than take the extra time to walk over to campus to workout compared to just going to the gym apartment building.”);
- Cost (e.g., “Students pay for the YMCA.”); and,
- Individual Factors (e.g., “Were they [students] an athlete or used to getting up early in the morning, they may be more likely to do that in college.”).

Beyond how connected the Formality of Physical Activity is to all the other themes, it also is the barrier that most uniquely affects students. More specifically, it affects students without their cognitive awareness. The following example taken from the Convenience theme demonstrates how undergraduates who narrow their conceptualization of physical activity to exercise experience a somewhat ironic barrier to physical activity, and without their even recognizing. A student described how the inconvenience of having to bring a set of clothes for physical activity would act as a deterrent; it would require an additional walk to and from one’s vehicle to collect those clothes:

“...having your gym clothes with you cause if you are already on campus, and you have to carry a backpack, you don’t want to have to carry an additional bag on top of that. And

parking is so terrible, which I know that is a gripe that everyone has, but it's true. You have to like go out to your car, and you don't want to leave your stuff."

Arguably, had the student had a broader definition of what is included in physical activity, they would have viewed the opportunity to walk to their car and/or carry additional supplies as a physical activity in and of itself. Due to the Formality of Physical Activity's connections to all the other themes, and perhaps its 'invisible' influence on students, the researcher felt as though it was not only a major theme, but potentially the most important theme to arise from the interviews.

*Major Theme 3: Socio-Cultural Influences.*

The last major theme was Socio-Cultural Influences ( $n = 100$ ) which demonstrated the ways in which various social and cultural factors can influence physical activity behavior. Among this theme, there were four distinct categories of socio-cultural influences that students frequently mentioned as barriers to physical activity: (1) the presence of others more generally; (2) social relationships (primarily peers/friends); (3) institutions (e.g., school); and, (4) cultural (including societal) norms.

First, students often discussed that the presence of others, particularly when engaging in physical activity, made them feel uncomfortable for various reasons (e.g., they felt they were being "sexualized", they felt "more peer pressure," they felt "women judging based on how fit/pretty you look when being physically active," etc.). Second, students mentioned the importance of having friends or groups to be physically active with. They mentioned that, without these relationships, it was harder to engage in physical activity. Additionally, students mentioned that they did not typically, and would not, talk about physical activity with their friends. This demonstrated that for some undergraduates, physical activity is potentially not a

significant dimension of their friendships. The third category of socio-cultural influence was the influence of institutions (primarily school). Students discussed how they felt as though WSU was not encouraging students to engage in physical activity: “I don’t notice or see specific things that make them [WSU] go out of their way to make us [students] physically active,” and “[they] have water fountains and vending machines everywhere, but we don’t have other things that are healthy available.” In general, students felt as though WSU, naturally, was a school-centric environment (i.e., largely focused on academics, coursework, etc.). Conversely, students expressed that there is an absence of health promotion on-campus to where students are not encouraged to think about their physical health when visiting campus; students cited that the campus lacks a presence of health promotional materials (e.g., flyers and posters on bulletin boards), health outreach, encouraging students to take physical activity class/electives, and a lack of healthy food options. In turn, low health promotion and visibility acts as a barrier to physical activity. Lastly, students mentioned cultural (including societal) norms related to physical activity that act as barriers. Most norms mentioned by students centered around sexist ideas our culture/society projects related to physical activity, such as “being ‘too muscular’ for girls is a bad thing,” and “guys are expected to workout, females are expected to look good/attractive but not expected to be physically active.” Additionally, a student mentioned cultural-projected shame that accompanies individuals as they try to get healthy:

“You see people make fun of like, ‘Oh wow, look at him or look at her going down the sidewalk and she’s 400 pounds’ or whatever, right? And it’s like, OK, sure, but we’re driving past them eating Cheetos.”

The student followed by saying,

“We applaud someone who has lost a lot of weight (for example, someone from high school who you’ve seen a picture of). You see someone who’s fat at the gym and you ask, ‘What are you doing here?’”

Although this specific example was only mentioned from one respondent, the image it portrayed about the ways in which cultural and societal norms act as barriers to physical activity was particularly poignant. Students often clarified that these cultural norms were not exclusive to WSU’s campus; however, they vividly described how deeply embedded they are, even on the campus.

### **3.3.5.2.2 Minor Themes**

In addition to the three major themes that emerged, the data also suggested several other minor themes that represent barriers to physical activity undergraduates experience. The seven minor themes were: (1) Convenience, (2) Cognitions, (3) Unfamiliarity, (4) Competing Priorities, (5) Cost, (6) Individual Factors, and (7) Weather.

#### *Convenience.*

The fourth theme, and the first of the minor themes, was Convenience. Students repeatedly identified the convenience level associated with physical activity, or sometimes lack thereof, as a perceived barrier to physical activity ( $n = 74$ ). Although students discussed several facets of convenience, three particularly stood out to the researcher: (1) the limited time of a typical undergraduate, (2) the amount of effort/planning required to participate in physical activity, and (3) students have more convenient locations for physical activity. The typical undergraduates’ time was a salient conversation during the interviews. Students mentioned that undergraduates have limited time and there are opportunity costs associated with using their

limited time on physical activity. For instance, “students weigh working out with socializing or listening to music or eating in the dining hall.” As this student later put it,

“Personally, I don’t think, ‘Hey! I have free time—let’s go for a run, that’s a really great idea!’ Like, I have to tell myself, ‘Hey, we’re going to go for a run this time,’ or else I’ll just be like, ‘Oh, ok, well Amanda’s not doing anything, I’ll go hang out with her instead; I have free time.’”

Students also told stories of how inconvenient physical activity is due to the type or the amount of effort/planning required to make it happen. The limited time of a typical undergraduate and the amount of effort/planning required to participate in physical activity were closely related. The relationship between these two categories was evident as students made comments about the role of scheduling (i.e., “An act that requires effort/planning”) and intentionally setting aside time to make sure they were physically active (e.g., “Set aside time every day for physical activity. Schedule time to take care of yourself. There’s never enough time, so you need to make time”). Comments like these demonstrate that students may be deterred by not having effortless physical activities which are seamlessly incorporated into the other activities of their day so as to not take time away from those other activities.

The third notable facet of the Convenience theme was the convenience of the location where students can be physically active. This included conversations about the proximity of a facility and the number of facilities/areas students can use on campus. Additionally, and more notably, students discussed they have more convenient locations for physical activity. A student mentioned that the local YMCAs may be more convenient locations for undergraduates—especially with it being ‘free’ for them to access—and make more sense for them to use because it may be closer [to their residence than campus]. Some students mentioned that their residences

are, ultimately, the most convenient location for physical activity because they do not need the equipment that a formal facility provides, and they can “pull up videos on YouTube.” This facet is particularly interesting because it functions as a barrier to physical activity on campus; however, the convenience of a location may not be a barrier to physical activity more generally though. The implication is students may not be physically active on campus, but they may be physically active elsewhere (i.e., at an alternative location such as a house/apartment gym, YMCA, etc.).

#### *Cognitions.*

Students mentioned several cognitions ( $n = 49$ ), or specific thoughts or thought processes, that functioned as barriers to physical activity for undergraduates; this made Cognitions the fifth theme. Among the cognitions mentioned were the following relatively isolated examples: “there’s limited/no benefit to physical activity”; “being satisfied with physical appearance”; “becoming physically active requires the rest of your life to become orderly”; and, “physical activity makes you too bulky.” In contrast, three other types of cognitions were frequently mentioned: (1) “that [space] is not an intended space for physical activity;” (2) “physical activity is work, not enjoyable, and/or stressful;” and, (3) “there’s other things I should or could be doing over physical activity.”

First, students mentioned their cognitions related to the design and/or intention of spaces on campus could act as barriers to physical activity. Overall, students did not think the campus was designed with the intention of it being a place for physical activity; the main purpose of the college was educational in nature. They mentioned there were isolated areas where physical activity would be appropriate on-campus (e.g., Heskett Center); one student even mentioned, “[they] never thought about physical activity outside of the Heskett Center.” Further, one student

mentioned, “[they] don’t know if it’ll [the whole campus] will be considered a ‘spot’ for physical activity,” while another more strongly stated:

“...[They’re] not sure you want the whole campus to be the ‘spot’ for physical activity.

You wouldn’t want me jogging in the RSC. Some spots are for getting to classes and not physical activity.”

This suggests that students do not associate, and sometimes are somewhat opposed to associating, WSU’s campus with physical activity—at least in whole. As a result, students are also potentially limited in the ways they intend to be physically active on campus. These cognitions are closely related to the Issues with the Built Environment theme. As discussed previously, one of the categories of comments in the Issues with the Built Environment theme is that the campus is not conducive for all physical activities due to its design. Similarly, these cognitions related to intended versus unintended spaces for physical activity suggest that students make cognitive assessments of the physical activities they can and cannot, or should and should not, do on campus based on its design. As such, they make decisions to engage, or not engage, in physical activity on-campus accordingly. The fact that students have to decide where they can/cannot or should/should not be physically active acts as a barrier.

Second, students mentioned that their cognitions related to how enjoyable physical activity was could act as barriers. By and large, students expressed that physical activity is sometimes unenjoyable and associated with pain or work. Students frequently used negative words/phrases (e.g., “overwhelmed,” “stress,” “beat their body,” and “torture”) to describe being physically active. Students mentioned they wanted to have fun while engaging in physical activity, and many suggested that WSU could play a larger role in creating physical activity “events,” “social activities,” or “games.” These comments suggest that students have negative

associations with physical activity, and the absence of fun while being physically active is a barrier to physical activity. It is an interesting proposition to think students' cognitions about how enjoyable physical activity is might be related to their conception of what constitutes as physical activity (i.e., The formality of physical activity).

Lastly, students mentioned that their cognitions related to the other behaviors they should or could be doing in exchange for physical activity (most notably school) could act as barriers. Two students discussed how students think their parents and society expect them to only focus on schoolwork while they are in college because "that's what they are in college for in the first place." Additionally, one student talked about how they often think that there are more productive things they could have done with their time instead of being physical active. These thoughts demonstrate how cognitions related to other behaviors they should or could be doing instead of physical activity often deter undergraduates from being physically active.

#### *Unfamiliarity.*

The sixth theme to emerge from the data was Unfamiliarity ( $n = 48$ ). Participants said undergraduates are generally uncertain about two things: (1) how to do certain physical activities and (2) where to be physically active on WSU's campus. Most participants commented undergraduates may not be skilled in particular physical activities or equipment (e.g., lifting weights), or they have never engaged in physical activity and do not know how to get started. Additionally, nearly all participants commented that undergraduates may not know where they can be physically active or what physical activities are offered by the school or at the Heskett Center. As such, a sense of Unfamiliarity can be a barrier to physical activity for WSU undergraduates.

#### *Competing Priorities.*

The seventh theme was Competing Priorities ( $n = 34$ ). All but two participants mentioned that undergraduates have multiple other priorities they are trying to satisfy in a typical day. At various times during the interviews, participants talked about competing priorities more generally, such as, “there are a lot of priorities that college students are balancing and being physically active isn’t necessarily at the top of a lot of most people’s list.” At other times, students remarked on specific priorities that may take precedence over physical activity (e.g., coursework/studying, family, work, social activities, organizational meetings, housework, self-care, sleep). By far, coursework/studying comprised the most frequently mentioned competing priorities. Familial commitments/responsibilities were scarcely mentioned, and commitments/responsibilities related to significant others/partners (e.g., boyfriend/girlfriend, spouse) were not mentioned at all.

#### *Individual Factors.*

Next, participants mentioned the role Individual Factors ( $n = 18$ ) played in deterring undergraduates from being physically active on campus. About half of the participants mentioned students generally are fatigued. Students further explained undergraduates are fatigued from doing so much during the day. They used words/phrases like “exhaustion,” “physically tired,” “tired,” and “zonked out” to describe the energy level of students. Similarly, about half of the participants explained there are biological reasons that might prevent some students from participating in physical activity (e.g., menstruation, hormonal levels). Other individual factors mentioned include: personality traits (e.g., laziness, unmotivated); pre-existing behaviors (i.e., if they were an athlete or used to being physically active in high school); physical disability; and, preference to not want to be physically active on campus.

### *Cost.*

The ninth theme to emerge from the data was Cost ( $n = 22$ ). The issues related to cost, however, were infrequently due to the cost to access facilities. It should be noted that most students recognized the Heskett Center and the YMCA as being ‘free’ for them to use (i.e., they did not mention having to pay as a function of student fees). Nevertheless, students did mention having to pay to rent equipment, purchase appropriate clothing, or hire a trainer to participate in physical activity, which may be deterrents for some.

The most frequent conversations about cost, however, centered around costs associated with attending school at WSU. First, students mentioned the cost of tuition and how the cost of tuition means students cannot afford other things related to physical activity (e.g., a physical trainer). Then, students mentioned how the cost of tuition drives students to spend more time thinking about their competing priorities. One student mentioned, “[the] stress of finances (i.e., taking out loans) with knowledge that students might not make enough money to be able to pay those loans back when they get out of college,” while another student said, “If you are spending all this money or someone else is...,” with the implication being they should focus on school instead of being distracted by other activities. Second, a student mentioned the costs associated with room and board at WSU. More specifically, one student said, “Living on campus isn’t free—[it’s] too expensive for some, so they live off-campus, which leads to them choosing a closer facility to their home.” As such, cost clearly related to other themes, such as Cognitions and Convenience.

### *Weather.*

Lastly, students mentioned the weather as a barrier to physical activity ( $n = 8$ ). In total, three students mentioned the weather, and, in general, they mentioned a preference for engaging

in physical activity outside. They commented that poor weather conditions (i.e., cold, rain) sometimes created a barrier to physical activity for students. Despite being the least prevalent theme to have emerged from the data, two of the comments associated with this theme demonstrate that weather is connected to other themes. Namely, weather was connected to Individual factors (i.e., “no one feels motivated when it’s rainy outside, [they] just want to watch movies all day”) and Issues with the Built Environment (i.e., “WSU could have a better entrance to Heskett Center that doesn’t require students to go outside (e.g., like Shocker Hall) to address weather barriers”).

### **3.3.6 Research Question 6: Are there differences in the degree to which undergraduates experience barriers to physical activity?**

#### **3.3.6.1 Sex.**

An independent-samples t-test was conducted to compare the total barriers to physical activity scores for males and females. There was a significant difference in scores for females ( $M = 73.0, SD = 47.7$ ) and males ( $M = 56.1, SD = 47.0$ );  $t(152) = -2.17, p = .03$ , two-tailed. The magnitude of the differences in the means (mean difference = -16.94, 95%  $CI = -32.37$  to  $-1.51$ ) was small (eta squared = .03). Since the total barriers to physical activity scores were significantly different, the researcher conducted further independent-samples t-tests based on gender to examine if there were differences in individual barriers to physical activity scores between females and males. The results of these independent-samples t-tests showed several significant differences between mean scores on select barriers to physical activity (Table 28). However, after doing a Bonferroni Correction to account for Type I error, the only mean differences to remain statistically significant were “the outdoor lighting on campus (before dawn or after dusk)” and “how self-conscious I feel when I am physically active.”

Table 28

*Mean Differences of Statistically Significant Barrier Scores Based on Gender (Rounded to Nearest Tenth)*

Barrier Item	<i>t</i> statement	Female		Male	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Variety of physical activity guidelines	$t(83) = -2.1, p = .04$	4.0	3.2	2.6	2.9
Financial cost	$t(99) = -2.3, p = .03$	5.0	3.4	3.4	3.3
the weather outside	$t(115) = -2.1, p = .03$	5.2	2.9	4.0	3.0
The outdoor lighting on campus (before dawn or after dusk)	$t(96) = -4.1, p < .01$	4.5	3.4	1.7	2.3
The availability of WSU police	$t(78) = -2.0, p = .05$	3.6	3.6	2.0	3.1
How much time being physically active takes away from my responsibilities (e.g., schoolwork, employment, familial commitments, etc.)	$t(141) = -2.3, p = .03$	7.1	2.8	6.0	3.2
How self-conscious I feel when I am physically active	$t(105) = -2.9, p < .01$	5.2	3.2	3.4	3.0
How skilled I think I am in the ways to be physically active	$t(95) = -2.6, p = .01$	4.3	3.1	2.8	2.7

### 3.3.6.2 Racial/Ethnic Minority Status.

An independent-samples t-test was conducted to compare the total barriers to physical activity scores for Non-Hispanic White/Caucasian students and racial/ethnic minority students.

Results of the Levene's test were significant ( $p < .01$ ) so equal variances were not assumed.

There was not a significant difference in scores between Non-Hispanic White/Caucasian students ( $M = 61.2, SD = 42.5$ ) and racial/ethnic minority students ( $M = 75.1, SD = 55.7$ );  $t(151) = -1.62, p = .10$ , two-tailed.

### **3.3.6.3 Academic Classification.**

A one-way between-groups analysis of variance (ANOVA) was conducted to explore the impact of academic classification (i.e., year in college) on total barriers to physical activity scores. Participants were divided into four groups according to their reported academic classification (Group 1: Freshman (0-29 credit hours); Group 2: Sophomore (30-59 credit hours); Group 3: Junior (60-89 credit hours); and, Group 4: Senior (90+ credit hours)). There was not a statistically significant difference in total barriers to physical activity scores for the academic classifications;  $F(3, 152) = 1.27, p = .27$ . This suggests that undergraduates do not necessarily experience barriers to physical activity differently depending on their year in college.

### **3.3.6.4 Housing Status.**

An independent-samples t-test was conducted to compare the total barriers to physical activity scores for undergraduates depending on their housing status. There was not a significant difference in scores between undergraduates who live on-campus ( $M = 79.3, SD = 11.4$ ) and those that live off-campus ( $M = 64.1, SD = 4.0$ );  $t(154) = 1.44, p = .15$ , two-tailed. This suggests that undergraduates do not necessarily experience barriers to physical activity differently depending on their housing status.

### **3.3.6.5 Meeting Guidelines v. Not Meeting Guidelines.**

An independent-samples t-test was conducted to compare the total barriers to physical activity scores for students who met the physical activity guidelines and those who did not. There was not a significant difference in scores for students who met the physical activity guidelines ( $M = 62.0, SD = 44.1$ ) and those who did not ( $M = 74.2, SD = 52.1$ );  $t(160) = -1.34, p = .18$ , two-tailed.

### **3.3.7 Research Question 7: Is there a relationship between WSU undergraduates' experiences of barriers and their level of physical activity?**

The relationship between undergraduates' total barriers to physical activity scores and their physical activity (as measured by total number of minutes engaged in moderate physical activity) was investigated using Pearson product-moment correlation coefficient. There was not a significant correlation between the two variables:  $r = .05$ ,  $n = 157$ ,  $p = .57$ ,  $r^2 < .01$ ; thus, there was not a reliable relationship between the degree to which students feel deterred by barriers and how many minutes they engage in physical activity.

#### **3.3.7.1 Sex.**

Pearson product-moment correlations were conducted to see if there was a relationship between female undergraduates' total barrier to physical activity scores and their physical activity; the same test was conducted to see if there was a relationship for male undergraduates. Both correlations were not statistically significant:  $r = .04$ ,  $n = 87$ ,  $p = .72$ ,  $r^2 < .01$  and  $r = .08$ ,  $n = 55$ ,  $p = .56$ ,  $r^2 < .01$ , respectively.

#### **3.3.7.2 Meeting the Guidelines v. Not Meeting the Guidelines**

The relationship between undergraduates' total barriers to physical activity scores and total physical activity (in minutes) for those students who did not meet the physical activity guidelines ( $n = 32$ ) was investigated using Pearson product-moment correlation coefficient. There was not a statistically significant correlation between the two variables:  $r = -.05$ ,  $n = 32$ ,  $p = .78$ ,  $r^2 < .01$ . Conversely, a Pearson product-moment correlation coefficient was used to test whether there was a relationship between total barrier scores and total physical activity for students who did meet the physical activity guidelines ( $n = 125$ ). There was not a reliable correlation:  $r = .15$ ,  $n = 125$ ,  $p = .10$ ,  $r^2 = .02$ .

### **3.3.8 Research Question 8: What are students' perceptions regarding their comfort with being physically active on campus?**

Wanting to better understand undergraduates' perceptions of the campus relative to physical activity, survey participants were asked to identify specific areas on campus they feel comfortable and uncomfortable engaging in physical activity. Using Qualtrics software's 'heat map' feature,<sup>18</sup> respondents were asked to select the specific areas (up to 10) on a map where they felt comfortable engaging in physical activity. Students who did not feel comfortable engaging in physical activity on campus were asked to leave the question blank. Figure 5 depicts the locations students selected, and Figure 6 depicts the heat map divided into 20 equal 'regions.'<sup>19</sup> Although students could not click on the same exact location (i.e., pixel) more than once, they were allowed to select a neighboring area on the map and/or the same region more than once. Therefore, a respondent could have selected the same region up to 10 times. Nevertheless, Qualtrics reports the region(s) with the most locations (i.e., pixels) selected by unique respondent. The most selected region—indicating that it was the area most respondents were comfortable engaging in physical activity—was Region #8 ( $n = 96$ ). The most notable landmark in Region #8, and the area with the largest cluster of responses (as indicated by the heat map in Figure 5),<sup>20</sup> is the Heskett Center (i.e., the main campus's formal recreational facility). Table 29 lists the regions by the number of times (in descending order) they were selected as a location student felt comfortable engaging in physical activity. Furthermore, the

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<sup>18</sup> For a step-by-step guide to Qualtrics Heat Maps, see Gorham and colleagues (2016).

<sup>19</sup> The map was divided into 20 equal regions prior to data collection.

<sup>20</sup> The intensity of the heat map coloring is relative to the number of unique respondents.

distribution of the heat map demonstrates that respondents selected locations on the map that were clustered more closely to the center of campus on the map.

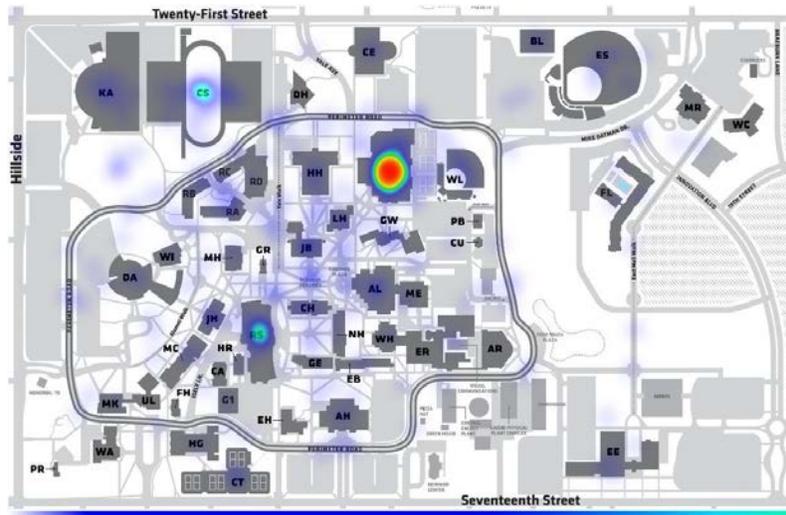


Figure 5. Heat map visualization of where undergraduates are comfortable engaging in physical activity

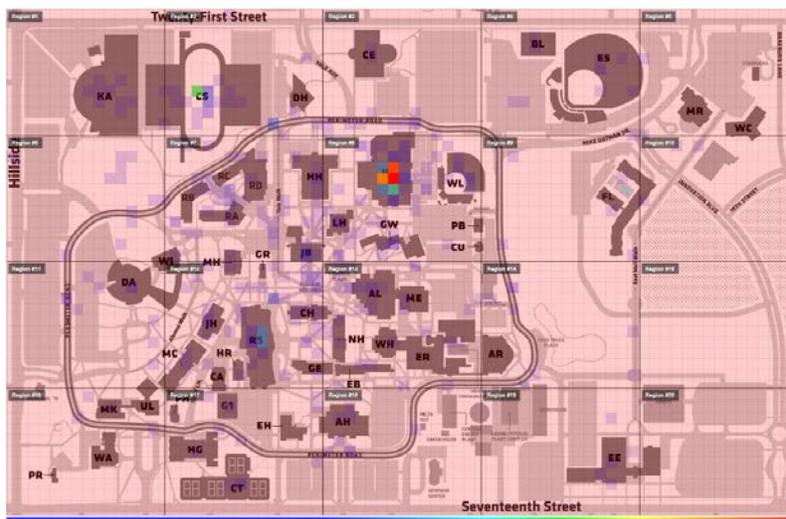


Figure 6. Heat map visualization of where undergraduates are comfortable engaging in physical activity with regions

When asked to explain why they felt comfortable engaging in physical activity in the selected locations, respondents cited several overarching reasons. The researcher organized the

reasons provided, regardless of the location on the map, into common themes. Among the reasons provided by respondents, the most frequently mentioned included:

- (1) familiarity with location/space (e.g., “This is the area I spend most of my time when I go to the main campus”) ( $n = 14$ );
- (2) the location is an intended space for physical activity (e.g., “I feel comfortable in these areas because they are meant to be worked out in”) ( $n = 14$ );
- (3) location/space feels safe (e.g., “The areas have good lighting and are patrolled frequently by campus police”) ( $n = 9$ ); and,
- (4) positive experiences/affect toward campus facilities/environment (e.g., “The Heskett Center is well-staffed and has nice work out machines”) ( $n = 8$ ).

Table 29

*Number of Locations (i.e., Pixels) Selected in ‘Comfortable’ Heat Map*

Region	Number of Clicks
#8	96
#7	37
#12	34
#2	31
#13	17
#1	11
#17	11
#18	11
#6	11
#3	10

TABLE 29 (continued)

#4	10
#11	9
#9	8
#14	7
#19	5
#16	4
#10	2
#5	1
#20	0
#15	0

Similarly, participants were asked to indicate the approximate geographic locations (up to 10) in which they felt uncomfortable engaging in physical activity. Students who did not feel uncomfortable engaging in physical activity on campus were asked to leave the question blank. Figure 7 depicts the locations students selected, and Figure 8 depicts the same locations students selected but divided into 20 equal ‘regions.’<sup>21</sup> The regions with the most locations (i.e., pixels) selected—indicating that they were the areas undergraduates were most uncomfortable engaging in physical activity—were Region #17 ( $n = 17$ ) and Region #8 ( $n = 16$ ). Based on the heat map, the largest cluster of responses in Region #17 appears around Coleman Tennis Complex and the largest cluster of responses in Region #8 appears around the Heskett Center. Table 30 lists the regions by the number of times (in descending order) they were selected as locations students felt

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<sup>21</sup> The map was divided into 20 equal regions prior to data collection.



When asked to explain why they felt uncomfortable engaging in physical activity in the selected locations, respondents cited several overarching reasons. Again, the researcher organized the responses into common themes. Among the reasons provided, the most frequently mentioned included: (1) location/space feels unsafe (e.g., “At night these places are not lit well and also seem to be far away from anyone if I needed help”) ( $n = 13$ ) and (2) social concerns/self-consciousness around others (e.g., “Mainly any place where students gather or walk commonly—I do not want to make a spectacle out of myself”) ( $n = 5$ ). During interviews, respondents also echoed sentiments that they felt relatively unsafe engaging in physical activity; particularly on the ‘outer edges’ of campus (i.e., outside of Perimeter Road):

- “Doesn’t walk on the out-skirts of campus;”
- “Female friend expressed that she doesn’t feel safe on campus sometimes; thinks she was referring to the surrounding areas (comments made right after bank robbery reported across campus);”
- “Avoids main roads;”
- “Stays closer to campus;” and,
- “Only participates in physical activity in center of campus (e.g., Heskett Center).”

Table 30

*Number of Locations (i.e., Pixels) Selected in 'Comfortable' Heat Map*

Region	Number of Clicks
#17	17
#8	16
#12	13
#1	13
#16	13
#13	13
#11	13
#18	12
#2	11
#4	11
#7	10
#6	9
#3	9
#19	8
#9	7
#5	7
#14	7
#20	4
#10	2
#15	2

## **CHAPTER 4**

### **DISCUSSION**

Overweight and obesity are national crises, and they affect millions of individuals, including college and university students. Overweight and obesity are often attributed to participation in unhealthy behaviors, among which are not engaging in adequate amounts of physical activity. Therefore, the purpose of this study was to examine the factors that deter students from engaging in physical activity on a university campus. In doing so, the information gained helps to understand why undergraduates do not engage in recommended levels of physical activity. Ultimately, this information should be utilized by stakeholders to prevent future incidence of overweight and obesity among young adults, and, theoretically, throughout their lives.

#### **4.1 Discussion of Methods**

##### **4.1.1 Benefits of Methods**

To better inform obesity prevention efforts targeted toward college and university students, the researcher explored the barriers preventing students from engaging in physical activity on a university campus with a higher number and a broader ecological scope of barriers than what previously existed in the body of research. Using the barriers previously examined in literature as a foundation, and further expanding the list using McLeroy and colleagues' (1988) ecological model, the researcher deliberately examined 30 barriers in total. Eben and Brudzynski (2008) critiqued prior researchers of barriers to physical activity for using close-ended methods, claiming those methods limit the scope of barriers that influence students' health behavior. However, the use of mixed methods in this research not only ensured thorough examination of barriers to physical activity—it also provided a mechanism for standardizing the measurement of

barriers to physical activity. Furthermore, the use of both quantitative and qualitative data collection provided highly descriptive results, triangulation of the findings, and a more exhaustive investigation than, arguably, any other study of barriers to physical activity among undergraduate students.

Since the researcher used simple random sampling for the survey, theoretically, results can be used to make inferences about undergraduates at universities similar in size and demographic composition. Nevertheless, caution should always be exercised when extrapolating findings, and the limitations of the research should always be considered when doing so.

#### **4.1.2 Limitations of Methods**

While the present study offers unique contributions toward understanding barriers to physical activity for college and university students, certain limitations deserve consideration. As such, interpretations of the data should be made with these limitations in mind. First, this study was self-report in nature. This characteristic is particularly troublesome for the self-reported measure of physical activity. In the collection of physical activity research, there are several methods for assessing physical activity (LaPorte, Montoye, & Caspersen, 1985), including both direct and indirect measures. Ideally, there would have been a method of identifying the number of minutes one engaged in physical activity that ensured accuracy. The researcher, however, was limited to indirect measures (i.e., self-report). Therefore, the research was open to students providing socially desirable or inaccurate answers. Furthermore, response selection could have influenced, and perhaps falsified, students' reported engagement in physical activity behavior.

Additionally, this research is limited in its understanding of what type of physical activity is stunted on campus. Sallis and Hovell (1990) proposed the determinants of different types of physical activities may be distinct from one another. In the quantitative portion of this study,

students were asked to report the number of minutes they engaged in both moderate and vigorous physical activities in a typical week. However, when students were asked to report the degree to which the listed factors deterred them from being physically active on campus, ‘physical activity’ was left undefined. It may be reasonable to assume that respondents were answering the questions about barriers in relation to moderate and vigorous intensity physical activities since they had been asked to report their total physical activity according to those categories prior to answering questions about barriers. Nevertheless, ‘physical activity’ was open to the respondents’ interpretation(s). Therefore, we do not definitively know what type of physical activity respondents were thinking of when they reported the factor(s) that deter them from being physically active on campus. However, the results from the semi-structured interviews could be used to confirm the likelihood that students were answering questions about barriers to physical activity on campus from a framework of moderate to vigorous intensity physical activity, even without prompting. During the interviews, the researcher intentionally did not define ‘physical activity’ for participants. In fact, the researcher had the participants define ‘physical activity,’ to which participants frequently cited descriptions that align with exercise-like behavior (i.e., deliberate/intentional movements that must incur physiological response, such as increased heartbeat, with the purpose of health and fitness) compared to more unintentional, light intensity physical activity. Therefore, regardless of not framing the assessment of barriers to moderate or vigorous intensity physical activity, there is probable cause that respondents did so on their own.

In addition to not specifying the type of physical activity the researcher wanted students to think about when assessing barriers, there were a couple technical issues on the instrument. If the instrument is used in the future, it will need to be refined; as it stands, the current findings are limited accordingly. First, there could have been an issue in the mechanics of the survey. The

mechanism for gathering the degree to which a barrier deterred a student from engaging in physical activity was on a 11-point scale (0 to 10). Students were asked to use a slider to indicate the degree to which they were deterred from engaging in physical activity on the campus based on the barrier in question. The slider defaults to appear as though it has been answered as “0—does not deter me at all.” Considering the lower response rate for some barriers, the researcher had suspicion that respondents thought they were answering “0—does not deter me at all” when, in fact, it was considered a missing case. If the researcher’s suspicions are founded, this would mean that some of the means might be somewhat ‘inflated’; however, the researcher does not have a way of knowing to what degree. Relatedly, the list of barriers respondents viewed was extensive. To offset the effects of selection bias based on respondent fatigue, the researcher should have randomized the presentation of the barriers. Unfortunately, this was not done, so the lower mean scores for barriers toward the end of the list (e.g., “my racial culture”, “my religious culture”) may be, at the very least, partially explained by attrition. These limitations, both individually and collectively, should be taken into account when considering the implications and the future research and advocacy opportunities associated with this study.

## **4.2 Findings**

Examining ways to prevent overweight and obesity on college and university campuses matters; and it matters for WSU undergraduates. The average reported weight for undergraduates was classified as overweight, and the median reported weight was considered nearly overweight. Furthermore, over four out of ten undergraduates were considered overweight or obese. The prevalence of overweight and obesity on this campus, combined with research which suggests lifelong physical activity patterns are developed in early adulthood (Buckworth, 2001),

emphasize the importance of primary prevention efforts for students as they enter and experience college.

#### **4.2.1 Research Question 1: Is there a relationship between undergraduates' physical activity and their BMI level?**

Despite the prevalence of overweight and obesity among WSU undergraduate students, the majority of respondents were physically active. Moreover, the majority met the physical activity guidelines (i.e., at least 150 minutes of moderate physical activity). In fact, students reportedly engaged in nearly 9 hours of moderate physical activity per week, which is approximately 3.5 times over what is required per week to achieve associated health benefits. Additionally, most students met the physical activity guidelines regardless of demographic variables (i.e., sex, academic classification, racial/ethnic minority status, and housing status).

The fact that the majority of students in this study were physically active is encouraging. It is even more encouraging considering there was an inverse relationship between physical activity and BMI levels in this sample. This suggests the more students engage in physical activity, the less their BMI level. Therefore, attempts to promote physical activity among undergraduates remains important. Nevertheless, the magnitude of the relationship between physical activity and BMI level reminds us that physical activity is just one of the factors leading to healthy weight for students. There are other contributing factors to BMI level that this study did not examine, such as nutritional/caloric intake and eating patterns (Mayo Clinic, 2015). As such, colleges and universities must continue to explore other reasons that could more significantly account for BMI level among their students in order to design impactful health programming.

Furthermore, the small relationship between physical activity and BMI level may further demonstrate how crude BMI level is as an indicator of health. As previously noted, self-reported overall BMI may be an unreliable measure, and thus, an inaccurate reflection of one's true health status. For example, athletes may be incorrectly categorized as overweight or obese, whereas their weight is largely contributed to muscle mass rather than adipose tissue. Therefore, the small relationship between physical activity and BMI level demonstrates a need for health stakeholders to continue exploring other metrics beyond overall BMI that may be more accurately indicative of one's health (e.g., weight circumference/abdominal obesity, etc.) (USDHHS NIH, n.d.-c).

#### **4.2.2 Research Question 2: Is there a difference in BMI level between those who meet the recommended level of physical activity?**

Whether or not a student met the physical activity guidelines was related to the student's BMI level. Moreover, meeting the guidelines accounted for 18% of the variance in BMI level. This large effect size means, beyond encouraging undergraduates to generically engage in physical activity, college and universities can promote physical activity with a specific goal in mind. More specifically, colleges and universities can design health programming and intervention with the purpose of helping students engage in enough physical activity to satisfy the physical activity recommendations related to their BMI.

#### **4.2.3 Research Question 3: What is the current proportion of undergraduates that are engaged in the recommended level of physical activity?**

Four out of five undergraduates in our sample met the physical activity guidelines. These findings were notably high, and somewhat surprising since 44% of the survey respondents were classified as either overweight or obese. Furthermore, according to Healthy People 2020 (2017), 62% of individuals aged 18-24 engaged in at least 150 minutes of physical activity (or the

vigorous equivalent) each week. Most studies regarding perceived barriers to physical activity, however, do not provide further contextualization of these findings for any combination of the following reasons: (1) they did not report the proportion of students that participate in physical activity (Rodenabugh, 2016); (2) they studied the proportion of students who participate in a different intensity type of physical activity than in this study (e.g., vigorous intensity only, light intensity) (Gyuresik et al., 2004); (3) they only studied physically *inactive* students (Daskapan et al., 2006); (4) they studied an international population (Awadalla et al., 2014; Öcal, 2014); or, (5) they studied different physical activity guidelines than this study (El-Gilany et al., 2011).

Although most research literature cannot contextualize the present study's finding, the instrument used in the present study may. Despite respondents having access to the CDC's definitions for moderate and vigorous physical activity (see Appendix A), the definitions and examples may not have been prescriptive enough for students to accurately report their current level of physical activity. As a result, students may have identified certain activities as 'moderate' or 'vigorous' physical activity when they are, in fact, not. However, Brown (2005) similarly found his sample of college students participated in an excess of physical activity beyond the physical activity guidelines; they participated in 8.2 hours of moderate physical activity each week. Furthermore, although not entirely synonymous, 78% of Ebben and Brudzynski's (2008) sample reported exercising. Therefore, although the proportion of students who meet the physical activity guidelines may be higher in this study compared to national averages, other studies have also examined the effects of perceived barriers to physical activity among equivocally active samples.

#### **4.2.4 Research Question 4: Are there differences between the undergraduates who meet the recommended level of physical activity and those who do not?**

Results did not indicate any significant differences between undergraduates who do and do not meet the physical activity guidelines on any demographic variables examined (i.e., age, academic classification, racial/ethnic minority status, housing status). Thus, we can conclude that the distribution of undergraduates who meet the guidelines in these categories is similar to those who do not meet the guidelines in these categories. As such, these findings suggest no one particular grouping of students, based on the variables in question, experiences greater difficulty meeting the physical activity guidelines. Hence, adjusting physical activity promotion strategies on this campus based on these variables seems unnecessary.

#### **4.2.5 Research Question 5: What are the top barriers to physical activity experienced by undergraduates?**

This research posits an ecological understanding of the perceived barriers to physical activity on campus is the first step toward promoting physical activity behavior on WSU's campus. Overall, in both the quantitative and qualitative data, undergraduates reported several factors deterred them from being physically active on WSU's campus. This alone suggests undergraduates believe there are multiple factors making it difficult for them to engage in physical activity on campus.

Still, it was surprising to see mean perceived barriers to physical activity scores for most factors, and the mean total perceived barriers to physical activity score was low, particularly considering the total possible score (i.e., 300). There are a few possible explanations for why students had low scores. First, answers may have been prone to social desirability bias; students may have not wanted to report negative opinions about how their university limits their behavior.

Second, although the survey drew from a random sample, there was still the chance of self-selection bias, such as in cases where students who were already physically active may have been more apt to submit feedback because of the topic's relevance to their current behavior and/or interests. As a result, students who responded to the survey may naturally have had lower total barrier scores because they already engage in the recommended level of physical activity. Third, data collection only occurred at one point in time, and it occurred near in time to students' spring break. Therefore, students' barrier scores only represent one 'snapshot' of reported experiences. Further, these scores potentially reflect students' reported experiences during a time when they may have been engaging in higher bouts of physical activity than what is typical. As a result, students' perceived barriers to physical activity scores may have been distorted by their current behavior. Without collecting this data at multiple points in time, the researcher cannot speak to the reliability of these barrier scores; however, this reason may explain the low scores. Lastly, the mean barrier scores may have been low because the examination of barriers was limited to a particular setting (i.e., the university campus). Students may have not reported higher mean barrier scores because they were solely answering what deters them from being physically active in one location (as intended), rather than what deters them from being physical active in general.

Regardless of the interpretation, these findings are not entirely unexpected compared to past research. Lovell and colleagues (2010) found reported mean scores for all the barriers (i.e., physical exertion, time expenditure, exercise milieu, and family discouragement) ranged from 2 (Agree) to 3 (Disagree) (on a 4-point scale), which was interpreted by the authors to mean "neutral." Additionally, Kulavic and colleagues (2013) found students' mean scores were not higher than 5.0 (out of a possible 9.0) on any barriers examined (i.e., meaning none of the

barriers were considered “major barriers” for the sample). Similarly, this study adds to the body of research that suggests undergraduates may experience a high quantity of barriers but do not experience a high magnitude of impact overall.

Despite lower average barriers to physical activity scores, some barriers were perceived as having a greater impact than others. When looking at the mean scores for barriers, whether undergraduates met the physical activity guidelines or not, they agreed that “the amount of coursework I have” and “how much time being physically active takes away from my responsibilities (e.g., schoolwork, employment, familial commitments, etc.)” are the top two barriers to physical activity on campus. This finding is congruent with many findings related to the perceived barriers and/or deterrents associated with physical activity. In a qualitative study of undergraduates, Ebben and Brudzynski (2008) found reasons associated with “time” and “other priorities” were the among the top three barriers to physical activity identified. Additionally, they found three out of the top four reasons that would lead exercisers to exercise more were related to time and coursework (e.g., “more time,” “less schoolwork,” “fewer time commitments”). Other studies found congruent results, citing a lack of time as the most common barrier reported by students (Awadalla, et al., 2014; Gómez-López et al., 2010; Daskpan et al., 2006; Gyurcsik et al., 2004; Grubbs et al., 2002).

The importance of time and having other responsibilities also emerged as a theme in the qualitative data collection. During interviews, convenience (e.g., the time physical activity takes and the time it takes away from other things) and competing priorities (e.g., coursework, studying) were identified as barriers to physical activity for students; however, convenience and competing priorities were not the most prevalent themes to emerge from interviews. This difference may be interpreted by two particular comments provided during the interviews: “[The]

amount of coursework is used as a ‘catch-all’/excuse,” and “[The] time it [physical activity] takes away from responsibilities—for the majority of people, this is probably used as an excuse rather than a deterrent—what’s 15 minutes in a 24 hour day?” However, all interviews mentioned convenience. More specifically, they mentioned time as a function of convenience was a barrier to physical activity on campus. Additionally, convenience was considered the most prevalent ‘minor’ theme to emerge. Further, 5 out of 7 interviews mentioned competing priorities as a barrier. Therefore, despite convenience and competing priorities not being the most frequently discussed barriers during interviews, the majority of participants identified them as barriers. Additionally, since the time physical activity takes away from students’ other priorities and coursework were barriers displayed in both quantitative and qualitative results, there is sufficient evidence to suggest this is one of the most important factors for undergraduates.

Beyond the top barriers demonstrated in the survey, the most prevalent themes discussed during interviews were issues with the built environment, the formality of physical activity, and socio-cultural influences. There were several issues with the built environment discussed during interviews, many of which were also explored during the survey (e.g., “the variety of physical activity options,” “the number of places to be physically active,” “the atmosphere of the places to be physically active,” “how competitive physical activities are,” “the condition of the places to be physically active,” “operating hours of the places to be physically active,” “the physical layout of campus,” “the visual appearance of campus,” “outdoor lighting,” and “how safe I feel”). The range of scores received on the survey, and the breadth of facets discussed during the interviews, suggests that undergraduates are sensitive to issues with the campus’ design and its recreational facilities. Moreover, both survey and interview results indicated ‘atmosphere’-related issues were the most prominent issues with the built environment. These findings suggest

undergraduates perceive themselves as relatively deterred, particularly by the campus's atmosphere, from being physically active as a result of issues with the campus design and its recreational facilities.

The formality of physical activity was both an interesting and novel finding of this research. This finding may suggest that students are deterred from being physically active on campus and/or in general, because of the way they conceptualize 'physical activity.' If students believe that, in order for movements to count as physical activity, they have to perform a high intensity activity or they must perform formal exercise techniques/routines, they may be hindered from engaging in those behaviors and/or other physical activity. Students may feel as though they are unable to do high intensity activity (e.g., due to disability, lack of skill, etc.) or they simply do not want to; if those are the only activities that count as 'physical activity,' then why try other forms of physical activity (e.g., light intensity physical activity, unintentional physical activity)? Since the formality of physical activity was not included in the quantitative examination of barriers, future research would benefit from adding this construct to the list of examined barriers.

Lastly, socio-cultural influences were found as a prevalent barrier to physical activity like other studies (Öcal, 2014; Daskapan et al., 2006; Ebben & Brudzynski, 2008; Gyurcsik et al., 2004; Leslie et al., 1999). Socio-cultural influences were not as influential in the survey as they were during interviews; however, the survey largely examined socio-cultural influence from the perspective of social relationship influence (i.e., peers, family) and cultural influence (i.e., racial culture, religious culture). While the importance of social encouragement was identified as a barrier during interviews, interviews revealed the greatest socio-cultural deterrent for undergraduates is feeling pressured or uncomfortable by the presence of others while being

physically active. This construct most closely aligns with “how self-conscious I feel while being physically active,” which was the seventh highest rated barrier by undergraduates overall in the survey; in contrast to “my peers” or “my family,” which were 18<sup>th</sup> and 21<sup>st</sup> respectively.

Collectively, these results lead the researcher to interpret time physical activity takes away from other responsibilities, competing priorities, issues with the campus’s built environment (specifically the atmosphere of the campus), the formality of physical activity, and social-cultural influences (specifically feeling uncomfortable around others/self-conscious) as the top barriers to physical activity on WSU’s campus.

#### **4.2.6 Research Question 6: Are there differences in the degree to which undergraduates experience barriers to physical activity?**

In this study, a mean barrier score at five or above signified the factor “somewhat deterred” students. Students who did not meet the physical activity guidelines indicated more barriers “somewhat deterred” them from being physically active compared to students who did meet the physical activity guidelines. In particular, students who did not meet the guidelines were more uniquely concerned with “the amount of time being physically active takes away from free time,” “weather,” “how self-conscious they feel while being physically active,” and “cost.” Conversely, students who met the guidelines indicated they were more deterred by the atmosphere of the places they could be physically active than students who did not meet the guidelines.

Despite students who did and did not meet the physical activity guidelines having slight differences in their mean barrier scores, results did not demonstrate reliable differences in total barrier scores between students based on most demographic variables. Of the demographic variables under examination (i.e., sex, racial/ethnic minority status, academic classification,

housing status), participants' sex was the only variable to demonstrate reliable differences. More specifically, female respondents indicated higher total barrier scores than male respondents. This means females perceive the factors examined as more of a deterrent to physical activity on campus than male respondents do. This finding is consistent with, and confirmatory of, most previous studies that examined sex/gender differences (Gómez-López et al., 2010; Daskapan et al., 2006). The results from the independent t-tests indicated several reliable mean differences between females and males. However, results for only two barriers remain reliably significant with a Bonferroni Correction: (1) "the outdoor lighting on campus (before dawn or after dusk)" and (2) "how self-conscious I am." Therefore, females may be uniquely concerned with the outdoor lighting on campus (presumably for safety reasons) and feeling self-conscious while being physically active on campus. These results, largely, suggest interventions to maintain and increase physical activity do not need to factor in students' demographic characteristics and thus, can be widely applied; however, programming which addresses differences in male and female experiences, particularly on these two variables, may be beneficial.

#### **4.2.7 Research Question 7: Is there a relationship between WSU undergraduates' experiences of barriers and their level of physical activity?**

As previously discussed, undergraduates did not indicate being heavily deterred from physical activity on campus, despite recognizing and identifying multiple factors as deterrents. Furthermore, there was no reliable relationship between perceived barriers and physical activity. Although this study was exploratory by nature, this finding was still somewhat surprising considering other researchers found significant negative relationships between perceived barrier scores and physical activity in among college students (Kulavic et al., 2013; Von Ah et al., 2004), and repeated negative associations are found more broadly in the literature (Sallis &

Owen, 1999). Yet, even when Kulavic and colleagues (2013) found significant negative relationships between barrier scores and physical activity, not all of the perceived barriers studied were associated with physical activity. Further, Sallis and Owen (1999) stated, “no single variable or category explains most adult physical activity or exercise.” As such, one should consider the five following interpretations when trying to understand why there was not a relationship between physical activity and perceived barriers to physical activity on campus scores. First, this finding could suggest there is still a potential relationship between perceived barriers on campus and physical activity, but not with the barriers we examined. As previously mentioned, Brown’s (2005) study of perceived benefits and perceived barriers of physical activity also did not demonstrate a significant correlation between perceived barriers and physical activity. Brown explained that the perceived barriers examined (Table 8) may not have been relevant to the college-aged population, and thus his findings may have been expected. However, unlike Brown (2005) and other research with this population, this study was a more exhaustive examination of perceived barriers. Nonetheless, the qualitative results revealed perceived barriers not included in the survey instrument (e.g., the ability to use certain facilities on campus, the visibility of the school’s health promotion, fatigue, motivation levels, the formality of physical activity), and, thus, also not included in the correlation analysis. Therefore, undergraduates’ physical activity may still be related to their perceived barriers, but just not those considered in this study.

Second, this finding could suggest there is still a potential relationship between perceived barriers on campus and physical activity, but not all barriers we examined. In this study, the relationship between perceived barriers and physical activity was treated as unidimensional (i.e., we examined the relationship between one total barrier score and physical activity rather than the

relationship between factors and physical activity). It was not until Myers and Roth (1997) divided a unidimensional benefits and barriers construct into subscales that they noticed subtle differences in benefit and barriers scores across stages of exercise adoption. Therefore, findings may have been different if perceived barriers had been treated as multidimensional constructs or factors. Future study may benefit from this approach to reevaluate the influence of perceived barriers and physical activity in this sample.

Third, despite having applied an ecological framework to the assessment of perceived barriers, this study still largely focused on individual factors. Since the data relied entirely on perceptions of barriers, data was collected at the intrapersonal level rather than an environmental or an ecological level. Therefore, quite simply, undergraduates' perceptions might not be related to their behavior. More specifically, how deterred one feels—or how deterred one thinks they are—from engaging in physical activity on campus does not have bearings on their physical activity.

Fourth, perceived barriers may be associated with college undergraduates' physical activity behavior; however, they are not associated with students' physical activity within this sample. Similar to Brown's (2005) study, the sample members were fairly physically active. Brown (2005) explained that, since potential participants were given a description of the study, those with a proclivity toward physical activity may have been drawn disproportionately to participate. Regardless of utilizing random sampling techniques and attempting to solicit participation from students with an array of physical activity profiles, the sample may not be representative of the college population.

Fifth and lastly, WSU students' level of physical activity may not have been related to their perceived barrier scores because students' perception of barriers was limited to a setting

(i.e., campus), whereas their physical activity (in minutes) was not. Therefore, this interpretation simply suggests that one's physical activity may be related to perceived barriers, but the relationship is domain-specific. This means, perceived barriers in one setting (i.e., a university campus) does not necessarily mean students experience those same barriers, and to the same degree, in another setting (e.g., YMCA, off-campus gym, home/apartment gym, etc.). As such, we should not expect how deterred one feels on WSU's campus to be related to their total physical activity, which may include both on- and off-campus behavior. The researcher is more favorable to this latter interpretation considering most respondents chose an off-campus location (e.g., off-campus recreation facility, house/apartment) as their primary location for physical activity. Therefore, students' assessments of how they are deterred on campus do not influence their level of physical activity elsewhere; however, they may be associated with *why* they are physically active somewhere else.

If one chooses to adopt this fifth interpretation, the quantitative and qualitative findings (i.e., barriers to physical activity on campus) should not be used to interpret why students are or are not physically active in general. Rather, the barriers to physical activity scores and the emerging themes could be used to better understand why students do not engage in physical activity on campus. As such, the findings now suggest that despite all the other reasons that could deter students from being physically active on campus, the most influential barrier could be engaging in physical activity at an off-campus location (i.e., an alternative and, perhaps, more desirable location).

There are several reasons grounded in our findings that would suggest why students choose another location to engage in physical activity. First, students were largely concerned with their coursework and the time physical activity takes away from other responsibilities. This

tells us that the ‘typical’ undergraduate at WSU perceives they lack time to do all the things they need and/or want to do. As such, students may be more particular about where they spend their time, as they try to maximize the benefit they receive from that location. Second, students reported several issues with Wichita State’s built environment, and they particularly highlighted issues related to the atmosphere of the campus and the atmosphere of its recreational facilities. If students already approach the decision of where they want to spend their limited time with heightened scrutiny, they may be less inclined to spend time somewhere they feel is uncomfortable, is aesthetically unpleasing, is crowded, is not intended for them, or is simply not intended for physical activity in the first place. Third, students defined and discussed physical activity in a formal sense, relaying to the researcher that students believe there are locations deliberately intended for physical activity, and they do not perceive WSU as one of those places. Lastly, the findings suggest that students may feel self-conscious being physically active on campus; thus, they choose to be physically active elsewhere.

#### **4.2.8 Research Question 8: What are students’ perceptions regarding their comfort with being physically active on campus?**

Finally, the heat map information further confirms that students’ most influential barrier to physical activity on campus is the campus itself. Most respondents indicated at least one location on campus they feel *comfortable* engaging in physical activity; this was not the case when asked to indicate the spots respondents feel *uncomfortable* engaging in physical activity. Nevertheless, there were far fewer areas identified as general spots undergraduates feel comfortable in comparison to the number of general spots undergraduates feel uncomfortable. Therefore, these findings help to contextualize why students may be choosing to engage in physical activity somewhere other than WSU’s campus.

## **4.3 Future Research and Action**

### **4.3.1 Ways to Expand the Research**

Despite overweight and obesity prevention and physical activity promotion having captivated researchers for decades, there is still room to expand its study. Above all, there is a need for a standardized mechanism for assessing physical activity, including how it is measured and how it is impacted by a broad array of perceived barriers to physical activity. The methods employed to study determinants of physical activity behavior have been diverse, and, thus, so have the findings. As a result, it was challenging to compare the findings of this study to those in the past. Yet, these frustrations have been shared long before this research. Dishman and colleagues (1985) explain:

Because most available research has been pragmatic, not theoretical, in origin, data have been generated by different methods, from different populations, with somewhat different outcomes in mind. Therefore, there is little standardization in defining and assessing determinants and physical activity. Also, the variables studied, and time frames sampled are inconsistent across population segments and settings. Thus, it is difficult to make comparisons among studies (p. 161).

In the future, researchers should dedicate their efforts toward creating an even more exhaustive instrument that can be used to more uniformly examine this phenomenon across different college and university campuses. Standardized instrumentation would provide more systematic methodology, which the researcher posits would lead to increased assurance of findings that can be generalized across college/university populations, as well as those that are unique to particular settings and samples.

Second, more research is needed to understand the variables that more reliably account for BMI levels. This research revealed that physical activity is related to undergraduates' BMI; however, it had a small relationship. As such, efforts to maximize physical activity are worthwhile, yet incomplete, without addressing other factors related to BMI. Other research literature communicates that nutritional intake and eating patterns, among other factors, are associated with BMI. Accordingly, future research should examine physical activity behaviors in conjunction with these factors to examine the prevention of overweight and obesity among college and university students.

Perhaps more importantly, stakeholders should continue to engage in discourse surrounding the usefulness of BMI level as an indicator of health and/or health risk, particularly knowing BMI level is, at best, an *estimate* of body fat. Therefore, stakeholders should continue researching alternative measures that may be more useful (e.g., weight circumference/abdominal obesity), all the while seeking to make known alternative indicators of body fat (e.g., Densitometry, Dilution Method, etc.) more accessible to community practitioners. In the meantime, stakeholders should exercise caution when developing interventions aimed solely at reducing BMI level. While stakeholders should remain interested in reducing and preventing body fat, perhaps their interventions should incorporate multiple measures. Also, stakeholders should develop and/or implement health programming with broader health outcomes and objectives (e.g., physical health, self-esteem, sense of community, etc.)—for example, programs like the Health at Every Size program (Bacon, 2010).

Additionally, there is a need to identify ecologically-based and community-founded interventions to address barriers to physical activity, particularly for females. Research should also begin moving toward more action-oriented studies which evaluate the effectiveness of such

interventions. The decades of research surrounding perceived barriers to physical activity has regularly shown gender differences, with women reporting higher barriers to physical activity. These results, including those from this study, should prompt researchers and practitioners to test interventions intended to dismantle barriers to physical activity for women. The research questions then become less about, *What barriers plague students, particularly females?*, and more about, *Are our efforts to address those barriers having an impact?*

Lastly, the approach utilized for this research was needs-focused as opposed to asset-focused. The majority of the sample under review met the physical activity guidelines. Future research could benefit from researching what factors facilitate, rather than deter, physical activity both on- and off-campus. Asset-based models of research and intervention might be of particular interest and of mutual benefit for many colleges/universities who are limited in the ways they are able to address barriers.

#### **4.3.2 Ways to Respond**

Ultimately, community-oriented research should also be action-oriented. Therefore, WSU administration and stakeholders should utilize this research to help identify a strategic vision for making the campus a more appealing location for physical activity to undergraduates. In March 2017, WSU announced plans to build a new YMCA on its “Innovation Campus” as an attempt to update the recreational facilities available to enrolled students and to market the campus to prospective students (Voorhis, 2017). This research, however, suggests most students do not utilize the campus for physical activity, and there are several locations on campus that make students feel uncomfortable engaging in physical activity. Therefore, the university should continue to monitor such efforts to make campus improvements that encourage students to engage in physical activity on-campus. This study suggests that the university needs to couple

this multi-million-dollar effort to upgrade facilities with other initiatives to address additional barriers to physical activity on campus.



*Figure 9.* Planned YMCA facility for WSU's campus (KWCH12, 2018)

Additional initiatives to address the many perceived barriers to physical activity on-campus that surfaced in this study could be developed using McLeroy and colleagues (1988) *Ecological Model of Health Promotion Interventions* (Figure 4). Some possible components of such an ecological intervention on Wichita State University's campus might include:

- host university-wide events (e.g., Convocation) and/or workshops on-campus that promote awareness of opportunities students can access to incorporate physical activity into their everyday lives, including 'informal' physical activity (e.g., parking farther away, not using the WSU shuttle system between classes);
- equip students with time management skills for balancing the competing priorities they experience (e.g., academic coursework, work, familial responsibilities, social lives, etc.);
- partner with instructors/professors to incorporate more physical activity into their instructional methods and coursework assignments;

- develop convenient physical activity opportunities (e.g., walking paths that are sheltered from the weather elements) such that students can effortlessly incorporate physical activity into their daily, on-campus routines;
- encourage student organizations (e.g., Student Government Association, Greek Life, etc.), of which students are already members, to conduct their meetings and to host events with a physical activity component such that students participate in physical activity just by attending;
- promote cultural/societal values and community norms centered around self-care and balance over busyness and industry such that students are equally likely to adopt health promotion behaviors;
- commit to a tuition cap to reduce the financial burden on students such that they feel less burdened to work while in school and have more free-time to spend on-campus;
- create a policy that students must enroll in a determined number of physical activity credits per semester (i.e., equivalent to a gym class requirement in secondary school);
- restructure old infrastructure and design new infrastructure such that students' classes are not 'clustered' in the same places to increase students' familiarity and comfort with the places on campus, as well as to facilitate movement;
- remove mirrors from shared exercise facilities; and/or,
- incentivize students to live on-campus, to take classes on-campus, and to engage in physical activity on-campus.

In the case of this study, components aimed to address female undergraduates' concerns with safety on campus and feelings of self-consciousness should also be incorporated in an intervention purposed to increase and maintain physical activity on-campus. As such, the university might consider these strategies:

- increase the presence of WSU police staff patrols on-campus;
- install security features (e.g., phones, notification systems, security cameras, etc.) around campus;
- organize opportunities for discourse around cultural and societal pressures (e.g., Brown Bag Lunches), including but not limited to physical appearance; and/or,
- facilitate students' involvement in other health programming that focuses on health from multiple angles, such as building healthy relationships with food and physical activity, self-esteem, self- and body-image (e.g., the Health at Every Size program, The Body Project).

Although these lists are nowhere near exhaustive, they represent examples of strategies that could be used to combat many of the prominent perceived barriers to physical activity respondents indicated. Additionally, these strategies are suggested with the intent of intervening at multiple points within the ecology (McLeroy, Norton, Kegler, Burdine, & Sumaya, 2003) that contributes to physical inactivity among WSU undergraduates. Ultimately, while the intervention(s) designed to increase and maintain undergraduates' participation in physical activity should be ecological in nature, they should also be community-based. Therefore, the researcher ultimately recommends the university exercise genuine stakeholder engagement and collaboration to further design, implement, and evaluate any ecological interventions purposed to increase and maintain physical activity among WSU undergraduates.

## CHAPTER 5

### CONCLUSION

Health stakeholders should be particularly concerned with the prevention of overweight and obesity during young adulthood. Historically, research has examined perceived barriers to physical activity in pursuit of overweight and obesity prevention. Overall, the information gained in this study suggests that there are many perceived barriers to physical activity for college undergraduates, and these barriers are best examined using an ecological framework. Nevertheless, some barriers are more influential than others. Through analyses across methods, coursework, time physical activity takes away from other responsibilities, issues with the built environment, formality of physical activity, and socio-cultural influences were found to be the most influential in this study. Although undergraduates highlighted these barriers more than others, no perceived barriers under review were related to participants' level of physical activity. This finding, coupled with the fact that most students primarily engage in physical activity at an off-campus location, tell us more about why students are not physically active on their university's campus than about physical activity in general. If the administration would like to encourage students to utilize campus space for physical activity, they can use these findings as a starting point for developing community-based strategies and interventions.

Even though perceived barriers to physical activity on this campus were not related to students' physical activity behavior, this examination of the barriers to physical activity adds to the current body of literature. Moreover, it provides one of the most comprehensive examinations of perceived barriers within a college population to date. After decades of research in this area, stakeholders should collaborate to standardize assessment methods of perceived barriers to physical activity so comparative analysis is possible. Additionally, researchers should

continue to examine other factors that may have a stronger relationship with and a greater impact on undergraduates' BMI levels.

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## APPENDICES

## APPENDIX A

### PERCEIVED BARRIERS TO PHYSICAL ACTIVITY ON WSU'S CAMPUS QUESTIONNAIRE

#### **Q1 Please tell us what may make it difficult for WSU students to engage in physical activity and help create a healthier campus!**

We are contacting you because you are an undergraduate student currently enrolled at Wichita State. We are recruiting research participants to help us identify the barriers at Wichita State that deter physical activity. Participation involves completing a survey that will take about 15 minutes. **We encourage you to take this survey using a computer rather than a mobile device.**

There are no anticipated risks to participating in this study. However, if you feel uncomfortable with a question, you may skip it. Participation is voluntary, and you can stop taking the survey at any time. Participation or declining to participate will have no impact on your academic evaluations.

We will work to make sure that no one sees your survey responses without approval. But, because we are using the Internet, there is a chance that someone could access your online responses without permission. In some cases, this information could be used to identify you.

If you have any questions or experience any technical difficulties while taking this survey, please contact the researchers conducting this study, Charles Burdsal (charles.burdsal@wichita.edu) or Hannah White (hannah.white@wichita.edu). For questions about the rights of research participants, you may contact the Office of Research and Technology Transfer at Wichita State University, 1845 Fairmount Street, Wichita, KS 67260-0007, and telephone (316) 978-3285.

You are under no obligation to participate in this study. By selecting "Yes" below, you are indicating that:

- You have read (or someone has read to you) the information provided above,
- You are aware that this is a research study, and
- You have voluntarily decided to participate.

**I have read the above and I would like to provide my input about physical activity on Wichita State's campus:**

Yes

No

APPENDIX A (Continued)

Q2 I am at least 18 years of age.

Yes

No

---

Q3 I would like to have a copy of the Consent Form emailed to me.

Yes

No

---

APPENDIX A (Continued)

Q4 Including this semester (Spring 2018), how many semesters have you been enrolled at WSU?

- 1 (this is my first semester)
  - 2
  - 3
  - 4
  - 5
  - 6
  - 7
  - 8
  - 9
  - 10 or more
- 

Q5 Have you taken at least one class on Wichita State's main campus (located at 1845 N. Fairmount Street)?

- Yes
  - No
-

APPENDIX A (Continued)

Q6 What is your current height in feet and inches?

For example, if you are 5 feet 8 inches tall, you will type 5 in the feet box and 8 in the inches box.

Feet \_\_\_\_\_

Inches \_\_\_\_\_

Q7 What is your current weight in pounds?

Please type in a whole number (e.g., 150) and **do not** include any words (e.g., lbs, pounds).

\_\_\_\_\_

Q8 How important is physical activity to you?

Not at all   Slightly   Moderately   Very   Extremely  
important   important   important   important   important

0   1   2   3   4   5   6   7   8   9   10



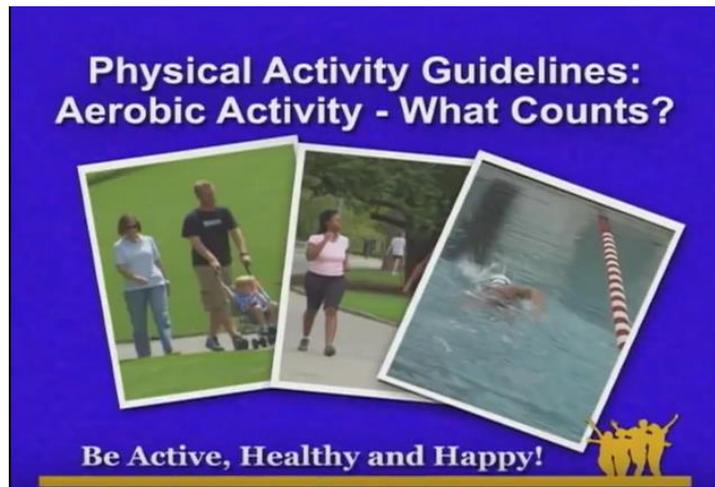
APPENDIX A (Continued)

Q9 Thinking about your current level of physical activity, to what degree do you desire to be more or less physically active?

- I desire to be a great deal less active
  - I desire to be somewhat less active
  - I desire to be neither less nor more active
  - I desire to be somewhat more active
  - I desire to be a great deal more active
- 

Q10

**Please watch this short video to help you answer the following questions.**



APPENDIX A (Continued)

**Q11 How to tell if you're doing moderate physical activity:**

Moderate physical activity will raise your heart rate and cause you to break a sweat. While it is possible to still talk relatively "normally" while engaging in moderate physical activity, you would not be able to sing.

Examples of moderate physical activity:      Brisk Walking      Dancing      Shooting  
Baskets

---

Q12 During a typical week, how many minutes do you engage in moderate physical activity?

(e.g., If you engage in 1 hour of moderate physical activity every day, then you would multiply 60 minutes x 7 days = 420 minutes)

---

**Q13 How to tell if you're doing vigorous physical activity:**

Vigorous physical activity will raise your heart rate quite a bit, causing it to beat hard and fast, and it will cause you to sweat. While engaging in vigorous physical activity, you would not be able to say more than a few words without taking a breath, let alone sing.

Examples of moderate physical activity:      Jogging/running      Playing a basketball game  
Jumping rope      Swimming laps

---

Q14 During a typical week, how many minutes do you engage in vigorous physical activity?

(e.g., If you engage in 1 hour of vigorous physical activity every day, then you would multiply 60 minutes x 7 days = 420 minutes)

---

APPENDIX A (Continued)

Q15 Where is the primary place that you currently engage in physical activity?

- On-campus recreation facility (e.g., Heskett Center, Intramural Fields)
  - Off-campus recreation facility (e.g., YMCA, Gym, Cross-fit)
  - House/ apartment
  - Outdoor space (e.g., park)
  - Does not apply- I am not currently physically active
- 

Q16 Have you ever used WSU's on-campus recreational facilities (e.g., Heskett Center, Intramural Fields)?

- Yes
  - No
- 

Q17 Are you currently participating in any organized sports (i.e., either a sport affiliated with WSU or a sport not affiliated with WSU)?

- Yes
  - No
-

APPENDIX A (Continued)

Q18 What type(s) of physical activities do you primarily do on WSU's main campus? Select all that apply.

- Aerobics
- Archery
- Badminton
- Baseball
- Basketball
- Biking/cycling
- Dance (ballet, line, ballroom, etc.)
- Fencing
- Fitness classes (e.g., Bootcamp, Zumba, etc.)
- Football
- Golf
- Gymnastics
- Jogging/running
- Lacrosse
- Martial Arts

APPENDIX A (Continued)

- Playing Frisbee (including Frisbee golf or Ultimate Frisbee)
- Pilates
- Rock climbing
- Roller skating/blading
- Rowing/canoeing
- Rugby
- Skateboarding
- Soccer
- Softball
- Spikeball
- Swimming
- Tennis
- Volleyball
- Walking
- Water aerobics
- Water polo

APPENDIX A (Continued)

- Weight training
  - Wrestling
  - Yoga
  - Other \_\_\_\_\_
  - Other \_\_\_\_\_
  - Other \_\_\_\_\_
-

APPENDIX A (Continued)

Q19 Please use the slider to indicate the degree to which the following factors have or have not deterred you from being physically active on Wichita State's main campus.

0 = Does not deter me at all    5 = Somewhat deters me    10 = Deters me a lot

Q20.

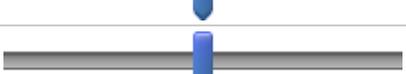
	<b>Does not deter me at all</b>	<b>Somewhat deters me</b>	<b>Deters me a lot</b>								
	0	1	2	3	4	5	6	7	8	9	10
The variety of physical activity options											
The number of places I can be physically active											
The atmosphere of the places where I can be physically active											
How competitive I feel the opportunities to be physically active are											
The condition of the places where I can be physically active (i.e., how up-to-date, how maintained)											

APPENDIX A (Continued)

Q21 Please use the slider to indicate the degree to which the following factors have or have not deterred you from being physically active on Wichita State's main campus.

0 = Does not deter me at all    5 = Somewhat deters me    10 = Deters me a lot

Q22.

	<b>Does not deter me at all</b>	<b>Somewhat deters me</b>	<b>Deters me a lot</b>									
	0	1	2	3	4	5	6	7	8	9	10	
The financial cost (e.g., membership fees, clothing, equipment)												
The operating hours of campus recreation facilities (e.g., Heskett Center, Intramural fields)												
The physical layout of campus												
The visual appearance of campus												
The availability of the WSU shuttle system												

APPENDIX A (Continued)

Q23 Please use the slider to indicate the degree to which the following factors have or have not deterred you from being physically active on Wichita State's main campus.

0 = Does not deter me at all    5 = Somewhat deters me    10 = Deters me a lot

Q24.

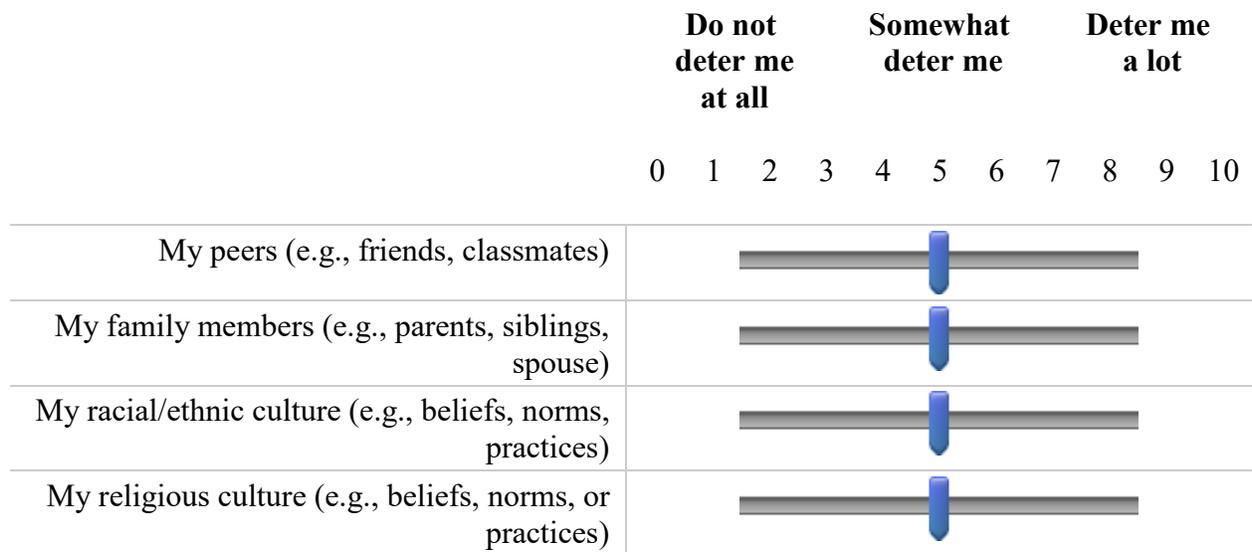
	<b>Does not deter me at all</b>	<b>Somewhat deters me</b>	<b>Deters me a lot</b>								
	0	1	2	3	4	5	6	7	8	9	10
The weather outside											
The air quality on campus											
The outdoor lighting on campus (before dawn or after dusk)											
The availability of WSU police											
The access to quality childcare on campus											
Campus rules or policies											

APPENDIX A (Continued)

Q25 Please use the slider to indicate the degree to which the following factors have or have not deterred you from being physically active on Wichita State's main campus.

0 = Does not deter me at all    5 = Somewhat deters me    10 = Deters me a lot

Q26.



APPENDIX A (Continued)

Q27 Please use the slider to indicate the degree to which the following factors have or have not deterred you from being physically active on Wichita State's main campus.

0 = Does not deter me at all    5 = Somewhat deters me    10 = Deters me a lot

Q28.

	<b>Does not deter me at all</b>	<b>Somewhat deters me</b>	<b>Deters me a lot</b>								
	0	1	2	3	4	5	6	7	8	9	10
How much time being physically active takes away from my responsibilities (e.g. schoolwork, employment, familial commitments, etc.)											
How much time being physically active takes away from what I like to do in my free time (e.g., hanging out with friends, student activities)											
The amount of coursework I have											

APPENDIX A (Continued)

Q29 Please use the slider to indicate the degree to which the following factors have or have not deterred you from being physically active on Wichita State's main campus.

0 = Does not deter me at all    5 = Somewhat deters me    10 = Deters me a lot

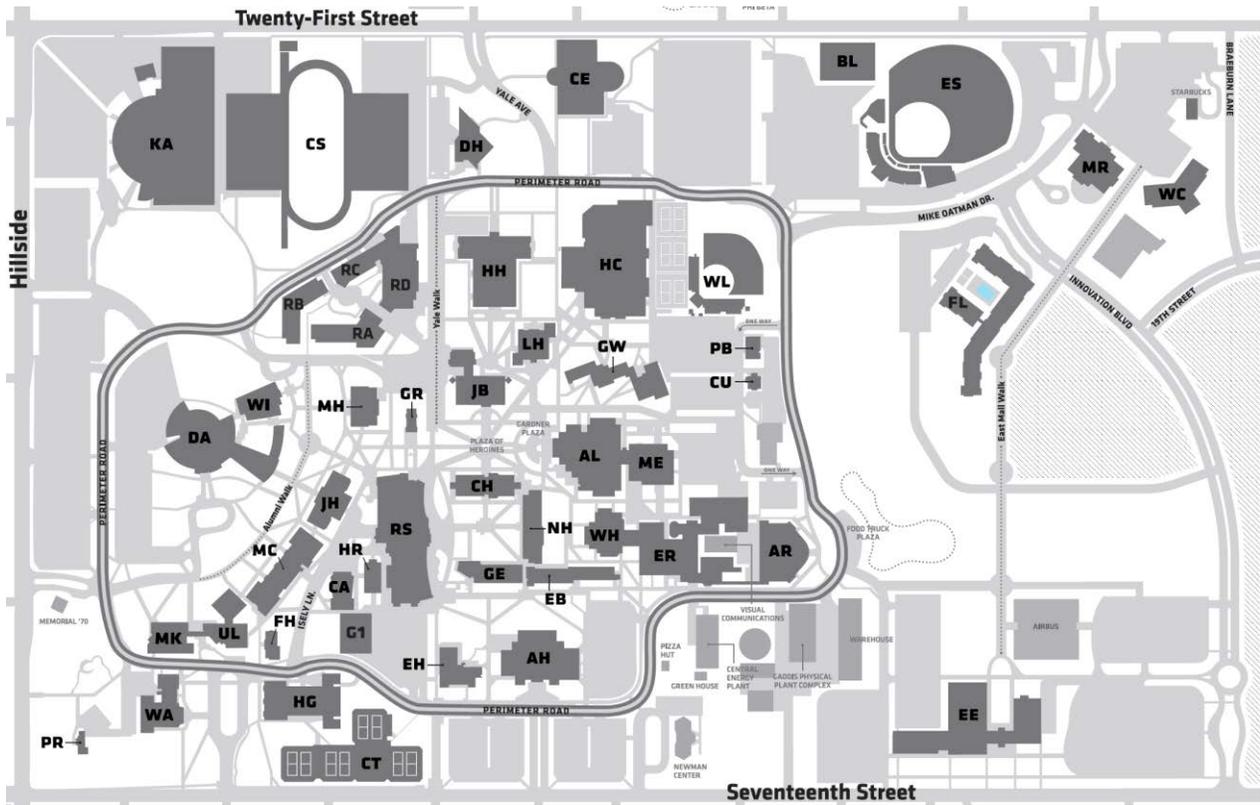
Q30.

	<b>Does not deter me at all</b>	<b>Somewhat deters me</b>	<b>Deters me a lot</b>									
	0	1	2	3	4	5	6	7	8	9	10	
My personal or family medical history												
My body (e.g., weight, physical disability, etc.)												
How self-conscious I feel when I am physically active												
How aware I am of possible places where I can be physically active												
How skilled I think I am in the ways to be physically active												
How concerned I am with getting physically or medically injured while being physically active												
How safe I feel it is to be physically active												

APPENDIX A (Continued)

Q31 Please click on the map to indicate the area(s) of campus in which you feel **comfortable** engaging in physical activity.

Just as a note: You may click up to 10 places on the map. If you do not feel comfortable engaging in physical activity on WSU's main campus, please leave this blank. If you find any areas difficult to see on the map, feel free to zoom in your screen. If you need to change the location of any dot, simply hover over the point you would like to change and drag it to its new location. The list of building codes has been provided to you for your reference.



APPENDIX A (Continued)

Q32

 **A-Z BY BUILDING CODE**  
FOR BUILDINGS NOT ON MAIN CAMPUS, VISIT [WICHITA.EDU/BUILDINGTOUR](http://WICHITA.EDU/BUILDINGTOUR)

 **WICHITA STATE UNIVERSITY**

AH   Ahlberg Hall	ES   Eck Stadium	MC   McKinley Hall
AL   Ablah Library	FC   Fairmount Towers	ME   Media Resources Center
AR   National Institute for Aviation Research	FH   Fiske Hall	MH   Morrison Hall
BA   Brennan Hall	FL   The Flats at WSU	MK   McKnight Art Center
BH   Blake Hall	G1   Parking Garage	MR   Marcus Welcome Center
BL   Bombardier Learjet Practice Facility	GE   Geology Building	NH   Neff Hall
CA   CAC Theater	G1   Garvey International Center	PB   WSU Police Department
CE   Corbin Education Center	GR   Grace Memorial Chapel	PR   President's House
CH   Clinton Hall	GW   Grace Wilkie Hall	RA   Shocker Hall*
CS   Cessna Stadium	HC   Heskett Center	<small>* Shocker Hall is made up of four separate buildings RA (building A), RB (building B), RC (building C) and RD (building D)</small>
CT   Coleman Tennis Complex	HG   Henrion Hall	RS   Rhatigan Student Center
CU   Campus Credit Union	HH   Hubbard Hall	UL   Ulrich Museum of Art
DA   Duerksen Fine Arts Center	HR   Human Resources Center	WH   Wallace Hall
DH   Devlin Hall	JB   Jabara Hall	WA   Wilner Auditorium
EB   Engineering Building	JH   Jardine Hall	WC   Woodman Alumni Center
EE   Experiential Engineering	IE   Intensive English Language Center	WI   Wiedemann Hall
EH   Elliott Hall	KA   Charles Koch Arena	WL   Wilkins Stadiumv
ER   Beggs Hall	LH   Lindquist Hall	



Q33 In 140 characters or less, please explain why you feel **comfortable** being active in the spots you identified.

If you did not identify any spots, leave this blank.

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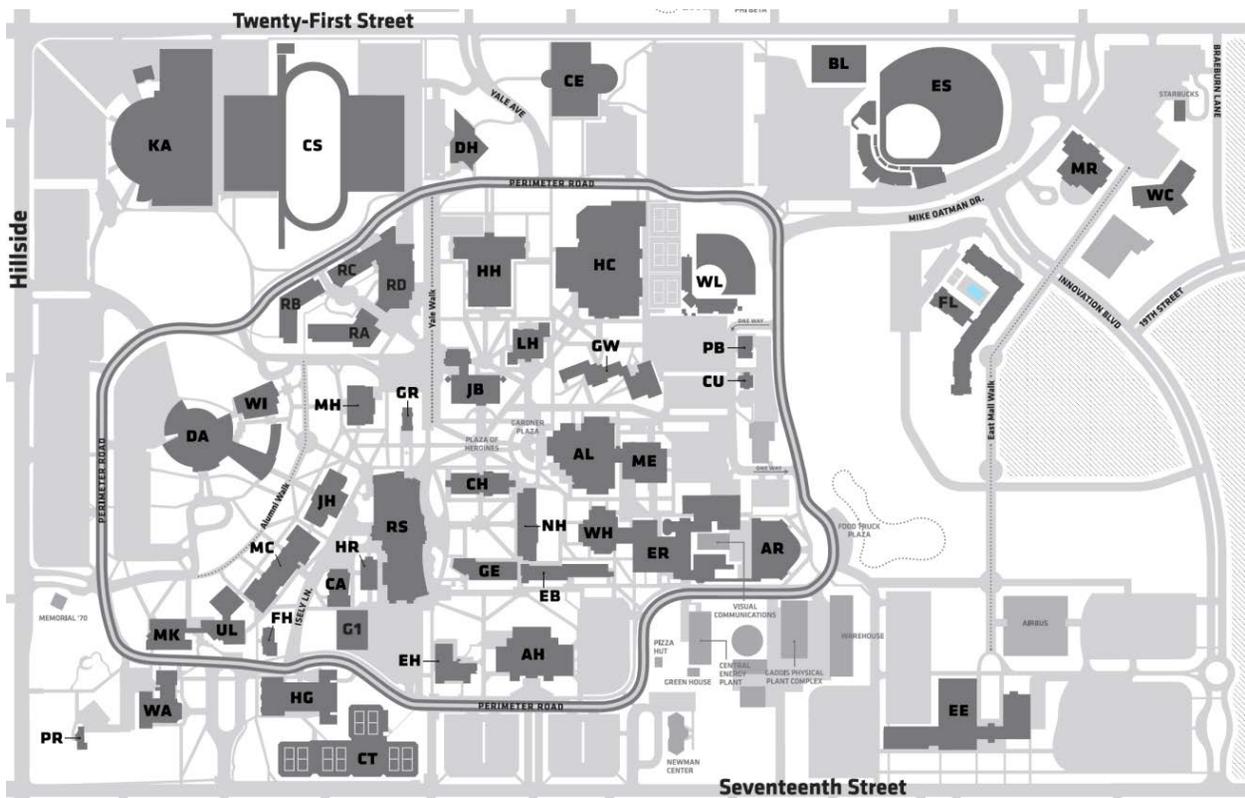
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APPENDIX A (Continued)

Q34 Please click on the map to indicate the area(s) of campus in which you feel **uncomfortable** engaging in physical activity.

Just as a note: You may click up to 10 places on the map. If you do not feel uncomfortable engaging in physical activity on WSU's main campus, please leave this blank. If you find any areas difficult to see on the map, feel free to zoom in your screen. If you need to change the location of any dot, simply hover over the point you would like to change and drag it to its new location. The list of building codes has been provided to you for your reference.



APPENDIX A (Continued)

Q35

 **A-Z BY BUILDING CODE**  
FOR BUILDINGS NOT ON MAIN CAMPUS, VISIT [WICHITA.EDU/BUILDINGTOUR](http://WICHITA.EDU/BUILDINGTOUR)

 **WICHITA STATE UNIVERSITY**

AH   Ahlberg Hall	ES   Eck Stadium	MC   McKinley Hall
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CA   CAC Theater	G1   Garvey International Center	PB   WSU Police Department
CE   Corbin Education Center	GR   Grace Memorial Chapel	PR   President's House
CH   Clinton Hall	GW   Grace Wilkie Hall	RA   Shocker Hall*
CS   Cessna Stadium	HC   Heskett Center	<small>* Shocker Hall is made up of four separate buildings RA (building A), RB (building B), RC (building C) and RD (building D)</small>
CT   Coleman Tennis Complex	HG   Henrion Hall	RS   Rhatigan Student Center
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EE   Experiential Engineering	IE   Intensive English Language Center	WI   Wiedemann Hall
EH   Elliott Hall	KA   Charles Koch Arena	WL   Wilkins Stadiumv
ER   Beggs Hall	LH   Lindquist Hall	

Q36 In 140 characters or less, please explain why you feel **uncomfortable** in the spots you identified.

If you did not identify any spots, leave this blank.

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APPENDIX A (Continued)

Q37 Would you be willing to participate in a focus group to further discuss the things that make it difficult for you to participate in physical activity on Wichita State's campus?

Yes

No

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Q38 What year were you born? Please Select Year:

1950

....

2000

---

Q39 Which gender do you most identify with?

Male

Female

Other

Prefer not to say

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APPENDIX A (Continued)

Q40 Choose the race that you identify closest with:

- Non-Hispanic White/Caucasian
  - Hispanic White/Caucasian
  - Black or African American
  - American Indian or Alaska Native
  - Asian
  - Native Hawaiian or Pacific Islander
  - Biracial (2 races)
  - Multiracial (3+ races)
  - Other \_\_\_\_\_
- 

Q41 Do you identify as Black or African American?

- Yes
  - No
- 

Q42 Do you identify as Hispanic?

- Yes
  - No
-

APPENDIX A (Continued)

Q43 What is your academic classification?

- Freshman (0-29 credit hours)
  - Sophomore (30-59 credit hours)
  - Junior (60-89 credit hours)
  - Senior (90+ credit hours)
  - Graduate Student
- 

Q44 What is your enrollment status?

- Full-time student
  - Part-time student
-

APPENDIX A (Continued)

Q45 How many credit hours are you currently enrolled in?

- 0
  - 1-3
  - 4-6
  - 7-9
  - 10-12
  - 13-15
  - 16-18
  - 19-21
  - 21+
- 

Q46 This semester, my classes are:

- All online
  - Mostly online
  - Mostly in-class
  - All in-class
-

APPENDIX A (Continued)

Q47 Do you currently live on WSU's campus?

Yes

No

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Q48 On a typical day, approximately how many hours do you spend on WSU's campus?

Less than 1

1

2

3

4

5

6

7

8

9

10

More than 10

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APPENDIX A (Continued)

Q49 Do you currently have a physical disability that limits your mobility?

Yes

No

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Q50 Are you a parent or guardian to a child under the age of 18?

Yes

No

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**Q51 Thank you for your time and for participating in this study!**

When you are ready, please hit "next" to submit your responses.

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## APPENDIX B

### INTERVIEW QUESTIONS

1. How do you define physical activity?
2. What has your experience been like being physically active on WSU's main campus?
  - a. What have you heard other WSU students say about their experiences being physically active on WSU's main campus?
3. What kinds of physical activity, if any, are:
  - a. the easiest to do on WSU's main campus?
  - b. the hardest to do on WSU's main campus?
4. You have a friend starting school here in the fall—how would you recommend they incorporate physical activity into their daily life on campus? Why do you say that? Why do these come to mind?
5. What influences your decision on where to be physically active?
  - a. Most students chose an off-campus location as their primary physical activity location—what do you think influences this decision?
6. What, if anything, could WSU do to promote the importance of physical activity on campus?
7. Barriers to physical activity on campus were all sorted relatively low; still, most students aren't being physically active on campus—why do you think that is?
8. To what degree is WSU's main campus designed for physical activity?
  - a. Where are 'the spots' for physical activity (i.e., the places 'designed' for physical activity)?
  - b. What would it take for the entire main campus to be known as a 'spot' for physical activity?
9. How might female students experience barriers to physical activity on WSU's campus that are different from male students?
10. Here is a list of the top barriers shared by students, regardless of whether they met the physical activity guidelines or not:
  - a. What do these barriers say about the lives of WSU undergraduates?
  - b. What, if anything, could WSU do to address these barriers in a way that would encourage students to be more physically active on the main campus?
11. What else would you like to say about physical activity on WSU's campus?