

MARYVILLE COLLEGE WOODS USE

A Report of a Senior Study

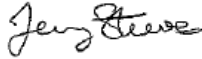
by

Trevor Gaines-Perry

Major: Health & Wellness Promotion

Maryville College

Spring, 2023

Date approved 05/05/2023, by 

Faculty Supervisor

Date approved _____, by _____

Division Chair

Abstract

As sedentary lifestyles and physical inactivity continues to increase, there is increased need for physical activity promotion, and insuring accessibility of locations to recreate. One way to encourage physically active is to get them outside using trails, such as the Maryville College Woods, which can provide physical and mental health benefits. This study aims to provide more information about Maryville College Woods use, users, and establish a permanent Maryville College Woods trail use monitoring system. Data collection included 33 days of counts from three TRAFx infrared trail counters placed through the Maryville College Woods trail network, an online/in person survey of Maryville College Woods use, and direct observations of trail use for 6 days (3 weekdays and 3 weekends) between February and March. The TRAFx counters recorded 5510 passes at the Perimeter Trail at the split, 3750 at the Perimeter trail at the RT Lodge, and 3186 at the bridge over 33 days. The primary activity in the woods based on self-report and observation was walking, and visits to the woods averaged 60 minutes. This data will help Maryville College with future trail planning, sustainability efforts and the promotion of physical activity in the community and on campus.

TABLE OF CONTENTS

	Page
Chapter I	
Introduction	1
Chapter II	
Literature review	4
Chapter III	
Methods	20
Chapter IV	
Results	25
Chapter V	
Discussion	37
Works Cited	43

CHAPTER 1

INTRODUCTION

Physical inactivity accounts for 6% of deaths globally, making it the 4th leading cause of death in the world (*Global Recommendations on Physical Activity for Health*, n.d.). Physical inactivity also leads to other noncommunicable diseases; leading to roughly 21–25% of breast and colon cancer burden, 27% of diabetes and about 30% of ischemic heart disease burden (World Health Organization, 2009). Physical inactivity can also lead to obesity which will raise the risk of obtaining some noncommunicable diseases even higher (National Institutes of Health, 1998).

On the contrary, physical activity reduces risks of cardiovascular disease, some cancers and type 2 diabetes and can also improve musculoskeletal health, control body weight and reduce symptoms of depression (World Health Organization, 2009). The recommended physical for adults over the age of 18 and below the age of 64 is 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity (*Global Recommendations on Physical Activity for Health*, n.d.). Despite all the evidence showing the benefits of physical activity, data shows that 25% of people 18 or older do not get the recommended amounts of physical activity (*Global Recommendations on Physical Activity for Health*, n.d.).

As young adults enter college, their daily habits will change drastically. Students will become more sedentary, and in the modern world where technology is increasingly prevalent,

they will spend more time in front of a screen (Bailey & Fernandez-Chung, 2021). These lifestyle changes will lead to almost half of college students not meeting their physical activity requirements (Abrantes et al., 2017). Adolescents with high levels of screen time are more likely to have poor mental health (Hoare et al., 2016), while adolescents who are physically active are less likely to show signs of depression (Wiles et al., 2012). Studies have shown that the habits that adolescents and young adults form will continue into late adulthood (Due et al., 2011). Therefore, it is vital that students form these healthy habits to maintain the healthiest lifestyle possible.

As students spend more time on screens and being sedentary, it is more likely that they will develop mental issues such as depression or anxiety (Bélair et al., 2018). Therefore, it is important to get students to become physically active while utilizing outdoor recreation areas. There is evidence supporting the claim that physical activity that takes place in green areas will lead to a longer duration of physical activity and also higher intensity (Lahart et al., 2019). *Healthy People 2010* (U.S. Department of Health and Human Services, 2000) stated that the presence of parks and trails among other things affected people's ability to reach at least 30 minutes of physical activity. People's experience in natural environments can enhance attitudes towards physical activity (Calogiuri & Chroni, 2014). A study published in 2018 took a large sample of working adults aged 20-59 and found that time spent outdoors on workdays and non-workdays was associated with less time being sedentary and more time engaged in moderate to vigorous physical activity (Beyer et al., 2018). Time spent outdoors and exposure to natural environments have been linked to reduced fatigue (Ryan et al., 2010), and sleep disruptions (Astell-Burt et al., 2013), and improvements in mental health (Alcock et al., 2014; Beyer et al., 2014).

This information suggests more should be done to motivate students to become more physical active. The state of Tennessee is composed of 56 state parks and the most visited national park in the country, The Great Smoky Mountains National Park. Maryville college students have access to one of the largest green campuses in the state. The campus woods make up half of the acreage on the campus and offers a unique experience that some college students may not take advantage of. Maryville is uniquely situated at the foothills of the Great Smoky Mountains which provides locals access to one of the few national parks that does not charge for entry less than one hours drive away. This paper will look to analyze the benefits of park usage and outdoor recreation in participants of the Maryville College Woods while establishing a permanent trail monitoring program which will communicate valuable information to ensure the sustainability of the trails.

CHAPTER II

LITERATURE REVIEW

Physical activity is a modifiable risk factor for cardiovascular disease and many other chronic diseases (Warburton, 2006). Physical activity doesn't just act as primary prevention, but secondary prevention as well. Physical inactivity was prevalent in 51% of adult Canadians, that figure is higher than any other modifiable risk factors (Warburton, 2006). Studies as old as the 1950s analyzed the effects of physical activity as it affects the reduction of cardiovascular disease. Studies as recent have 2004 have found that being fit or active was associated with more than a 50% reduction in risk (Myers et al., 2004). Although fitness and activity differ, an increase in physical fitness will reduce the risk of premature death while a decrease in physical fitness will increase the risk. These effects are graded, meaning it differs on the degree (Eriksen, 2001). Although there may be better results for larger amounts of physical activity, low-intensity exercise training has been associated with an improvement in health among those with cardiovascular disease. With each increase of 500 kcals in energy expenditure per week was associated with a decreased incidence of type 2 diabetes by 6%. This was particularly evident among those at high risk of diabetes (Helmrich et al., 1991). Physically inactive men with type 2 diabetes were 1.7 times more at risk of premature death compared to physically active men with type 2 diabetes (Wei et al., 2000).

Librett et al., used some national surveys to pull data from trail users to help inform as to how often they use trails and how much it is associated with their total physical activity (2006). There is research that shows community level interventions in natural environments such as

biking and walking trails can influence people to be physically active. These trails can convince people to be more physically active and act as a preventive measure against many health issues. This is also a cost-effective public health initiative that can last over generations if handled properly. There is research that shows trails can be effective in increasing physical activity, but there is not much research that talks about the trail users specifically.

The researchers used the annual surveys ConsumerStyle and Healthstyles to gather their data. They sent out 10,000 surveys randomly in a group of 600,000 adults who agreed to be a part of the random pool. Out of the 10,000 sent out, 6207 responded to the ConsumerStyle survey. The researchers then sent out 6207 follow up HealthStyles surveys and 4345 adults responded to that. Of that number, 628 responses were deleted, 101 did not answer the trail use problem, and 527 did not answer the physical activity questions. This left the researchers with a final sample size of 3717. Physical activity was measured by asking two questions about days per week being physically active and minutes spent doing moderate to vigorous physical activity. They also measured trail use asking similar questions about how often they use trails.

12.7% of those who responded said they used trails at least once a month and 24.3% responded using trails once a week. People who reported using a trail once a week were twice as likely to meet physical recommendations compared to those who never or rarely used trails. 43.6% of non-trail users supported the expansion of public space to use for exercise and 36.4% of non-trail users supported an increase in taxes to fund more trails and parks.

Trails and parks in communities help facilitate more physical activity and those who frequent these are more likely to achieve their physical recommendations. It was also discovered that almost half of those surveyed believed that the accessibility of parks, trails, or green areas played a part in deciding where to live (Librett et al., 2006).

Researchers in Denmark did a similar study where they used national data to look at the relationship between the distance from green spaces and physical activity (Toftager et al., 2011). This study analyzed the relationship between distance from green areas and physical activity levels while also looking at distance from green space and how it relates to obesity. This discussion possesses significance because it could be used as an interventive tool to help get the general population to become more physically active. Green environments like parks and trails also allow people to use it while spending little to no money. This allows many people to take advantage of these green areas despite their socioeconomic status. The researchers also mention how utilizing green environments can positively influence physical, mental, and social health. Therefore, green environments could be used by many people and offer many benefits, so it is important to know if living near these areas leads to more visits to these areas.

The National Institute of Public Health at the University of South Denmark sent out surveys nationally to collect data on health trends in the adult population. The surveys asked about what factors influence overall health such as habits, lifestyles, and environmental and occupational health risks. Data from the 2005 survey consisted of 21,832 adult Danes who were sent the self-reported surveys. They were informed participation was voluntary. From that, 14,566 completed a personal interview and 11,238 individuals completed the self-administered questionnaire. To measure distance to green space, researchers asked participants how close they were to green environments. They asked if the person was less than 300 meters away, 300 meters to 1 kilometer, 1 kilometer to 5 kilometers, and over 5 kilometers away. The researchers repeated that question for areas such as beaches, seas, lakes, parks, urban green spaces, forests, and agricultural fields. They also asked people why people felt it was important to use these green spaces. The question about agricultural fields was not used in the data since it was not available

as a recreational area. The physical activity levels were measured during the face-to-face interview using the following categories: Heavy exercise and competitive sports regularly and several times a week; exercise or heavy gardening at least 4 hours a week; walking, biking, or other light exercise at least 4 hours a week; and reading, watching tv, and other sedentary activities. The heavy exercise category and the heavy gardening/ light exercise category were combined to create an overall measure of moderate to vigorous activity. BMI was self-reported during the face-to-face interview. Researchers included other variables in the survey to account for some confounding variables such as education level, socioeconomic status, sex, age, smoking, alcohol consumption, and marital status.

In total, 27.1% of the respondents reported being moderately (23.4%) or vigorously (3.7%) active in their leisure time. 66.9% reported living less than 300 meters from a green space. 28.3% of those who were less than 300 meters away from a green space reported being moderately to vigorously physically active in their leisure time. That number dropped to 26.1% for those who lived between 300 meters to 1 kilometer away from a green space. For those who were over a kilometer away, the number decreased even further to 22.6%. 10.8% of the less than 300 meters group had a BMI of over 30 kg/m². 10.7% of the 300 meter to 1 kilometer group had a BMI of over 30 kg/m², while 14.7% of the over 1 kilometer group had a BMI of over 30 kg/m².

This study seemed to determine that distance to green spaces helped predict whether respondents used green spaces. Even after accounting for confounding variables, the researchers found that those closer to green areas were also more likely to take part in moderate to vigorous physical activity. The researchers believed that although they did not measure these certain factors, they believe that physical condition, access, aesthetics, and perception of safety were important factors in the decision to use green areas for physical activity purposes. Men and

younger people were less likely to use green spaces for exercise than women and elderly people. The researchers believe this was because women and older people are more likely to practice “light” exercises that are more common in green spaces. This is proven by their data that only $\frac{1}{3}$ participated in moderate to vigorous physical activity. That means $\frac{2}{3}$ were participating in what could be considered “light activity”. The researchers acknowledge that this data was self-reported so there is a risk of overestimation of physical activity or wish bias. With that being said, the researchers concluded that self-reported distance to green space was related to self-reported physical activity and obesity (Toftager et al., 2011).

In this study, researchers tried to see how living near a trail influenced walking among patients in community clinics (Pierce et al., 2006). Researchers hypothesized that living near a trail would influence those to walk more. The authors acknowledged that walking is recommended for aiding in the prevention of many non-communicable diseases. If having a trail in neighborhoods influences local residents likelihood to walk and be more physically active, it could result in better health and cost-efficient strategies for health promotion.

The researchers used a cross-sectional survey to see if patients who walked thought they lived close to a walking or cycling trail. They tried to make sure that this relationship was analyzed independent of physical health, mental health, lifestyle habits, and demographic characteristics. The sample population was drawn from five community clinics from low-income areas. Participation was voluntary. They had participants complete a survey and drop it into a box. Anyone under 18 was excluded. They received surveys from 1237 people, but only complete information was acquired from 1211 subjects and those were the ones used in the cross-section analysis. Subjects were asked to list the number of times they had walked for at least 30 minutes. The researchers put these into categories of none, 1-3 times, and 4 or more

times. Subjects who walked 1-3 times or 4 or more times were compared to those who did not walk. Researchers used Leyden's scale of walkability in the survey to determine if the subjects lived somewhere with no convenient walking areas or somewhere where there were one or more convenient walking areas.

A higher percentage of people who reported not living close to a trail were sedentary. 47.8% of those who did not live near a trail were sedentary compared to the 39.2% who lived near a trail. Those who perceived 3 or more convenient destinations were more likely to report walking for at least 30 minutes.

This study showed that the walkability (having more walking destinations available) and the proximity to a walking trail were associated with increased walking among the community clinic population. Although the results of this study may not be applicable to all populations, it is applicable to those who are considered unhealthy. Therefore, the creation of trails can help create healthy habits for those who need it most. With this study being cross sectional, it cannot prove that this relationship is cause and effect. It does prove that there is some sort of association between the two. It is also all self-reported so there is room for bias and inaccurate information (Pierce et al., 2006).

The authors in this study introduce the topic of promoting physical activity in rural communities by constructing and promoting walking trails (Brownson et al., 2000). The researchers acknowledged how physical activity can reduce the risk of coronary heart disease, hypertension, type 2 diabetes, colon cancer, and osteoporosis, among other chronic diseases. There are substantial health benefits when people make the transition from being completely sedentary to doing light amounts of physical activity. Light to moderate physical activity can provide numerous health benefits like reducing blood pressure and decreasing risk of

cardiovascular disease and cancer. Among the general population, walking is one of the most common forms of physical activity that is readily available and doable for most people despite age, race, or socioeconomic status. Its accessibility makes it the focus of many public health interventions. The public health recommendation for adults is 30 minutes of moderate intensity physical activity on most, if not all days of the week. At the time of this study, $\frac{1}{4}$ of the American population remained completely inactive. The authors also acknowledge that the percentage of people who aren't physically active is highest in rural communities, thus creating a higher demand for interventions in those communities. Among the different environmental and policy approaches, creating walking trails is a relatively low-cost intervention that offers convenience and accessibility to a community and can become a permanent fixture in the community. With all that information considered, the authors conducted this study that examined walking related behaviors. There were four main purposes of this study that the authors noted: To describe the patterns and correlates of walking, to assess availability of places to walk, to determine the extent of walking trail use and effects on rates of physical activity, and to describe attitudes towards trail and their uses that may serve as barriers or motivators.

There were two community-based intervention projects happening in 12 rural counties in Missouri. Compared to the rest of the United States, this region has significantly more poverty, has lower education levels, and is medically underserved. The projects are trying to change behavioral risk factors for cardiovascular disease. One of the larger components of the projects has been the construction of new walking trails and the enhancement of existing trails. This specific rural region does not have many locations to walk. There were 13 walking trails in the Ozark counties and 8 in the Bootheel communities; 44% are asphalt, 44% are gravel, and 11% were wood chip covered. The average lengths of these trails were .68 miles with a range of 2.25

miles while the average time of existence for these trails was 1.53 years with a range of 54 months or 4.5 years. The survey they used was the Missouri Behavioral Risk Factor Surveillance System (BRFSS). This survey allowed the researchers to cover large areas of content and allowed a large sample size for the researchers. From April through December 1998, random computer-assisted surveys were conducted with 1269 adults over the age of 18 from 17 communities, ranging in size from 616 to 22,494 people, in 12 southeastern Missouri counties. 8 of the communities were chosen specifically since they already had walking trails in them. Researchers asked about: (1) walking behavior in the past month; (2) regular walking, such as walking 5 times per week and 30 minutes per occasion (the algorithm commonly used to determine compliance with current public health recommendations for moderate-intensity physical activity); (3) access to walking trails (defined by the question: “Are there any walking trails or paths in your area, not including those in state parks or national forests?”); (4) access to indoor exercise facilities (defined by the question: “Do you have access to an indoor facility where you can exercise when you don’t want to or can’t use the trail?”); (5) use of walking trails; (6) whether exercise behavior had changed due to walking trail use; (7) perceptions of safety when using trails; (8) how respondents found out about the trails; and (9) aspects of the trails most liked.

The sociodemographic characteristics of the sample size was representative of the overall population in the region. 44.9% of respondents had walked in the past month for exercise and about half of those walkers, 19.5%, had walked at a level of 5 or more times per week and 30 minutes or more per occasion. Specific subpopulations that were more likely to have walked in the last month included people over the age of 60, women, and people who possessed a higher level of education. 36.5% reported having access to walking trails in their area. 50.3% reported

having access to indoor facilities for exercise. Among those who had access to walking trails, 38.8% had used them. Out of those who did report using the trails, 55.2% reported they had increased their amount of walking since using the trail. Women were almost twice as likely as men to report that they walked more since utilizing the walking trails. Nearly 62% of people with a high school education or less reported increased walking since using walking trails. This is a statistically significant difference from those with a college degree (45.5%). Those who used trails longer than 0.25 miles were more likely to report an increase in physical activity. Travel distance to the walking trail seemed to have a slight perceived effect on walking. However, it should be noted that 43% of the respondents had to travel over 15 miles to their trail. The researchers also investigated the perceived safety of these trails as barriers. Most participants (86.9%) said concern of safety was not a barrier to trail use. 1.1% of participants said they felt unsafe when exercising on trails. Trail users were asked the most liked aspects of using their trails; 19.4% said scenic beauty, 18.2% said availability as a free place to exercise, 15.9% said convenient location, 10% said safe surface, and 5.3% said lighting (Brownson et al., 2000).

This study was one of the first to examine descriptive characteristics, correlates, and possible effects of walking-trail development. The authors cited a study done in Australia that gathered qualitative data that suggested people believe they are more likely to exercise when they have access to both free and pay facilities (Huijg et al., 2015). Some promising points from this accumulated data is that women and those in lower socioeconomic groups were more likely to report an increase in walking when using walking trails. In this study, those in lower socioeconomic groups were influenced to initiate and increase their activity. On the other hand, persons of higher socioeconomic status may use trails to maintain their walking levels, but not as likely to increase that rate. Although not a statistical difference, people who weren't regular

walkers (57.7%) were most likely to report increased activity due to trail use than regular trail walkers (47.5%). The researchers noted that this data suggests a “ceiling” effect where regular trail users are using trails to maintain their walking levels, but not increase those levels. Since the relationship between physical activity and disease outcome is an inverse relationship (Blair & Connelly, 1996), getting sedentary individuals to initiate and increase levels of physical activity is vital. Walking is a relatively moderate form of physical activity that is accessible to many, and this study shows that the use of trails can help promote healthy living among the population (Brownson et al., 2000).

In a study done by Christopher Coutts, he tries to look at characteristics of accessibility to predict the use of greenway segments (Coutts, 2008). Population level- health promotion efforts have adopted an ecological paradigm that accepts both individual and environmental determinants play a role in health behavior. This means the environment around the individual plays as just as much of a part as who the individual is. An environment that supports physical activity is becoming more and more important as physical activity levels continue to decrease. This ecological approach says that the environment influences one’s ability to be active. This study aimed to examine the ecological factors of a built environment that may hinder or facilitate participation in physical activity.

Obesity has reached epidemic proportions with disparities across age, gender, and race. This presents major public health challenges (Ewing et al., 2003). Obesity is also linked to other comorbidities like coronary heart disease, diabetes, and several types of cancer (Troped et al., 2001). This shows the importance of finding a way to combat obesity in any way possible. Studies have shown that residents of low-density, vehicle-oriented communities are at a higher risk of obesity (Sallis, 2002). This creates precedence to try and tackle this problem in rural

communities where we see these trends more often. The availability, accessibility, and utilization of trails by neighborhoods is an area of research that remains understudied. Thus, the author deems it necessary to research the use of these trails and greenways in the built environment. The author aims to characterize the physical attributes of urban trails and try to link those attributes to trail use patterns. This will develop a better understanding of determinants of trail use. Many studies have looked at different trail attributes that are correlated with trail use, but many have not been tested. The author hoped combining self-reported trail use with trail characteristics would provide more information about trail use patterns, including frequency and duration. Therefore, the purpose of this study was to identify trail attributes associated with levels of self-reported trail use by residents living near urban trails in 3 climatic regions. Understanding these characteristics and the direction of their relationship with trail use can help the design of future urban trails and efforts to maximize the use of existing trails.

Researchers used three multiuse urban trails located in Chicago, Dallas, and Los Angeles. For a trail to meet the criteria for the study, it had to be available to multiple users, located within a metropolitan area, minimum of 15 miles in length, unbroken along their entire length, located within different climactic regions, traverse neighborhoods with at least 2 or more races or ethnicities, and lastly, must have received some level of Intermodal Surface Transportation Efficiency Act funding. Each of the three identified trails were divided into half mile segments in length, resulting in Chicago having 34, Dallas having 30, and LA having 38 segments respectively. An audit was used to determine physical characteristics of the trails. A self-report survey was completed by 490 residents living within 1 mile on either side of the trail. The survey included measures of trail use, demographics, and perception of the trail and the trailside neighborhood. Participants with no past trail use were excluded (n=159), leaving a sample size of

331. A recruitment letter was sent, and individuals were then called by a recruiter to screen for eligibility and check for consent. Inclusion criteria included being 18 or older, living in the buffer zone, able to give informed consent, possessing the ability to complete surveys in English, and the use of trails without motorized support. The self-report questionnaire was mailed, and a followed-up call was made to confirm delivery and participants who returned valid questionnaire answers were compensated \$50. Out of the 331 respondents, 164 were from Chicago, 113 from Dallas, and 54 from LA. Researchers used the Systematic Pedestrian and Cyclist Environmental Scan (SPACES) to review components of the trails. Part A covered trail environment and consisted of 4 questions about buildings, infrastructure, and natural features along the trail. Part B consisted of 12 questions on trail functionality. Part C was composed of 13 questions addressing trail safety. Lastly, Part D consisted of 12 questions pertaining to trail attractiveness. The survey also included items about trail use. This included extent and purpose of trail use, sociodemographics, motivation for physical activity and self-reported health status, and perception of the trail environment.

Researchers found, after controlling for distance to trail from home and motivation for physical activity, that presence of distance signs, higher vegetation height, higher levels of vegetation maintenance, and greater trail crowding were associated with residents spending more time on trail segments during the last month. The presence of crossings on trail segments was associated with residents spending fewer hours on trail segments.

These results show that trail use by neighborhood residents was heavily influenced by trail characteristics. This conclusion came after controlling for proximity to the trail and motivation to engage in physical activity. The relationship between distance signs and time spent walking could possibly be explained by people who are trying to achieve a specific distance goal

and these signs help them keep record of that distance, whether it be for weight loss, an athletic event, or just a target level of fitness. These signs also may increase perceived benefits of utilizing the trail. One of the more peculiar findings of this study was the positive association between vegetation height and time spent on the trail. This may be due to some sort of aesthetically pleasing view or it could act as a possible obstruction of view from the road. It also allows more shade which can be beneficial for areas of higher temperatures. Maintenance of the vegetation was also positively associated with time spent on the trails. This could also be due to the aesthetic that trail users would like to see. A poor maintained trail could be less visually pleasing, therefore discouraging people to use it. Another surprising positive association was found between trail crowding and trail use. This could possibly be explained by the feeling of safety when other people are around. Increased foot traffic can also lead to more social interaction, which could lead to more positive social outcomes and increases future trail use. The only negative association they found was between trail crossings and time spent on the trail. This may be due to trail users seeing it as a safety hazard and be perceived as dangerous. It also could lead to more public viewing which may not be what certain users are looking for. These crossings also may impede the flow of traffic, especially those who are on bikes or skates.

This study lays out somewhat of a blueprint for urban planners to consider when creating these trails. With this study being cross sectional, it is difficult to infer that these relationships are causal. In conclusion, the study found that there were some objectively assessed trail features that were positively associated with trail use (Johansen et al., 2020).

Physical activity is a complex health-enhancing behavior. Incorporating environmental approaches may help motivate individuals to be more active. Although most Americans are not regularly active, data has shown that walking is the most common form of physical activity.

Moderate walking can improve an individual's health so finding a way to promote individuals to walk more often is beneficial. There are few studies that look at the walking habits of college students. Some barriers to physical activity that college students face is lack of time, trail accessibility, and trail proximity. College students already exhibit many health risk behaviors, so it is vital to inform and influence them to be as physically active as possible to increase healthy habits and hopefully maintain those habits later in life. Recreational trails are convenient environments in which students can engage in physical activity. Therefore, the purpose of this study is to identify the level of trail awareness and user patterns on a recently built trail near a university setting (Reed & Wilson, 2006).

All students received directions in their mailbox to answer an online questionnaire voluntarily. 467 students, 183 freshman, 133 sophomores, 62 juniors, and 89 seniors; and 293 of them were women, and 174 men. out of 2,654 completed this online questionnaire sent out by the researchers. The researchers used the Environmental Supports for Physical Activity Questionnaire. They made some slight modifications in the vernacular to make sure it applied to university students. Each participating student responded on a 3-point scale for yes, no, or not sure for all questions regarding physical activity. They measured physical activity using the National College Health Risk Behavior Survey.

91% of students were aware of the recreational trail. 64% of students reported seeing signs referring to the trail. Of the 91% of students who were aware of the trail, 73% reported using the trail. Of those who used the trail, 62% reported using the trail with another individual, 79% reported using the trail between 1 and 5 times in the last month, 8% reported using the trail between 6 and 10 times, 2.8% reported using the trail between 11-15 times and 3% reported using the trail more than 15 times in the last month. Roughly 8% of students reported not

knowing about the trail or were not sure how often they used the trail. Of trail users, 67% reported using the trail 1 time in the past week, 7% reported using it twice, and only 2% used the trail 3 or more times in the past week. 52% reported engaging in other physical activities other than walking on the trail, such as 45% reported jogging or running, 18% reported biking, 3% reported picnicking, 2% reported nature identification, and 10% reported engaging in “other activity” on the trail. Only 17% of students reported engaging in vigorous physical activity in the last week whereas 43% reported participating in moderate-intensity physical activity.

Most of the students who were aware of the trail used the trail. Trails are a sustainable intervention that can positively impact physical activity at the population level. The data of trail users revealed that trail awareness was associated with physically active behavior but few trail users engaged in the recommended activity levels necessary to gain a significant health benefit based on their trail activity alone. The fact that almost 66% of trail users reported walking with a friend shows that social support is a factor to consider when understanding physical activity patterns in adults. Even with the added social support, the recommended level of physical activity was not reached. There could be many reasons why students in this survey did not reach the recommended level of physical activity. Time constraints or social influences could restrict students from utilizing the trail. Sophomores, Juniors, and Seniors were more likely to use the trail than freshman. The freshman dorms are the furthest away from the trail, and previous research shows the proximity plays a big part in trail use.

This study showed that there is a possible positive association between awareness of recreational trails on campus and level of physical activity. This means campuses with trails like this one should try to promote the trail to their students to influence college students to utilize it

to meet physical activity guidelines. It also indicates that proximity also plays a large role in motivating individuals to utilize the trails (Reed & Wilson, 2006).

CHAPTER III

METHODS

Participants: Maryville College students, staff, and faculty, and adult community members who use or have used the Maryville College Woods in the past.

Instruments: To estimate the number of users of the Maryville College Woods, a variety of instruments were used including infrared trail counters, surveys, and direct observation tally sheets of those entering and exiting the woods.

Three TRAFx infrared trail counters were installed at different locations on trails within the Maryville College Woods. As each person passed through this infrared laser, the trail counters would create a timestamp that recorded the exact date and time of that walk through. The data could then be downloaded and uploaded to a software program (TRAFx) where the data could be analyzed.

To test the validity of these trail counters and prior to their deployment into the Maryville College Woods, a two-part validation study was conducted to make sure the trail counters could accurately count 100 passes. Part 1 involved the researcher counting an individual walking or running past the trail counter 100 times. The second test involved the researcher counting an individual biking past the trail counter 100 times. To simulate how it would be used in the woods, the trail counters were positioned at waist level of the person passing by the trail counter. This height was the same for the bike test as well. While one person crossed the laser back and forth, another counted each pass to confirm when 100 passes had been completed. After 100

passes, data was retrieved from each of the counters and uploaded to the TRAFx program where we verified the start and finish time, and the number of passes.

Direct observations were conducted on 3 weekdays and 3 weekend days, and involved counting individuals as they entered or exited the Maryville College Woods via Entry trail by the main parking lot at MacArthur's Pavilion, being active on Morningside Lane, or playing disc golf. Specifically, we recorded sex (female, male), estimated age (child, teen, adult, older), ethnicity (Latino, Black, White, Other), physical activity type (walk, run, bike, disc golf, other), and whether they were accompanied by a dog (yes, no).

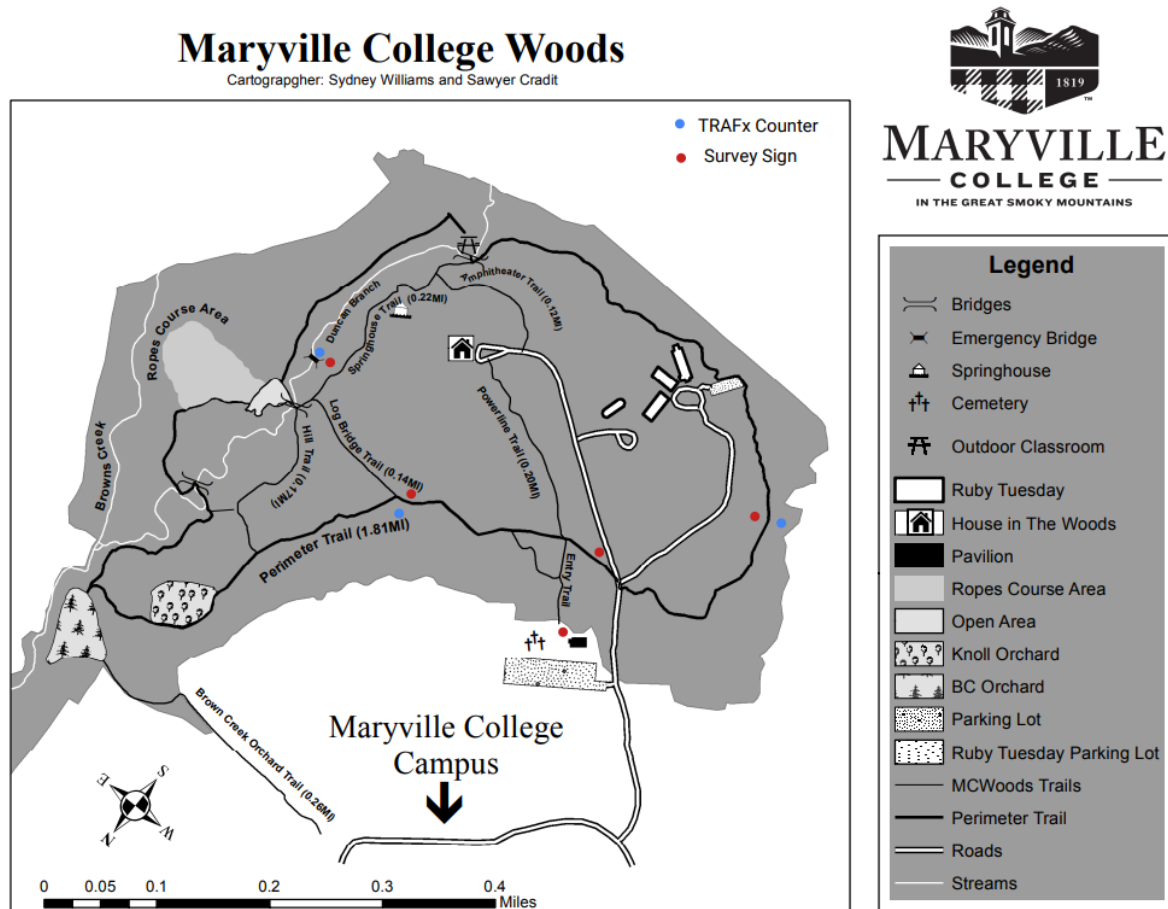
The 36-question Maryville College Woods Use survey asked questions about what activities the participants are doing in the woods, how frequently they are in the woods, and distance traveled to the woods. The survey finished by collecting some basic demographic information about the participants such as race, gender, and age.

Procedures: To estimate the number of users of the Maryville College Woods, a variety of methods were employed including infrared trail counters, surveys, and direct observations of those entering and exiting the woods.

Starting in February of 2023, three TRAFx infrared trail counters were installed at different locations on trails within the Maryville College Woods. Specific locations of the infrared trail counters included where the Perimeter Trail splits off into the Log Bridge Trail, at the large bridge over Duncan Branch leading toward the Mountain Challenge Ropes Course, and one more on the Perimeter Trail by the community entrance off Court St. across from Boardman Ave. on the southwest side of the woods near the Ruby Tuesday Lodge (Figure 1).

Figure 1

Maryville College Woods map with TRAFx counters and survey sign locations identified.



After conducting validity testing of the counters and we confirmed counter placement location with the Maryville College Woods committee, construction of the posts for the counters began. Three 6" x 6" posts were modified so that the TRAFx counters could be fully embedded inside of it. Once the posts were completed, we dug holes 2 feet into the ground where we were placing the free-standing counters, and attached one counter to the bridge across Duncan Branch. We laid down 6 inches of gravel to flatten the base where the posts would be standing. We then submerged the base with a foot of concrete. The last 6 inches were filled in with dirt. The posts have a metal panel that can be taken off to retrieve the data from the counters when needed.

Five-yard sale style signs were also placed around the woods (Figure 1) to promote the study and solicit Maryville College Woods Use survey responses through a QR code that participants could take a picture of with their phone camera and that would link participants to the 36-question Maryville College Woods Use survey (Figure 2).

Figure 2

Maryville College Woods Use Survey sign.



Printed 8 x 11" page size versions of the Maryville College Woods Use survey signs were also shared around campus and two stores (Little River Trading Company and Rock Bottom Outfitters) where we believed people who spent a lot of times outdoors would shop. Maryville College students, staff, and faculty were also recruited to complete the Maryville College Woods Use survey through Today@MC announcements and social media posts. To motivate people to participate in the survey, we offered a chance to win a \$25.00 gift card for completing the survey and submitting their email to be contacted if they won. The survey collected some basic demographic information about the Maryville College Woods users, such

as race, gender, and age and asked about what activities the participants are doing in the woods, how frequently they are in the woods, and distance traveled to the woods. The survey took an about 8-10 minutes to complete. No identifying information was collected about the participants in the actual survey.

Direct observations were conducted on 3 weekdays and 3 weekend days, and involved counting individuals as they entered or exited the Maryville College Woods via Entry trail by the main parking lot at MacArthur's Pavilion, being active on Morningside Lane, or playing disc golf. The direct observation dates were spread over a month from February to the end of March. This allowed us to capture a demographic profile and identify physical activity types and behaviors of those who were using the Maryville College Woods. Specifically, we recorded sex (female, male), estimated age (child, teen, adult, older), ethnicity (Latino, Black, White, Other), physical activity type (walk, run, bike, disc golf, other), and whether they were accompanied by a dog (yes, no). On these observation days, we would sit and observe during 3 different periods of the day: 7:30-9:30, 11:30-1:30, and 4:30-6:30. This allowed us to compare different time periods and the difference in traffic during those times. During the direct observations, Maryville College Woods Use Survey responses were solicited from participants. Trained surveyors would introduce themselves and inform participants about purpose of the study, privacy, and their rights as a volunteer, before they worked through the survey questions onsite with the researcher entering their responses into their mobile phone and submitting the completed survey.

Analysis: Survey data was collected using Google Forms and exported into a Windows Excel sheet and uploaded to SPSS Statistics version 24.0.0.0 to generate descriptive summary statistics. The results from our six direct observations, and the TRAFx counters were totaled and percentages for each category were calculated to summarize the results.

CHAPTER IV

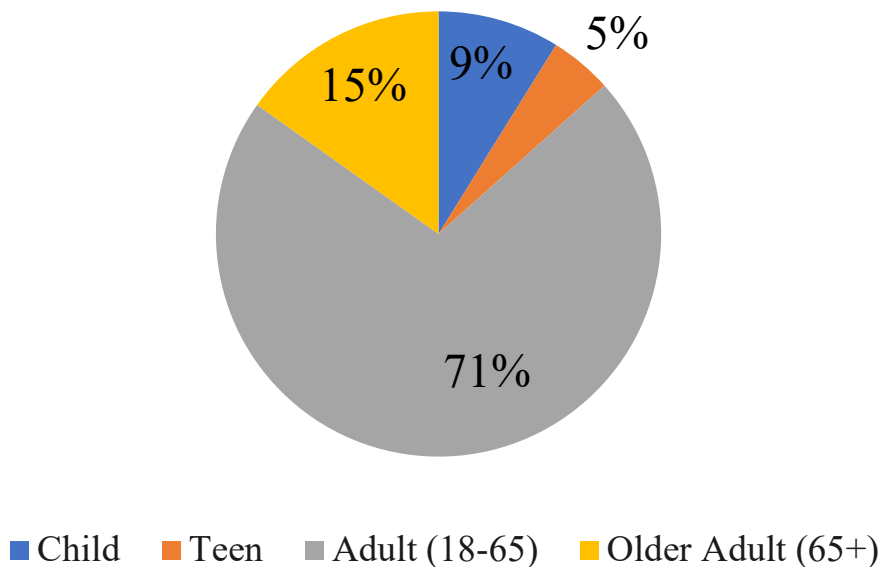
RESULTS

Here we present the results from three sources: 1) the direct observations, 2) the data from the TRAFx trail counters, and 3) the data from the surveys.

The direct observations happened periodically from the 22nd of February to the 26th of March (Wednesday, February 22; Wednesday, March 1; Saturday, March 11; Wednesday, March 15; Saturday, March 25; and Sunday, March 26). Temperature ranged from 30 degrees on March 15th to 79 degrees on February 22nd. During the 6 data collections (3 weekdays and 3 weekend days), 508 people were observed in total. Of those 508 people, 45 (9%) were children, 23 (5%) were teens, 363 (71%) adults, and 77 (15%) were over the age of 65 (Figure 3).

Figure 3.

Percentage of Directly Observed Maryville College Woods Users by Age Group.



On average, across our 6 hours of observation we observed an average of 61 Maryville College Woods users on the weekdays, which was 38 people less than the average of 99 participants of weekend days. The busiest day was Saturday, March 11th with 123 visitors in total. The least busy day was Wednesday, March 1st with 45 visitors (Table 1).

Table 1.

Mean Directly Observed Maryville College Woods Users by Time of day on Wednesday and Saturdays.

Weekday	Mean	SD
Morning	8.0	1.0
Noon	23.0	11.8
Evening	29.7	7.4
Total	60.7	18.4
Weekend	Mean	SD
Morning	13.7	2.1
Noon	37.0	7.9
Evening	48.3	5.6
Total	99.0	14.5

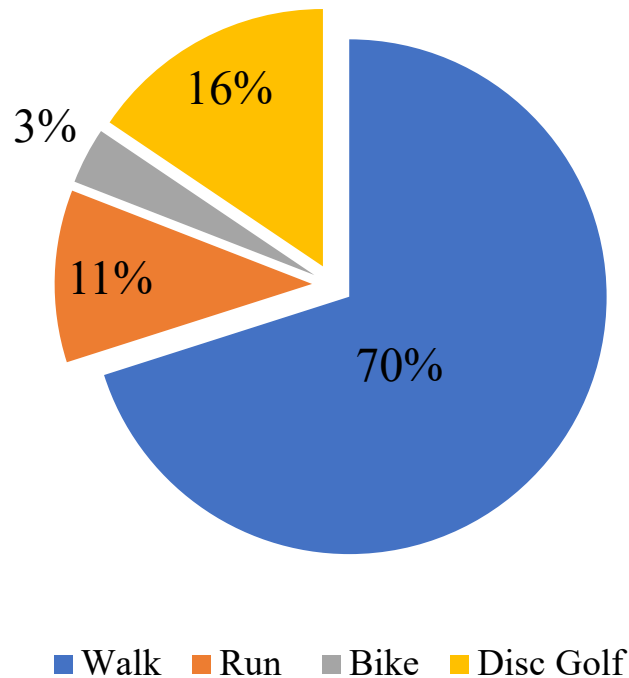
Evenings seem to be the most popular time to visit the Maryville Colleges woods, followed closely by the noon hour. During the weekdays, on average, there were 8 visitors in the morning, 23 at the noon time slot, and 30 during the evening. For the weekends, there was an average of 14 visitors during the morning, 37 during the afternoon, and 48 during the evening. Adults and older adults made up most (99%) of the sunrise visitors (67/68). No children were observed during the first two hours around sunrise, and only 1 teen was observed on a Sunday morning.

The most popular directly observed activity was walking, which accounted for 70% of Maryville College Woods users, 68% on weekdays and 66% on weekends. The second most popular activity observed was disc golf which accounted for 16% of Maryville College Woods

users, an average of 11 on weekdays and 18 on weekends. Runners made up 11% of Maryville College Woods users, and the smallest percentage was bikers at 3% (Figure 4).

Figure 4.

Percentage of Directly Observed Maryville College Woods Users by Activity Type



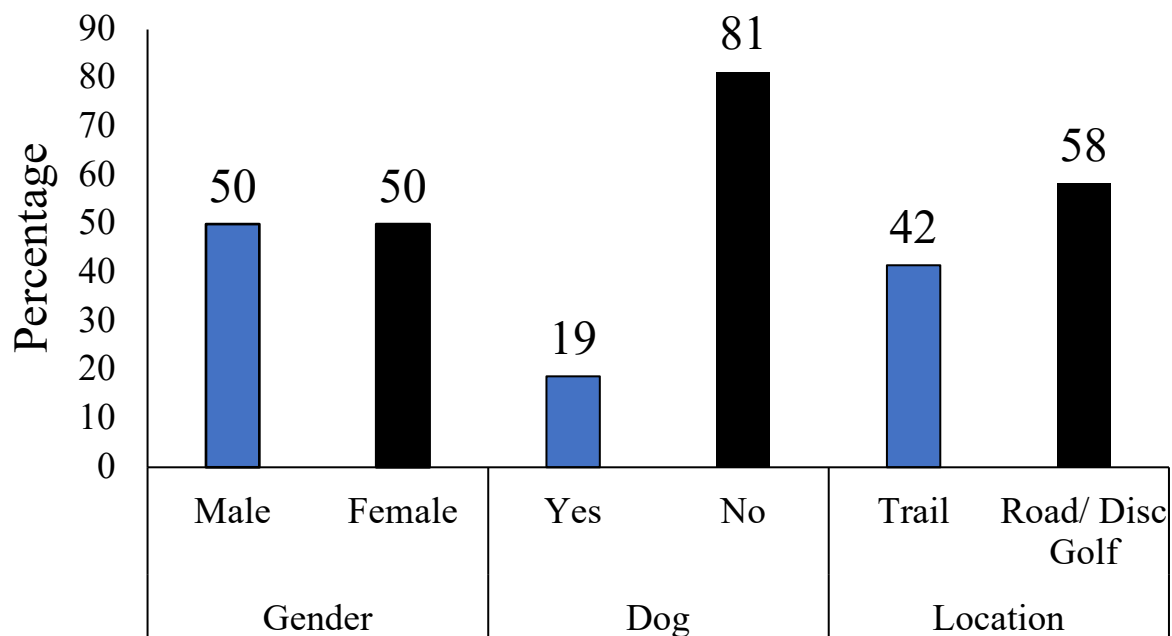
The most directly observed walkers (92) visited on Saturday, March 11th. As for runners, they showed up the most on Saturday, March 25th (16). Cyclists showed up the most on Saturday, March 11th, adding up to 11 cyclists, 6 were there during the noon time slot and another 5 were there during the evening. Disc Golf was busiest on Saturday, March 25th with 19 participants.

There was a split right down the middle when it came to directly observed male (50%) and female (50%) visitors. There were more men (33) than women (28) on average during the weekdays. This flipped on weekends where there was an average of 44 males and 55 females.

Out of all the visitors during the observation days, 95 (18.7%) people had dogs with them while 413 (81.3%) did not. People preferred to use the road/ disc golf course to ambulate on and enter the trail (297, or 58.5%) rather than entering or exiting at the Entry Trail by McArthur pavilion. (211, or 41.5%) (Figure 5).

Figure 5

Percentage of Directly Observed Maryville College Woods Users by Gender, With Dogs, and Access Location



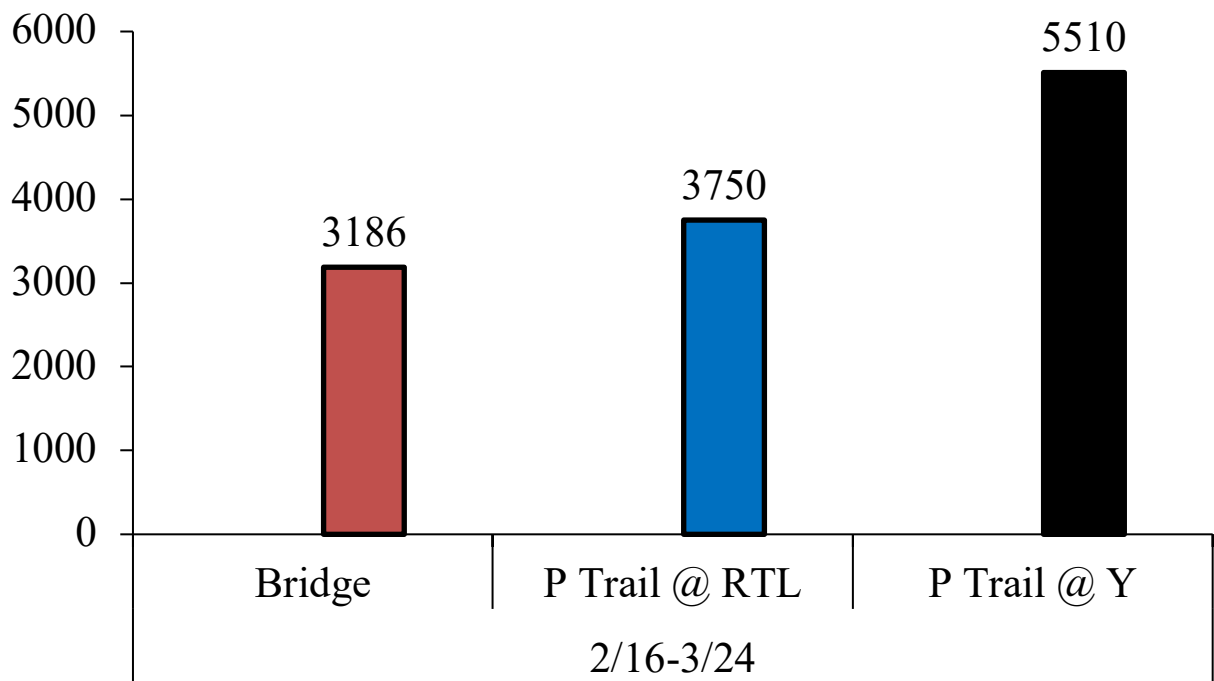
The most dogs were observed on the weekends, specifically Saturday, March 11th, where 32 dogs were seen entering the woods with their owners. The least number of dogs (10 across the whole day) were observed on both Wednesday, February 22 and Wednesday, March 1.

The data from the TRAFx trail counters generated a total of 12,446 counts from individuals that used the Maryville College Woods trails in just over one month of use (33 days) between February 17 and March 22, 2023. The breakdown of the number of users by the trail location is found in Figure 6. Estimated total monthly users by location ranged from a low of

3186 at the bridge over Duncan Branch, to a high of 5510 at the Perimeter trail split. Of the 3 locations, the TRAFx counter at the Perimeter trail split accumulated 44.2% of the counts, the Perimeter Trail Ruby Tuesday Lodge location entrance accounted for 30.3% of the counts, and the bridge over Duncan Branch. saw only 25.6% of the total monthly traffic based on counts.

Figure 6

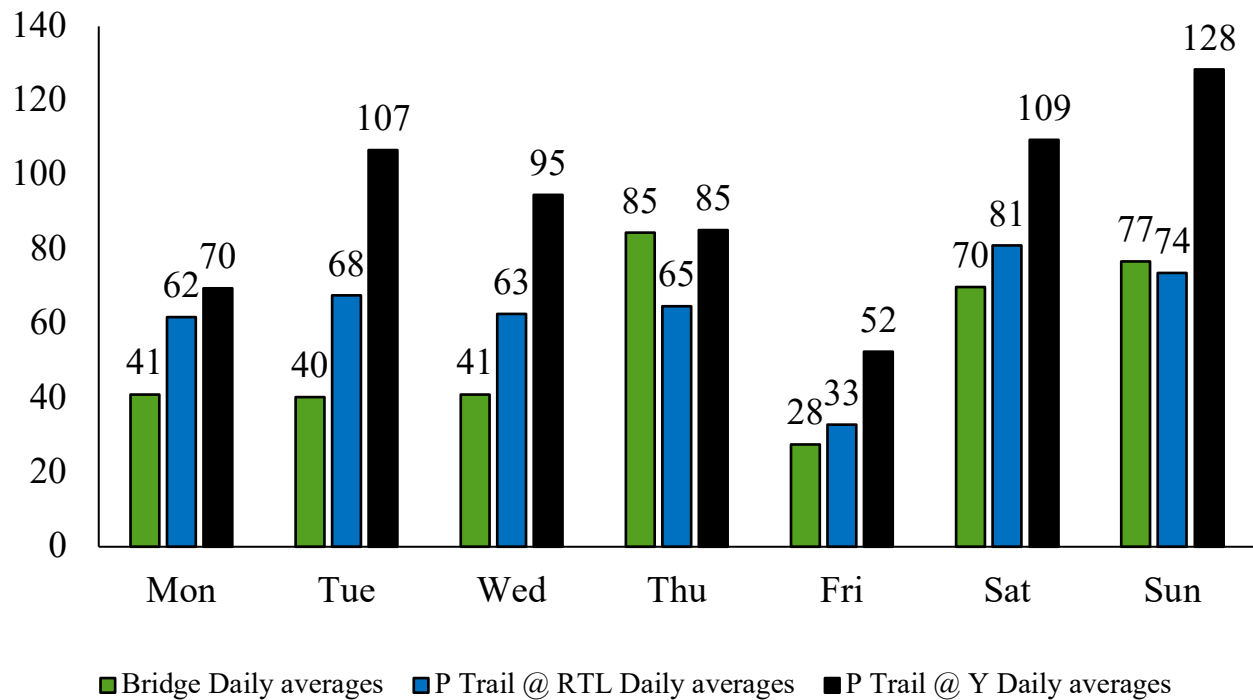
TRAFx total counts for ~1 month (33 days) by location



Weekends were the busiest times for Maryville College Trail use according to the TRAFx counters. Sunday averaged the most traffic accounting for 18.9% of passes, followed by Saturday (17.7%), Thursday (15.9%), Tuesday (14.6%), Wednesday (13.5%), Monday (11.7%), and lastly, Friday with 7.7%. Figure 7 shows the average of each day by location. Overall, the Perimeter Trail at the split averaged 92.4 ± 23.8 counts per day the Perimeter Trail at the Ruby Tuesday Lodge averaged 63.5 ± 14 counts per day, and the bridge averaged 54.4 ± 20.4 counts per day.

Figure 7

Counts per day by day of the week and trail location.



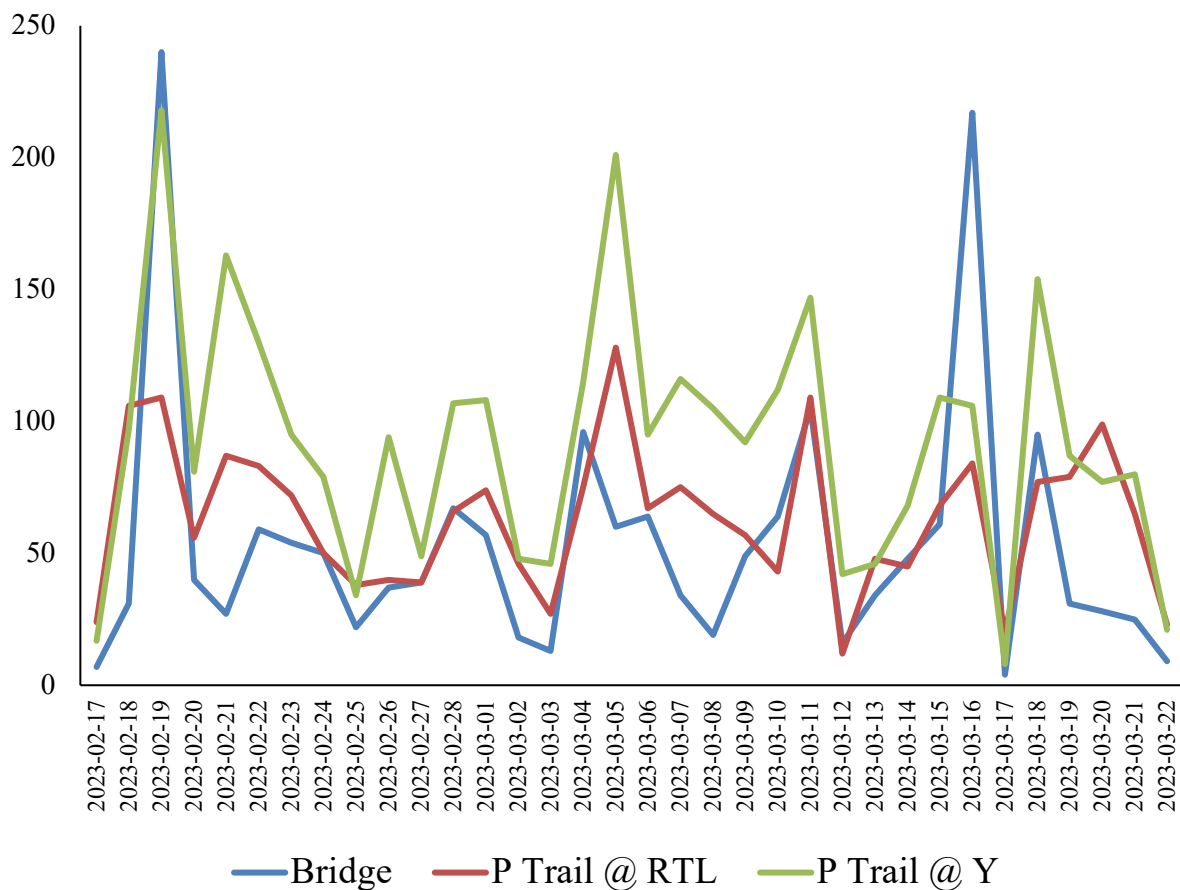
For perspective during the week with the most trail counts (2/13 to 2/19) the Perimeter Trail at the split had 775 passes, the Perimeter Trail Ruby Tuesday Lodge location had 558 passes, and the bridge had 649 passes. Compared to during the week with the least trail counts (3/20 to 3/26) the Perimeter Trail at the split had 415 passes, the Perimeter Trail Ruby Tuesday Lodge location had 436 passes, and the bridge had 150 passes.

Daily totals across the month show a pattern of increased weekend use (Figure 8). Specifically, the days that all trails had the highest counts were all weekend days; for the Perimeter trail at the split (218 passes) and the bridge (240 passes) it was Sunday, February 19th, and the perimeter trail near the RT Lodge got the most activity (128 passes) on Sunday, March 5th. The lowest trail counts at 2 of the 3 locations were on weekdays. The Perimeter Trail split

saw the least amount of traffic on Friday, March 17th with only 8 passes, and the bridge across Duncan Branch saw the least activity on Friday, February 17th with only 7 passes. The RT Lodge Perimeter Trail location saw its lowest counts, only 12 passes on, Sunday March 12th. Typically, the least used trail, bridge trail, showed uniquely high counts on two separate days, specifically on February 19, there were 240 counts registered, and on March 16, there were 217 counts registered, making it the most used trail on those two dates. For perspective the average counts per day at the bridge, not including these two outliers was 49 counts.

Figure 8.

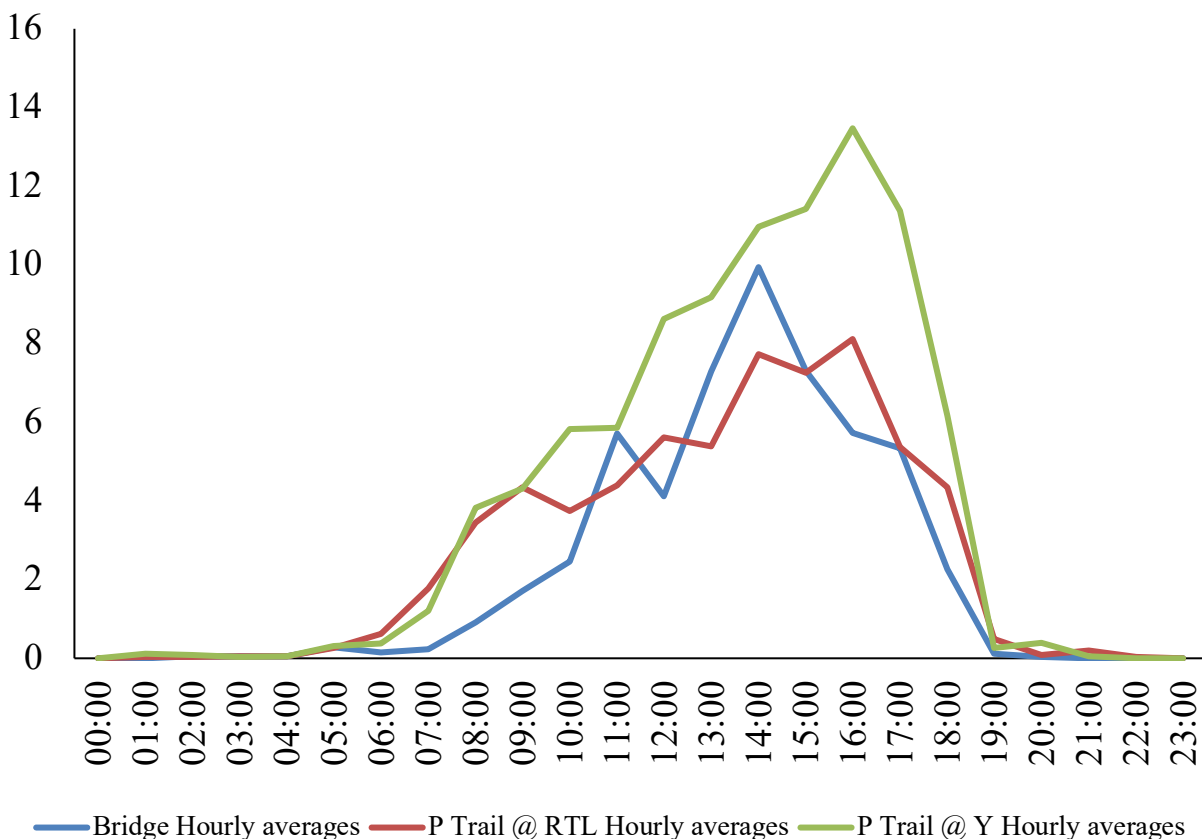
Daily trail counts by location for 1-month of trail monitoring.



Reviewing trail counts by the hour reveal a pattern of increased weekend use throughout the day with peak later afternoon through early evening. 4:00 pm was the busiest hour for all locations. On average during the 4:00-5:00 pm hour the perimeter trail at the split averaged 21 passes, the perimeter trail near RT lodge averaged 15 passes, and the bridge averaged 13 passes. Trail use appears to start around 5:00 am and end around 8:00 pm. Aside from the large peak between 3:00- 5:00 pm, there appeared to be another smaller peak in activity between the 12:00-1:00 pm hour (Figure 9).

Figure 9.

Hourly average trail counts by location from 1-month of trail monitoring.



In addition to the direct observations, we used surveys to collect data on 189 trail users. All 189 surveys were answered online. Trail users were predominantly female (50.3%), white (92.7%), and were college graduates (60.3%) (Table 2). Users age ranged from 18 to 77 years, with an average age of 41.1 ± 17.9 years. Trail users walked alone 26.7% of the time alone, alone, but with pets 19.4% of the time, and with other humans 37.2% of the time. The Entry Trail by the McArthur Pavilion was used as the main point of entrance by 63.3% of trail users. The Perimeter Trail near the RT lodge was the second most popular, accounting for 13.3%. 28.3% of trail users (51) don't come to the woods if it is raining or snowing, 21.1% do (38). 53 responders said they do not replace that activity if they don't go due to those conditions (29.4%). 62.2% of trail users reported Covid-19 hadn't affected their use of the woods in the last several years.

When it came to primary activity done in the woods, hiking/ walking made up 74.4% of responses (Table 3). Followed by trail runners who made up 8.9%, forest bathers with 5.6%, and disc golf players at 5%. On average, trail users reported the physical activity from the woods made about 23% (23.2 ± 24.0) of their total physical activity, and that they spent about 60 minutes (60.1 ± 26.8) in the woods each visit. Trail users averaged almost 2 visits (1.9 ± 1.6) per week and were traveling an average of 5 miles to visit the Maryville College Woods (5.0 ± 10.2). Most of the physical activity done in the woods (67.8%) that trail users reported participating in was moderate activity.

Table 2.*Demographics of Maryville College Woods Users Surveyed (n=179).*

	N	Percentages
Age	179	41.1 ± 18.0*
Gender	180	
Female	90	50.0%
Male	80	44.4%
Other	8	4.5%
Race	180	
White	161	89.4%
Black	10	5.6%
Other	4	2.3%
Marital Status	180	
Married	94	52.2%
Divorced	11	6.1%
Never married	51	28.3%
Unmarried Couple	18	10%
Separated/Widowed	5	2.8%
Education Level	180	
Grade 12 or GED	17	9.4%
1-3 yr College	55	30.6%
4+ yr College	108	60%
Employment status	180	
Employed	92	51.1%
Retired	26	14.4%
Student	43	23.9%
Self Employed	10	5.6%
Out of work	3	1.7%

Age reported as mean and standard deviation*

Table 3.*Trail Behaviors of Maryville College Woods Users Surveyed (n=175-180).*

	Mean & Std. Deviation
Proximity to Home (Miles)	5.0 ± 10.2
Minutes from Home	9.4 ± 12.4
Minutes Spent in Woods	60.0 ± 26.8
Visits per Week	1.9 ± 1.6
Percentage of Total Activity	23.2 ± 24.0
	Percentage
Primary Activity Type	
Walk/Hike	74.4%
Trail Running	8.9%
Forest Bathing	5.6%
Disc Golf	5.0%
Mountain Biking	2.8%
Other	3.5
Intensity of Activity	
Light Intensity	25%
Moderate Intensity	67.8%
Vigorous Intensity	7.2%

Trail users were also asked about their perceptions about safety in the woods, attractiveness, and congested feel in the woods. 89.4% of trail users agreed the woods were attractive, 95.5% said they felt safe in the woods, and 87.8% claimed that the woods were not congested.

On one of the last questions of our survey, we asked the respondents a series of statements and asked if they either agreed that the statement was like them, if they were neutral, or if they disagreed. These questions covered physical and mental health. 72.8% agreed that being active in the woods made them enjoy life more, 68.4% agreed to using it to improve overall fitness, 68.3% agreed that it them appreciate life more, 65% agreed it related to other positive aspects of their life, and 64.4% agreed it improved life satisfaction. These answers were

all higher than the disease prevention related reasons for being active outdoors in the Maryville College Woods, for example, only 49.4% agreed they are motivated to spend time being active in the Maryville College Woods to reduce weight gain, and 46.7% agreed they use it to reduce their risk of diabetes.

CHAPTER V

DISCUSSION

The results of this study highlight the characteristics of Maryville College Woods users and the types of activities they participate in when using them. The multifaceted approach of this study allowed different measures to be recorded and allowed objective characteristics to be noted while also getting firsthand subjective information from the individual. This study discovered that most trail users were white, female, married, and college graduates. Librett acknowledged that trails within communities facilitate more physical activity and those who frequent those trails are more likely to be physical active (2006). This study shows that the Maryville College woods do facilitate light, moderate, and vigorous physical activity among those in the community and those on campus. Maryville College Woods users were predominantly walkers, and the average trail user was spending 60 minutes per visit and visiting almost 2 times per week. Trail users reported that their time spent in the Maryville College Woods accounts for 23.2% of their total physical activity time. This means their time in the woods is making up almost a quarter of their weekly physical activity. The World Health Organization (2010) stated that adults need to have at least 150 minutes of moderate intensity aerobic activity. At an average of 60 minutes of activity, trail users are getting 40% of that on average each visit.

Toftager's study in Denmark looked at the relationship between distance to green area and level of physical activity (2011). Although this study did not analyze that same relationship, we did note that many who were coming to use the woods reporting

traveling an average of 5 miles to use them. Most people visit the woods with someone else, but a little over 25% come alone. This number makes sense considering the amount of people who said they feel relatively safe when using the trails.

In the survey, trail users mostly reported coming on both weekdays and weekends while 25% only come on weekdays. Based on our direct observations, the weekend averaged more visitors in all 3 time slots (morning, noon, and evening). All 3 weekend days were busier than every weekday observation.

In a study done in Spain surveyed students were asked why they were physically active (Carballo-Fazanes et al., 2020); and students agreed that improving overall fitness was a motivator to be physically active. The reasons why people reported using the trails in the Maryville College Woods matched this finding, with 68.4% agreeing that they use the woods to improve their overall fitness. However, the highest rated reason (72.8%) for using the Maryville College Woods was it caused them to enjoy life more. Bélair et al. pointed out the importance of physical activity and decreasing sedentary behavior to combat severe depression and anxiety symptoms (2018). It seemed like most who were using the trails realized or appreciated the benefits associated with being active outdoors and used that as motivation or inspiration to be physically active outdoors in the Maryville College Woods.

It should be noted that there were some discrepancies between the direct observations and the survey responses. Only 5% (9/180) of survey respondents reported playing Disc golf, but we observed 16% (79/508) of our direct observation counts playing disc golf. This could just be explained by disc golfers being less likely to complete the survey. It is worth noting that when looking at where the 5 Maryville College Woods

Survey signs were placed, disc golfers would only see the one sign along Morningside Lane. Disc golfers and some walkers entered through the road instead of any of the trails. This would mean they would only see one of the signs and not any of the other 4 unless they got onto the perimeter trail through one of the many trails that connects to it. The entry trail near McArthur Pavilion was the most popular entrance accumulating 63% of trail users. This also partially explains why the TRAFx counter on the perimeter trail at the Y had the most passes (5,510). That counter is the closest to the McArthur Pavilion entrance if you follow the perimeter trail to the left. According to the TRAFx count data, the second highest location was at the Perimeter trail on the RT Lodge side near the Court Street entrance (3750 passes). After seeing the amount of those who answered using the Court Street entrance and the amount of community members that use the trail, it makes sense that it is the second most common crossing point of the 3 TRAFx counters. The counter on the Bridge across Duncans Branch averaged the least counts on most days (3186 total passes), however, it did have some days where it had more passes than either of the other two counters, specifically February 19th, and March 16th.

Saturdays and Sunday averaged the most Maryville College Woods users based on both our direct observations and the TRAFx counters data and based on the survey response where 25% of respondents only use the Maryville College Woods on the weekend. We expected this considering it is the days off for a typical work week and it also days off from school, allowing families to come. This could also explain why the afternoon hours were so busy. Both our direct observations and TRAFx counter data showed that, the afternoon was the busiest time of the day. People had to be 18 or older to do the survey so we were not able to get any demographic information from the few

children and teens that we saw during our direct observations.

When looking at the basic demographic information, it is important to remember the region the Maryville College Woods is located. In the East Tennessee region, people are predominantly white. Both our direct observations and survey responses showed this. It is also important to note that these samples were only taken over a span of 33 days in the first several months of 2023. This data does not reflect what traffic in the woods could look like in the Summer, Fall or Winter months. One would expect the number of Maryville College Woods users to increase as the temperature increased. Almost 90% of all survey respondents agreed that the Maryville College Woods were attractive and not congested. This is a benefit, but also something to think about when considering making any changes to the Woods or specific trails. Our statements about motivation regarding using the Maryville College Woods showed that almost half who are using the woods are using them to take advantage of the physical and mental benefits.

More community members are reported using the woods than Maryville College students. This could be due to a lack of a strict schedule, despite Maryville College students, staff and faculty being in the closest proximity to easily access the Maryville College Woods. College students are starting to spend more time in front of a screen being sedentary (Carballo-Fazanes et al., 2020). There is a need to motivate students to use their free time to form healthy habits like participating in physical activity outside where they can acquire the most benefits (Warburton, 2006). Research has proven that community trails promote physical activity (Librett et al., 2006) and those that live closer to trails are more likely to be physically active (Pierce et al., 2006). This means that Maryville College should be investing in encouraging its students, staff, and faculty to

use this valuable resource more frequently. By maintaining the Maryville College Woods it provides a valuable resource for Blount County and Maryville College community members to maintain healthy levels of physical activity. Research has shown that characteristics like non-congested trails or well-maintained trails helps trail users be more comfortable using them (Johansen et al., 2020). This can also be shown by our survey responses where 87.8% agreed that the Maryville College Woods are not congested, and 89.4% agreed the woods are attractive and well maintained. The survey approach used in this study was like the approach Reed and Wilson used to look at college students' knowledge and use of recreational trails on college campuses (2006). Those researchers found that 73% had used the trail at least once but only 67% reported using the trail once in the last week. When asked if they had visited twice in the last week, the number dropped drastically to 7% (Reed & Wilson, 2006). In our study, our respondents averaged 1.85 visits a week and 6.33 visits a month. Our survey also had members from the community and not strictly college students. Leahy et al. noted that those who frequented trails in her study were more likely to be trail educated (2009). The same can be seen in our data where 60% of trail users reported completing 4 or more years of college.

Strengths of this study include the multifaceted approach of using the different forms of data that allowed us to make some conclusions and generalizations about Maryville College Woods users and use. Because the survey was confidential, and mostly self-administered, the respondents would be less likely to be embarrassed or possibly nervous about responding truthfully, hopefully reducing respondent bias due to social desirability. However, because of the self-reported aspect of the survey, there is room for

error, for example, someone could state they spend more time being active than they really are.

Our observations allowed us to get a more accurate count of who is coming to use the Maryville College Woods on certain days. A weakness is we only observed from one location, the main one by the main parking lot near McArthur Pavilion. We could not see everyone who came in from any of the other entrances. Our observation days were made up of 3 Wednesdays, 2 Saturdays, and a Sunday. This allowed some variety so we could generalize the difference between weekdays and weekends, but more variety in the days might have been ideal. Additionally, our TRAFx counters, survey access, and direct observations were limited to the Spring months of February and March. It would be valuable to repeat observations in the Summer, Fall and Winter months. The TRAFx counters were able to record data 24/7 every day for 33 days. A weakness though, is that the TRAFx counters just count passes, meaning one person could account for 10 passes and another person account for 1. Fortunately, the TRAFx portion of this study will continue and allow the Maryville College Woods Group to account for seasonal trends in the count data over time.

Works Cited

- Alcock, I., White, M. P., Wheeler, B. W., Fleming, L. E., & Depledge, M. H. (2014). Longitudinal effects on mental health of moving to greener and less green urban areas. *Environmental Science & Technology*, 48(2), 1247–1255.
<https://doi.org/10.1021/es403688w>
- Astell-Burt, T., Feng, X., & Kolt, G. S. (2013). Does access to neighbourhood green space promote a healthy duration of sleep? Novel findings from a cross-sectional study of 259 319 Australians. *BMJ Open*, 3(8), e003094. <https://doi.org/10.1136/bmjopen-2013-003094>
- Bélair, M.-A., Kohen, D. E., Kingsbury, M., & Colman, I. (2018). Relationship between leisure time physical activity, sedentary behaviour and symptoms of depression and anxiety: Evidence from a population-based sample of Canadian adolescents. *BMJ Open*, 8(10), e021119. <https://doi.org/10.1136/bmjopen-2017-021119>
- Beyer, K. M. M., Szabo, A., Hoormann, K., & Stolley, M. (2018). Time spent outdoors, activity levels, and chronic disease among American adults. *Journal of Behavioral Medicine*, 41(4), 494–503. <https://doi.org/10.1007/s10865-018-9911-1>
- Blair, S. N., & Brodney, S. (1999). Effects of physical inactivity and obesity on morbidity and mortality: Current evidence and research issues: *Medicine & Science in Sports & Exercise*, 31(Supplement 1), S646. <https://doi.org/10.1097/00005768-199911001-00025>
- Blair, S. N., & Connelly, J. C. (1996). How much physical activity should we do? the case for moderate amounts and intensities of physical activity. *Research Quarterly for Exercise and Sport*, 67(2), 193–205. <https://doi.org/10.1080/02701367.1996.10607943>
- Blumenthal, J. A., Rejeski, W. J., Walsh-Riddle, M., Emery, C. F., Miller, H., Roark, S., Ribisl,

- P. M., Morris, P. B., Brubaker, P., & Williams, R. S. (1988). Comparison of high- and low-intensity exercise training early after acute myocardial infarction. *The American Journal of Cardiology*, 61(1), 26–30. [https://doi.org/10.1016/0002-9149\(88\)91298-2](https://doi.org/10.1016/0002-9149(88)91298-2)
- Brownson, R. C., Boehmer, T. K., & Luke, D. A. (2005). Declining rates of physical activity in the United States: What Are the Contributors? *Annual Review of Public Health*, 26(1), 421–443. <https://doi.org/10.1146/annurev.publhealth.26.021304.144437>
- Brownson, R. C., Housemann, R. A., Brown, D. R., Jackson-Thompson, J., King, A. C., Malone, B. R., & Sallis, J. F. (2000). Promoting physical activity in rural communities. *American Journal of Preventive Medicine*, 18(3), 235–241. [https://doi.org/10.1016/S0749-3797\(99\)00165-8](https://doi.org/10.1016/S0749-3797(99)00165-8)
- Calogiuri, G., & Chroni, S. (2014). The impact of the natural environment on the promotion of active living: An integrative systematic review. *BMC Public Health*, 14(1), 873. <https://doi.org/10.1186/1471-2458-14-873>
- Carballo-Fazanes, A., Rico-Díaz, J., Barcala-Furelos, R., Rey, E., Rodríguez-Fernández, J. E., Varela-Casal, C., & Abelairas-Gómez, C. (2020). Physical activity habits and determinants, sedentary behaviour and lifestyle in university students. *International Journal of Environmental Research and Public Health*, 17(9), 3272. <https://doi.org/10.3390/ijerph17093272>
- Coutts, C. (2008). Greenway accessibility and physical-activity behavior. *Environment and Planning B: Planning and Design*, 35(3), 552–563. <https://doi.org/10.1068/b3406>
- Erikssen, G. (2001). Physical fitness and changes in mortality: The survival of the fittest. *Sports Medicine*, 31(8), 571–576. <https://doi.org/10.2165/00007256-200131080-00001>
- Ewing, R., Schmid, T., Killingsworth, R., Zlot, A., & Raudenbush, S. (2003). Relationship

- between urban sprawl and physical activity, obesity, and morbidity. *American Journal of Health Promotion*, 18(1), 47–57. <https://doi.org/10.4278/0890-1171-18.1.47>
- Helmrich, S. P., Ragland, D. R., Leung, R. W., & Paffenbarger, R. S. (1991). Physical activity and reduced occurrence of non-insulin-dependent diabetes mellitus. *New England Journal of Medicine*, 325(3), 147–152. <https://doi.org/10.1056/NEJM199107183250302>
- Huijg, J. M., van der Zouwe, N., Crone, M. R., Verheijden, M. W., Middelkoop, B. J. C., & Gebhardt, W. A. (2015). Factors influencing the introduction of physical activity interventions in primary health care: A qualitative study. *International Journal of Behavioral Medicine*, 22(3), 404–414. <https://doi.org/10.1007/s12529-014-9411-9>
- Johansen, C., Reynolds, K. D., Wolch, J., Byrne, J., Chou, C.-P., Boyle, S., Spruijt-Metz, D., Lienemann, B. A., Weaver, S., & Jerrett, M. (2020). The association of trail features with self-report trail use by neighborhood residents. *Journal of Physical Activity and Health*, 17(7), 715–722. <https://doi.org/10.1123/jpah.2019-0347>
- Kaczynski, A. T., & Henderson, K. A. (2007). Environmental correlates of physical activity: a review of evidence about parks and recreation. *Leisure Sciences*, 29(4), 315–354. <https://doi.org/10.1080/01490400701394865>
- Leahy, J., Shugrue, M., Daigle, J., & Daniel, H. (2009). Local and visitor physical activity through media messages: A specialized benefits-based management application at Acadia National Park. *Journal of Park & Recreation Administration*, 27(3), 59–77.
- Librett, J. J., Yore, M. M., & Schmid, T. L. (2006). Characteristics of physical activity levels among trail users in a U.S. national sample. *American Journal of Preventive Medicine*, 31(5), 399–405. <https://doi.org/10.1016/j.amepre.2006.07.009>
- Myers, J., Kaykha, A., George, S., Abella, J., Zaheer, N., Lear, S., Yamazaki, T., & Froelicher,

- V. (2004). Fitness versus physical activity patterns in predicting mortality in men. *The American Journal of Medicine*, 117(12), 912–918.
<https://doi.org/10.1016/j.amjmed.2004.06.047>
- Pierce, J. R., Denison, A. V., Arif, A. A., & Rohrer, J. E. (2006). Living near a trail is associated with increased odds of walking among patients using community clinics. *Journal of Community Health*, 31(4), 289–302. <https://doi.org/10.1007/s10900-006-9014-8>
- Reed, J. A., & Wilson, D. K. (2006). Awareness and use of a university recreational trail. *Journal of American College Health*, 54(4), 227–230.
<https://doi.org/10.3200/JACH.54.4.227-230>
- Roemmich, J. N., Balantekin, K. N., & Beeler, J. E. (2015). Park-like campus settings and physical activity. *Journal of American College Health*, 63(1), 68–72.
<https://doi.org/10.1080/07448481.2014.960421>
- Roemmich, J. N., & Johnson, L. (2014). Seasonal alterations in park visitation, amenity use, and physical activity—Grand Forks, North Dakota, 2012–2013. *Preventing Chronic Disease*, 11, 140175. <https://doi.org/10.5888/pcd11.140175>
- Ryan, R. M., Weinstein, N., Bernstein, J., Brown, K. W., Mistretta, L., & Gagné, M. (2010). Vitalizing effects of being outdoors and in nature. *Journal of Environmental Psychology*, 30(2), 159–168. <https://doi.org/10.1016/j.jenvp.2009.10.009>
- Sallis, J. (2002). How the environment shapes physical activity: A transdisciplinary research agenda. *American Journal of Preventive Medicine*, 22(3), 208.
[https://doi.org/10.1016/S0749-3797\(01\)00435-4](https://doi.org/10.1016/S0749-3797(01)00435-4)
- Toftager, M., Ekholm, O., Schipperijn, J., Stigsdotter, U., Bentsen, P., Grønbæk, M., Randrup, T. B., & Kamper-Jørgensen, F. (2011). Distance to green space and physical activity: A

- Danish national representative survey. *Journal of Physical Activity and Health*, 8(6), 741–749. <https://doi.org/10.1123/jpah.8.6.741>
- Troped, P. J., Saunders, R. P., Pate, R. R., Reininger, B., Ureda, J. R., & Thompson, S. J. (2001). Associations between self-reported and objective physical environmental factors and use of a community rail-trail. *Preventive Medicine*, 32(2), 191–200. <https://doi.org/10.1006/pmed.2000.0788>
- Warburton, D. E. R. (2006). Health benefits of physical activity: The evidence. *Canadian Medical Association Journal*, 174(6), 801–809. <https://doi.org/10.1503/cmaj.051351>
- Wei, M., Gibbons, L. W., Kampert, J. B., Nichaman, M. Z., & Blair, S. N. (2000). Low cardiorespiratory fitness and physical inactivity as predictors of mortality in men with type 2 diabetes. *Annals of Internal Medicine*, 132(8), 605. <https://doi.org/10.7326/0003-4819-132-8-200004180-00002>
- World Health Organization. (2010). Global recommendations on physical activity for health. *Recommandations mondiales sur l'activité physique pour la santé*, 58.