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AN EXAMINATION OF THE IMPACT OF COLLEGE LEVEL PHYSICAL ACTIVITY CLASSES BY RACE AND ETHNICITY

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ABSTRACT

Not only is physical activity associated with physical, psychosocial, and cognitive health benefits, but regular physical activity can help prevent the onset of multiple chronic diseases. Conditions such as cardiovascular disease, diabetes, cancer, and depression can be prevented through exercise, yet fewer college students are participating in physical activity than in the past. Additionally, fewer 4-year colleges are enforcing mandatory physical education courses that could potentially bring great health benefits to students. The purpose of this study was to examine differences in physical activity behaviors by race in a sample of college students from a large 4-year university in the northeast. Surveys asked students about physical activity behaviors as well as social media sharing about exercise and wearable device usage. Data was analyzed by SPSS software, where t-tests, correlations, and ANOVAs had significance levels set at $p<0.05$. Differences were found by race in variables such as weekly vigorous physical activity, self-efficacy of exercise, and physical activity enjoyment. Differences in these variables were also associated with each race's participation in social media sharing and wearable device usage. Changes were seen in variables over the course of one semester where the students were involved in a university physical activity course. Future studies with higher response rates could possibly find more significant differences by race. Future methods of encouraging physical activity in college students with attention to race could also be employed to better the health and longevity of college-aged people.

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Chapter 1

Literature Review

Physical Activity and Health

Physical activity is proven to greatly benefit health, including physical, psychological, cognitive, and social aspects. Physical activity (PA) also aids in the prevention of chronic disease and premature death, both of which are often increased due to physical inactivity. In a study of current literature related to the development of chronic disease, it was found that PA aids in both the primary and secondary prevention of chronic disease (Warburton, Nicol, & Bredin, 2006). For primary prevention, both men and women who reported increased PA were found to have a 20%-30% reduction in risk of death. In another examination, being fit or active was related to more than a 50% reduction in risk of cardiovascular disease. An increase of 500 kcal per week of energy expenditure per week was found to decrease type 2 diabetes by 6% in another study. For secondary prevention, a cohort study found that men with type 2 diabetes had a 1.7-fold decreased risk of premature death if they were physically active. Another study involving breast and colon cancer patients found that physical activity was associated with a decreased recurrence of cancer (Warburton et al., 2006).

Regular physical activity can also affect health-related issues outside of inactivity-related chronic diseases. In a report to the Secretary of Health and Human Services, 31.9% of U.S. adults were reported to be entirely inactive with another 19.4% insufficiently active (Physical Activity Guidelines Advisory Committee, 2018). Sedentary behaviors have been found to have a strong relationship between all-cause mortality with increasing slopes at higher amounts of inactivity (Physical Activity Guidelines Advisory Committee, 2018). Yet these health and mortality risks can be prevented simply by increasing regular daily exercise. Moderate evidence shows that there is an inverse relationship between amount of physical activity and mortality in cancer patients . Significant decreases in chronic high blood pressure are also seen following regular physical activity, which can aid in the prevention or maintenance of cardiovascular disease (Physical Activity Guidelines Advisory Committee, 2018). In a review of health benefits of PA in children and adolescents, moderate-intensity exercise was found to potentially benefit the immune system, particularly the interleukin-2/natural killer cell system (Sothern, Loftin, Suskind, Udall, & Blecker, 1999). The same study found that reduced stress and depression from exercise further improves oxygen transport, endocrine function, and cholesterol ratios. The reduction of mental stress also may enhance the immune system (Sothern et al., 1999).

The U.S Department of Health and Human Services published guidelines for PA in 2008 based on age; for adults of all ages, 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic activity is recommended weekly in order to garner the health benefits of exercise (U.S. Department of Health and Human Services, 2008). The guide also recommends muscle strengthening two or more days a week and avoiding inactivity. Yet, in spite of these recommendations, studies consistently find that large portions of college students are insufficiently active. In a meta-analysis, researchers reported that 40-50% of college students and inactive (Keating, Guan, Castro, Dwan, & Bridges, 2005). In another sample of 736 college freshmen, 44.2% were found to be insufficiently active with another 12.4% being totally inactive (Fountaine, Liguori, Mozumdar, & Schuna Jr, n.d.). One final study of 871 undergraduate students found that 18% of students did not participate in any vigorous or moderate physical activity (Pauline, 2013).

Collegiate Physical Education Requirements

Chronic disease and obesity can be counteracted in college populations by physical activity, and namely, physical activity classes for undergraduate students. The U.S. Preventive Services Task Force (2014) recommends offering overweight adults with cardiovascular disease risk factors behavioral interventions as well as healthy diet and physical activity promotion. These interventions could easily be achieved through required physical education courses in colleges. The transition to college or university often gives students more autonomy over their dietary and activity decisions, but students may not consider the risk of chronic disease in their choices. Studies show that college-based fitness classes as PE interventions can significantly increase moderate physical activity. In a systematic review of 29 physical activity interventions in colleges, 18 yielded significant results with increases in moderate physical activity compared to control (Plotnikoff et al., 2015).

Despite the evidence associated physical activity with countless health benefits, fewer colleges are requiring health and physical activity courses in required curriculum. From the peak of physical education (PE) in universities in the 1920s, physical education requirements have declined significantly. With 97% of universities requiring physical education then, merely 39.55% of 354 American institutions required PE in 2010 (Cardinal, Sorensen, & Cardinal, 2012). This trend is also seen on an international level; in a study of 17,928 universities in 23 countries, 45.8% of women and 33% of men were physically inactive (Pengpid et al., 2015).

Amidst this decline in college-level PE, a lack of evidence exists as to whether PE would promote long-term behavioral changes towards physical activity. A task force to increase college-based physical education found that, due to a lack of available studies, there is insufficient evidence as to whether college-based health and PE interventions can be effective (Zaza, Briss, & Harris, 2005).

In a survey of 738 college students age 18 to 27, 21.6% of students were overweight with a BMI > 25 kg/m^2 and 4.9% were obese with a BMI > 30 kg/m^2 (Huang et al., 2003). The 738 students also reported less than 3 days a week of physical activity on average. Findings such as these are present in nearly every college study; significantly higher portions of student populations are reportedly overweight or obese. As a result of less movement being required in daily activities and the decline of physical education programs in universities, a sharp decrease is evident in the PA of college students. The increase in physical activity is further associated with an increase in overweight and obesity rates.

Obesity in Children and Adults

Obesity takes significant tolls on individual health and poses potential long-term effects for both children and adults. In the United States, more than one in three adults and one in six children are obese ("The State of Obesity," 2018). Genetics are often key players in the onset of obesity, but behavior and lifestyle are predominant contributors to the disease. High caloric intake and sedentary lifestyles, coupled with a decrease in population physical activity, influence the onset of weight gain in children and adults. In a study of cardiovascular fitness of school-aged children, children with low fitness had 3.5-fold higher risk of being overweight (Vos &

Welsh, 2010). The same review confirmed that caloric imbalances, often associated with sweetened beverages, was associated with weight gain. Obese children suffer from psychosocial issues such as depression, bullying, and decreased school performance, and their mortality in adulthood was greatly increased (Vos & Welsh, 2010).

Being overweight or obese as a child can have a great impact on adult life. In a study of American Indian children, a follow-up at 24 years found that children in the highest quartile of body mass index had double the mortality rate (Franks et al., 2010). Those who have obesity as children as also much more likely to suffer from obesity as adults; in adulthood, obesity increases the risk of chronic diseases such as cardiovascular disease, type 2 diabetes, and cancer (U.S. Department of Health and Human Services, 2016). Although the prevalence of metabolic syndrome is decreasing in adults, trends for adolescents aren't as static. In a study for 5117 adolescents, the obesity-related disease had a prevalence rate of 9.83% with a 9.97% prevalence in the Hispanic subgroup alone (Lee, Gurka, & DeBoer, 2016). Metabolic syndrome in adolescents is frequently carried into adulthood with characteristics such as obesity, high fasting glucose, high fasting triglycerides, and high blood pressure.

The same psychosocial effects that children with obesity face can also be seen in adults. In a review of adverse outcomes associated with childhood obesity, both children and adults who are overweight or obese can suffer from depression, body dissatisfaction, eating disorders, and trouble forming relationships (Daniels, 2006). Formerly thought to be causes of obesity, research suggests that psychosocial disturbances are more likely the consequences of obesity (Sadock, Sadock, & Kaplan, 2004). In a review of consequences of obesity, discrimination in academic and word settings was found to frequently be associated with obesity (WADDEN, 1985).

Undoubtedly, obesity had significant impacts on the psychosocial and physical qualities of children and adults.

Health Disparities by Race

Obesity rates vary in the U.S adults by race and ethnicity. Hispanics/Latinos have the highest obesity rates with 21.4% for females and 22.4% for males (“The State of Obesity,” 2018). The second highest rates are of African Americans with males at 20.7% and females at 18.4%. White females and males have obesity rates of 15.1% and 14.3%, respectively. Asian Americans have significantly lower obesity rates with 5.3% of females and 11.8% of males. For children, American Indian/Alaska Natives have startlingly high rates of obesity—31% of 12 to 19 year old are reportedly obese (“The State of Obesity,” 2018).

Health disparities are frequently seen between racial and ethnic groups in America. African American women have the highest rates of overweight and obesity compared to other groups, and African Americans as a whole have higher death rates than whites for heart diseases, stroke, cancer, and diabetes (U. S. Department of Health & Human Services, 2016). Hispanics/Latinos, particularly Mexican Americans, are more frequently obese than non-Hispanic whites. Asian Americans have significantly lower obesity rates than whites, and Asian American women have the highest life expectancy of any group. American Indians and Alaska Natives are 30% more likely to be obese than whites, and the group has the highest diabetes rates. Native Hawaiians and Pacific Islanders have high rates of smoking and alcohol consumption, leading to a generally high rate of obesity (U. S. Department of Health & Human Services, 2016).

Findings differ on the amount of PA between races/ethnicities. Many find that in American undergraduate students, Caucasians are significantly more active compared to other races/ethnicities. In a study of 903 undergraduate students, those reporting vigorous PA were more likely to be younger Caucasian males with those reporting moderate PA were more likely to be younger Caucasian females (Miller, Staten, Rayens, & Noland, 2005). Most Americans are at risk for chronic diseases such as heart disease, cancer, stroke, and obesity due to inactivity with only slight variation by race/ethnicity (U. S. Department of Health & Human Services, 2016).

Physical Activity Benefits and Engagement

Whether or not students are required to participate in physical activity courses or not, it is important to understand why people engage in physical activity. Determinants for physical activity engagement are often categorized into intrinsic and extrinsic factors. In his review of scientific literature on known determinants of exercise, Dishman (1985) explains that the most reliable correlate of PA participation is past participation in organized sport, which may account for 30-50% of the variance in physical activity participation. Current physical characteristics further determine participation: knowledge and belief in health benefits as well as feelings of enjoyment are found to be associated with higher physical activity participation. Attitudes of family and peers is often associated with PA, whether positively or negatively, and personal enjoyment of the activity is large proponent (Dishman et al., 1985). In a study of 133 non-obese and 54 obese sixth grade children, the obese children reported both lower daily physical activity and lower levels of PA self-efficacy, suggesting self-efficacy as a determinant for exercise

(Trost, Kerr, Ward, & Pate, 2001). Another study showed that availability of PA equipment was highly associated with vigorous PA (Wendel-Vos, Droomers, Kremers, Brug, & van Lenthe, 2007). Lack of time, access to facilities, and feeling too tired were among the most commonly reported personal barrier to PA in a study of U.S. adults (Brownson, Baker, Housemann, Brennan, & Bacak, 2001).

In a study of 871 undergraduate students, participants submitted a questionnaire to assess physical activity behavior, motivation, and self-efficacy (Pauline, 2013). Women were largely motivated by weight manage, appearance, and mental health while men were motivated by performance and ego-related factors. Males reported higher scheduling self-efficacy for physical activity than females, suggesting a need for PA interventions in colleges to promote exercise self-efficacy for all (Pauline, 2013). In another study of colleges students, intrinsic motives such as enjoyment and challenge were associated with sport engagement while extrinsic factors such as appearance and stress management were more associated with motivation for exercise (Kilpatrick, Hebert, & Bartholomew, 2005). Collectively, research finds that both intrinsic and extrinsic factors influence physical activity participation.

Social Media/Wearable Devices and Physical Activity

In recent decades, personal fitness technologies have become increasingly popular among exercise enthusiasts and those trying to increase their own physical activity. In an overview of wearable fitness and activity trackers, motivation to increase physical activity throughout the day and goal accomplishment were listed as intents of gaining fitness records from wearable devices (Kaewkannate & Kim, 2016). An investigation of common fitness devices found that most devices on the market now are generally reliable, accurate, and precise, allowing users to base their goals and activity levels off of valid data (El-Amrawy & Nounou, 2015). A survey of 206 U.S. participants explained that perceived usefulness, ease of use, attitudes toward technology, and perceived health benefits greatly influence wearable usage (Lunney, Cunningham, & Eastin, 2016). Devices perceived as both useful and easy to use were more likely to be adopted by users, and wearable use was significantly related to perceived health outcomes. In 2017, a 12-week fitness program for 20 overweight adolescents, including physical activity, nutrition classes, and goal-setting lessons, implemented wearable activity trackers to their program. Participants as a whole had positive trends in self-efficacy, muscle strength, fasting glucose, and diastolic blood pressures; however, participants used the wearable devices less frequently over the course of the trial, preventing the ability to analyze the correlation between wearable usage and these positive results (Wilson, Ramsay, & Young, 2017). Another study on exercise apps found that most apps incorporate fewer than four behavior change techniques; because of this, participants may need to use multiple apps to initiate and maintain behavior change, serving as a limitation to the usefulness of each app (Conroy, Yang, & Maher, 2014).

Social media can potentially affect an individual's PA participation. In a study of obese children, effects of social media sharing on weight loss were mixed. Although some were found to be successful in weight management when children felt they were important members of their social network and their voices were heard, potential risks were present in the form of limited self-regulation and potential for peer pressure (Li, Barnett, Goodman, Wasserman, & Kemper, 2013). Internet addiction, sleep deprivation, and excessive screen time were also potential risks of social media's impact on fitness programs. In an examination of 22 randomized controlled trials examining the use of social media to promote health behaviors, no significant differences were found for primary health outcomes when compared to control (Williams, Hamm, Shulhan, Vandermeer, & Hartling, 2014). One of the trials analyzed, predominantly comprised of middle-aged Caucasian women, found that exercise social media sharing made no significant change in overall physical activity, and sharing tended to decrease over the period of the trial (Williams et al., 2014). Ultimately, research is unclear as to whether social media sharing has a significant positive impact on PA behaviors.

Chapter 2

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Abstract

Not only is physical activity associated with physical, psychosocial, and cognitive health benefits, but regular physical activity can help prevent the onset of multiple chronic diseases. Conditions such as cardiovascular disease, diabetes, cancer, and depression can be prevented through exercise, yet fewer college students are participating in physical activity than in the past. Additionally, fewer 4-year colleges are enforcing mandatory physical education courses that could potentially bring great health benefits to students. The purpose of this study was to examine differences in physical activity behaviors by race in a sample of college students from a large 4-year university in the northeast. Surveys asked students about physical activity behaviors as well as social media sharing about exercise and wearable device usage. Data was analyzed by SPSS software, where t-tests, correlations, and ANOVAs had significance levels set at $p<0.05$. Differences were found by race in variables such as weekly vigorous physical activity, self-efficacy of exercise, and physical activity enjoyment. Differences in these variables were also associated with each race's participation in social media sharing and wearable device usage. Changes were seen in variables over the course of one semester where the students were involved in a university physical activity course. Future studies with higher response rates could possibly find more significant differences by race. Future methods of encouraging physical

activity in college students with attention to race could also be employed to better the health and longevity of college-aged people.

Introduction

Physical activity has been shown to improve physical, psychosocial, and cognitive aspects of health. Not only does physical activity (PA) promote fitness and weight loss, but PA plays a role in the prevention of the development of chronic disease and premature death. Warburton and colleagues confirm that from their analytical review of current literature, PA is effective in the primary and secondary prevention of chronic diseases including cardiovascular disease, diabetes, cancer, depression, and many others (Warburton et al., 2006). Not only this, but regular physical activity can boost immune responses through stress-reduction and even help with chronic constipation (De Schryver et al., 2005; Sothern et al., 1999).

The U.S Department of Health and Human Services published guidelines for PA in 2008 based on age; for adults of all ages, 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic activity is recommended weekly in order to garner the health benefits of exercise (U.S. Department of Health and Human Services, 2008). The guide also recommends muscle strengthening two or more days a week and avoiding inactivity. Yet, in spite of these recommendations, studies consistently find that large portions of college students are insufficiently active (Keating et al., 2005).

Collegiate Physical Education Requirements

Since the peak of required physical education in universities in the 1920s, physical activity requirements and overall involvement have been on the decline for college students. Despite efforts of professionals in higher education, 40-50% of college students remain physically inactive (Keating et al., 2005). Further, fewer institutions are requiring PA courses in order to earn bachelor's degrees, preventing student populations from learning critical health information that will serve them the rest of their lives (Cardinal et al., 2012). With an all-time high of 97% in the 1920s and '30s, universities with physical education requirements hit an all-time low of 39.55% in 2010 (Cardinal et al., 2012). Low rates of PA are seen on an international level in undergraduate students (Pengpid et al., 2015).

In a survey of 738 college students age 18 to 27, 21.6% of students were overweight with a BMI > 25 kg/m^2 and 4.9% were obese with a BMI > 30 kg/m^2 (Huang et al., 2003). The 738 students also reported less than 3 days a week of physical activity on average. The combination of less movement being required in daily activities and the decline of physical education programs in universities has resulted in a sharp decrease in the PA of college students as well as an increase in overweight and obesity rates.

Obesity in Children and Adults

The obesity epidemic in the United States contributes to significant health risks in children and adults. Throughout the U.S., more than one in three adults and one in six children are obese ("The State of Obesity," 2018). Although genetics play a role in obesity, behavior and lifestyle are predominant components contributing to the disease. High caloric intake coupled with sedentary lifestyles and a decrease in overall physical activity influence the onset of excess weight gain in children and adults (Vos & Welsh, 2010).

Children who have obesity are also more likely to suffer from obesity as adults; obese adults are at an increased risk of chronic diseases such as heart disease, type 2 diabetes, and cancer (U.S. Department of Health and Human Services, 2016). Obesity can take a significant toll on the psychological and social aspects of children and adults. Those who are overweight or obese can suffer from depression, body dissatisfaction, and eating disorders, and they may have trouble forming friendships and relationships (Daniels, 2006). Early studies believed these psychological and social elements to be causes of obesity, but recent reviews suggest they are instead consequences of obesity (WADDEN, 1985). Discrimination in academic and work settings is also frequently associated with obesity (WADDEN, 1985). Ultimately, the psychological, social, and health-related consequences of obesity that begin in childhood can carry into adulthood and decrease overall quality of life.

Health Disparities by Race

The *State of Obesity* reports that in the United States, obesity has different rates by race/ethnicity (2018). Latino/a adults have the highest obesity rates at 21.4% for females and 22.4% for males. African American males and females have the second highest obesity rates at 20.7% and 18.4% respectively, followed by white females and males at 15.1% and 14.3% respectively. Asian American have substantially lower obesity rates with females around 5.3% and males at 11.8%. American Indian/Alaska Native children have remarkably high obesity rates with 31% of 12 to 19 year olds being obese ("The State of Obesity," 2018).

A variety of health disparities are evident between American racial/ethnic groups. According to the Office of Minority Health, African Americans generally have higher death rates than whites for heart diseases, stroke, cancer, and diabetes, and African American women have the highest rates of being overweight or obese compared to other groups (U. S. Department of

Health & Human Services, 2016). Hispanics/Latinos tend to have higher rates of obesity compared to non-Hispanic whites, and Mexican-Americans typically have disproportionate rates of diabetes compared to other populations. Obesity rates in Asian Americans are significantly lower than non-Hispanic whites, and Asian American women have the highest life expectancy of any group. American Indians and Alaska natives are 30% more likely to be obese than non-Hispanic whites and have the highest diabetes rates. Native Hawaiians and Pacific Islanders have higher rates of smoking, alcohol consumption, and obesity (U. S. Department of Health & Human Services, 2016).

Findings differ on the amount of PA between races/ethnicities, but many studies find that in American undergraduate students, Caucasians are significantly more active compared to other races/ethnicities (Miller et al., 2005). Most Americans are at risk for chronic diseases such as heart disease, cancer, stroke, and obesity due to inactivity with only slight variation by race/ethnicity (U. S. Department of Health & Human Services, 2016).

Physical Activity Benefits and Engagement

Physical activity classes can be used to combat the chronic diseases and obesity rates that plague U.S. populations and, particularly, undergraduate students. The U.S. Preventive Services Task Force (2014) recommends offering overweight adults with cardiovascular disease risk factors behavioral interventions as well as healthy diet and physical activity promotion. The transition to college or university often gives students more autonomy over their dietary and activity decisions, but students may not consider the risk of chronic disease in their choices.

Studies have found that physical activity interventions, such as through college-based fitness classes, can significantly increase moderate physical activity (Plotnikoff et al., 2015).

Studies show that determinants for why people engage in physical activity can often be categorized into personal and environmental factors. Intention, personal capabilities, and commitment appear frequently as personal characteristics related to physical activity involvement (Dishman et al., 1985). Knowledge of, attitudes toward, and beliefs about health and activity also correspond with personality traits and feelings towards exercise (Dishman et al., 1985). Exercise self-efficacy, which is typically higher in males than females, is frequently associated with physical activity involvement (Pauline, 2013). Environmental prompts, such as from family, peers, or healthcare agents act as determinants towards activity. Environmental barriers such as accessibility to facilities, however, can outweigh personal motivation or attitudes (Dishman et al., 1985). With colleges students in particular, motivation for exercise is more often extrinsic and focused on appearance, weight, and stress management (Kilpatrick et al., 2005). Thus, participation in exercise is largely influenced by both intrinsic and extrinsic influences.

Social Media/Wearable Devices and Physical Activity

In a technologically-driven society, is it no surprise that wearable fitness technologies have become popular in the past couple decades. Wearable fitness devices can motivate users to increase their physical activity throughout the day and aid in reaching fitness goals by conveniently providing fitness records (Kaewkannate & Kim, 2016). Most devices on the market now are generally reliable, accurate, and precise, providing users with valid data to base their progress off of (El-Amrawy & Nounou, 2015). Fitness outcomes from wearable device usage are largely based off individual values and motivation (Gilmore, 2016). Studies show that wearable fitness technologies, when perceived as "easy to use" by consumers, are more likely to be used and are significantly related to perceived health outcomes (Lunney et al., 2016).

Social media can also play a role in physical activity; in a study of obese children, social media sharing can be successful in weight management when children feel they are important members of their social network and their voice is heard (Li et al., 2013). However, in a study of predominantly middle-aged Caucasian women, social media sharing of exercise made no significant change in overall physical activity, and sharing tended to decrease over the period of the studies (Williams et al., 2014). Social media sharing and wearable device usage both have the potential to affect exercise involvement, but results are inconsistent.

Aims

1. To evaluate differences in physical activity variables by race/ethnicity in a sample of college students.
2. Examine associations between physical activity, exercise enjoyment, and exercise self-efficacy by race/ethnicity in a sample of college students.
3. Determine the associations between wearable device usage and social media sharing of physical activity behavior with physical activity variables.
4. Examine the change in physical activity, exercise enjoyment, exercise self-efficacy, wearable device usage, and social media sharing over the course of one semester.

Hypotheses

1. Significant differences will be found between racial/ethnic groups for physical activity and related variables such as exercise enjoyment and self-efficacy.
2. Physical activity will be positively correlated with physical activity enjoyment and self-efficacy for all races by the follow-up time point.
3. Wearable device usage and social media sharing will be associated with an increase in vigorous physical activity, enjoyment, and self-efficacy.
4. Physical activity values will increase over the course of one semester.

Methods

Participants and Recruitment

This was a cross-sectional, longitudinal study following students enrolled in a large, northeastern United States university's physical activity courses (PA) between August 2014 and March 2017.

Recruitment was conducted via direct email among undergraduate students enrolled in PA courses. Participation was voluntary and did not impact students' grades, though instructors were requested to encourage student participation. All students enrolled in PA courses were eligible to participate, and those who completed the survey had the chance to enter a random drawing for a $50 gift card as an incentive. An informed consent statement was presented to students before they could participate in the survey. The University's Institutional Review Board approved this study.

Participants were invited to voluntarily complete shorter follow-up surveys distributed at the end of the semester, approximately 12 weeks later. Follow-up surveys were linked with original responses using a unique identification number to enable longitudinal analyses.

Survey and Measures

Survey questions included demographic information as well as scales from validated measures to examine student physical activity, enjoyment, self-efficacy, and depression and were grounded in the Social Cognitive Theory(Bandura, 1986). Questions were also asked regarding students' fitness device usage and social media (SM) usage regarding fitness.

Demographics: Students provided demographic information by self-report including age, sex, race/ethnicity, weight, and height. BMI was later calculated by the height and weight. Constant demographic data such as age, sex, and race were only reported during the beginning of the semester survey while variable data such as height and weight were asked in both the initial and follow-up surveys. Students were organized into four groups by race for analysis: non-Hispanic white, non-Hispanic African American, Hispanic or Latino of any race, Asian American, and an "other" category that included Pacific Islanders, Native American, multiracial, and any other race that was unlisted.

Physical activity: Students self-reported their physical activity levels in both the initial and follow-up surveys. The Global PA Questionnaire (GPAQ), a reliable and valid measure (Bull, Maslin, & Armstrong, 2009), assessed minutes per week of moderate and vigorous leisure time PA (Armstrong & Bull, 2006).

PA enjoyment: The Physical Activity Enjoyment Scale (PACES) was used to provide descriptive information on participants' feelings toward PA via a seven-item indicator measuring attitudes toward PA on a scale ranging from zero (low enjoyment) to 10 (high enjoyment) (Mullen et al., 2011). The seven items were summed for a total possible score of 70. The scale, found to be reliable by Mullen et al. in 2011, used agreement to statements related to enjoyment, gratifiers, stimulators, and refreshment. The internal consistencies of PA enjoyment (PAE) items were tested to check that Cronbach's alphas exceeded the recommended value of .8 (Pallant, 2007). PA enjoyment Cronbach's alpha (baseline=0.946, follow-up=0.952) indicated a high level of internal consistency (Pallant, 2007), and the deletion of no item would improve the Cronbach's alpha.

PA self-efficacy: Participants responded to five items about their PA self-efficacy (SEE) with an 11-point Likert scale ranging from zero (not at all confident) to 11 (very confident) (Marcus, Selby, Niaura, & Rossi, 1992). Items were summed for a potential total of 0-55. The internal consistencies of self-efficacy items were tested to check that Cronbach's alphas exceeded the recommended value of .8, which was found to be a reliable measurement in Pallant's *SPSS Survival Manual* (Pallant, 2007). PA self-efficacy Cronbach's alpha (baseline=0.813, follow-up=0.839) indicated a high level of internal consistency (Pallant, 2007), and the deletion of no item would improve the Cronbach's alpha.

Fitness device and social media sharing: Participants responded (yes/no) on their usage of wearable PA trackers, PA and/or fitness apps, and weight loss apps. They further responded (yes/no) about their use of eight common or popular social media platforms to share their exercise behavior. The author-developed scale included Facebook, Twitter, Instagram, Google+, Pinterest, Tumblr, Snapchat, and an "Other" option. Participants were dichotomized into users and non-users of both wearables and social media.

Data Analysis

All data were analyzed using SPSS Version 22.0 (Armonk, NY). Correlations were used to examine the influences of race on vigorous physical activity (VPA), PAE, and SEE as well as social media sharing and wearable device usage. ANOVA was used to find means of the previous variables as well as BMI and demographic information such as sex, race, and year in school. Change variables were calculated by subtracting the beginning of semester value of a variable from the end of semester value. ANOVA and correlation tests were used to explore the relationships between change variables by race. Individual t-tests were used to inspect the effect of wearable devices and social media usage on VPA, PAE, and SEE by race. The significance levels for all tests were set at $p < 0.05$.

Results

A total of 13,696 surveys were distributed from fall 2014 to spring 2017. Figure 1 explains the recruitment and participation that resulted in 2,349 surveys used in the study

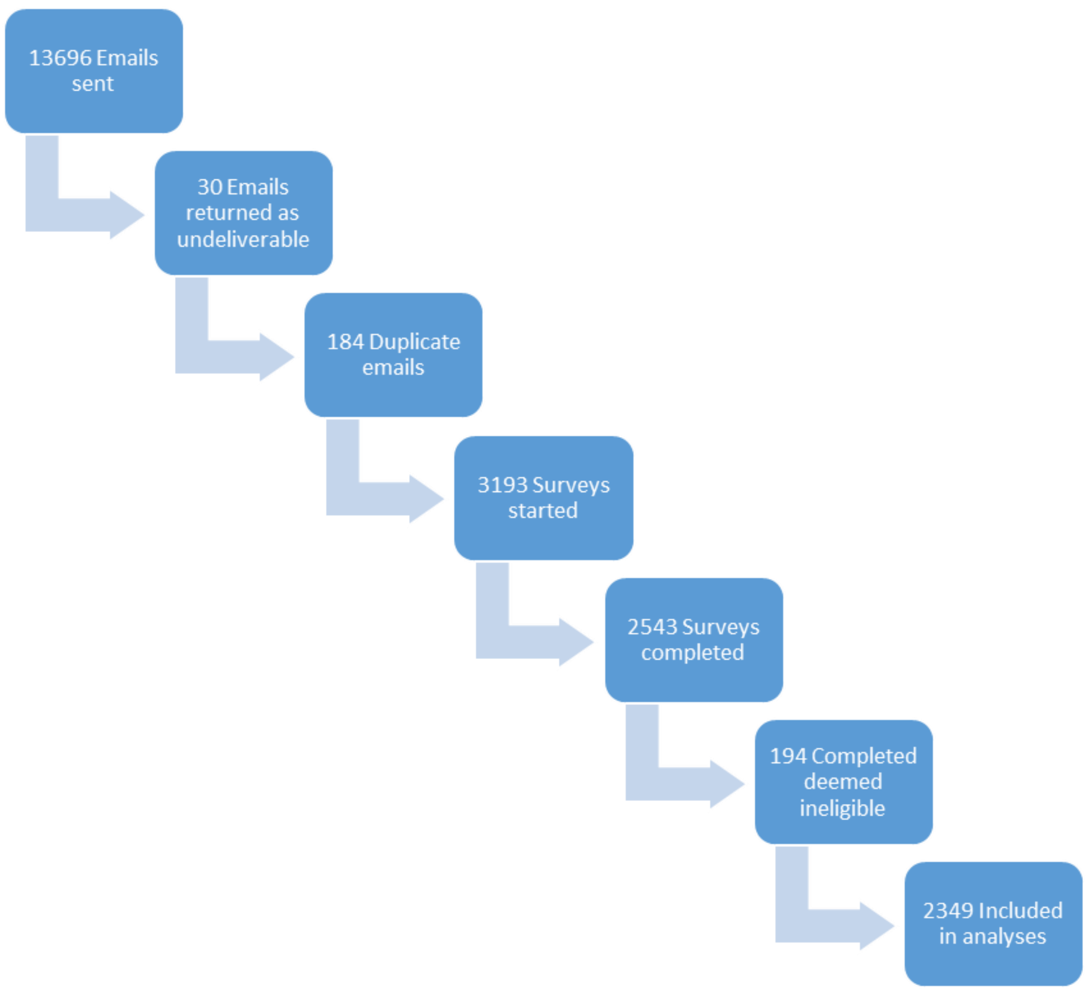

Figure 1. Baseline survey recruitment and participation from Fall 2014 to Spring 2017.

A total of 2,349 students responded to the vigorous physical activity questions in the survey. The majority of the sample consisted of non-Hispanic (NH) white students, who accounted for 78.6% (n=1847) of the total sample. NH African American students accounted for 1.4% (n=35) of the total, and Hispanic/Latino students were 4.4% (n=103) of the total. Asian American students were 8.4% (n=197) of the total, and students identifying as other races or multiracial accounted for 7.1% (n=166) of the sample. The demographics of the sample are shown in Table 1 of Appendix A.

Differences by Race/Ethnicity

Table 1 of Appendix A displays that, at baseline, NH White and NH African American students had the highest mean BMI values. At follow-up, however, NH African American and Hispanic/Latino students had higher BMIs than the other three race categories. NH White and Hispanic/Latino students had the highest baseline VPA participation, yet at follow-up, NH African American and Hispanic/Latino groups had higher VPA participation. Asian American students had the lowest VPA participation at both baseline and follow-up. NH White and Hispanic/Latino students had higher PAE at baseline, but NH African American students had higher PAE than any other race by follow-up. NH White students had the highest mean SEE at baseline while Asian Americans had the lowest SEE; however, at follow- up, Hispanic/Latino students had the highest mean SEE while Asian American students still had the lowest.

At baseline, NH African Americans and students in other races had the highest of social media sharers, but by follow-up, all races showed large drop-offs in sharing. NH White and Other race students had the highest percent of students using wearable fitness devices at both baseline and follow-up compared to other races.

Chi-Square of Social Media Sharing and Wearable Usage

A chi-square test found significant differences by race for baseline social media sharing (χ^2 = 0.00) and nearly significant differences at follow-up (χ^2 = 0.057). Both baseline and follow-up chi square tests showed significant differences by race for wearable device usage (χ^2 = 0.02, χ^2 = 0.03)

Non-Hispanic White Students

Differences by race are shown in Table 1 of Appendix A. Of the 1857 NH White students in the sample, 56.1% were female while 43.7% were male. The majority of NH white students were seniors (63.9%) with successively less juniors, sophomores, and freshmen (14.6%, 7.8%, 2.7%). At baseline, the mean body mass index (BMI) was 23.17 $\pm$ 4.48 kg/m^2 and BMI at follow-up was 23.67 $\pm$ 4.21 kg/m^2. Among this group, baseline VPA participation was 174.7 $\pm$ 173.8 minutes per week and 164.2$\pm$166.7 minutes per week at follow-up. The mean PAE score at baseline was 54.9 $\pm$ 12.6 and 54.6 $\pm$ 13.2 at follow-up. Mean SEE scores were 30.7 $\pm$ 10.4 at baseline and 30.3 $\pm$ 11.1 at follow-up. Social media sharing decreased from 11.5% (n=212) of the 1848 NH white student at baseline to 3.5% (n=64) at follow-up. Similarly, wearable fitness device use decreased from 28.6% users at baseline to 17.2% at follow-up.

VPA, PAE, and SEE correlations are found in tables 2, 3, and 4, respectively, of Appendix A. VPA was positively correlated with PAE at both baseline and follow-up time points. VPA was also positively correlated with SEE at baseline and follow-up time points. PAE positively correlated with SEE at both initial and follow-up time points.

Results from wearable device usage and social media sharing t-tests are found in tables 5 and 6 of Appendix A, respectively. NH white students who reported using wearable fitness devices at baseline reported a slightly higher mean VPA per week compared to wearable non-users (t = -1.79, p = 0.074). At follow-up, wearable users still reported higher VPA than non-users (t = -1.50, p = 0.135). Baseline VPA for social media sharers was higher than non-sharers (t = 5.02, p < 0.01) as well as at follow-up (t = 2.18, p = 0.03). Less change was evident between wearable user and non-users for baseline and follow-up PAE. Results from social media sharing t-tests are found in table 6. Social media sharers reported higher PAE than non-sharers at baseline (t = 5.48, p = < 0.01) and at follow-up (t = 3.65, p < 0.01). SEE showed minimal change between wearable users and non-users at baseline (t = -1.01, p = 0.31) and follow-up (t = -0.44, p = 0.66). Social media sharers displayed slightly higher SEE than non-sharers at baseline (t = 6.00, p < 0.01) and follow- up (t = 3.06, p < 0.01).

Non-Hispanic African American Students

Differences by race are shown in Table 1 of Appendix A. With only 35 NH African American students in the sample, 54.3% were female and 45.7% were male. Most students were seniors (71.4%) with much fewer underclassmen (11.4% juniors, 5.7% sophomores, 0% freshmen). The mean BMI at baseline was 23.21 $\pm$ 5.63 kg/m^2 and 25.08 $\pm$ 20.4 kg/m^2 at follow-up. Baseline VPA participation was 146.1 $\pm$ 154.4 minutes per week and at follow-up, mean VPA was 173.5 $\pm$ 201.9 minutes per week. Baseline PAE was 51.1 $\pm$ 14.45 and 60.4 $\pm$ 9.2 at follow-up. Mean SEE at baseline was 29.5 $\pm$ 11.8 and at follow-up 28.0 $\pm$ 6.0. The baseline number of students who shared fitness-related posts on social media was 25.7%, which decreased to 0.0% at follow-up. Wearable fitness device usage decreased from 20.0% at baseline to 8.6% at follow-up.

VPA, PAE, and SEE correlations are found in tables 2, 3, and 4 of Appendix A, respectively. NH-African American had no significant correlations for any of the variables analyzed.

Results from wearable device usage t-tests are found in table 5 of Appendix A. Wearable users displayed little difference in VPA than non-users at baseline (t = -0.0p, p = 0.93) and follow-up (t = 0.78, p = 0.46). SM non-sharers at both baseline and follow-up reported a higher VPA, but the values were not significant. Baseline PAE did not show significant differences between wearable users and non-users. Follow-up PAE was higher for wearable users than non-users and was approaching significance (t = -0.69, p = 0.51). Results from social media sharing t-tests are found in table 6 of Appendix A. Significant differences were not found in PAE between SM sharers and non-sharers. Significant differences were not reported in SEE between wearable users and non-users at baseline nor follow-up. Significant differences were not found in SEE between SM sharers and non-sharers.

Hispanic or Latino Students

Differences by race are shown in Table 1 of Appendix A. Of the 103 Hispanic or Latino students in the sample, 51.5% were female while 47.6% were male. The majority of

Hispanic/Latino students were seniors (64.1%) with successively less juniors, sophomores, and freshmen (16.5%, 6.8%, 1.0%). At baseline, the mean body mass index (BMI) was 22.8 $\pm$ 5.63 kg/m^2, and BMI at follow-up was 24.31 $\pm$ 3.86 kg/m^2. Baseline VPA participation was 173.6 $\pm$ 187.3 minutes per week and 203.2 $\pm$ 253.8 minutes per week at follow-up. The mean PAE score at baseline was 54.8 $\pm$ 13.5 and 55.4 $\pm$ 12.8 at follow-up. Mean SEE scores were 29.4 $\pm$ 11.1 at baseline and 31.2 $\pm$ 11.0 at follow-up. Social media sharing decreased from 10.7% of the Hispanic/Latino students at baseline to 0.0% at follow-up. Wearable fitness devices decreased from 22.3% of users at baseline to 8.7% at follow-up.

VPA, PAE, and SEE correlations are found in tables 2, 3, and 4 of Appendix A, respectively. VPA positively correlated with PAE at baseline and follow-up time points. VPA also positively correlated with SEE at the baseline time point. PAE positively correlated with SEE at the initial time point.

Results from wearable device usage t-tests are found in table 5 of Appendix A. There were no significant differences in VPA at baseline or follow-up between wearable users and non-users. Significant differences were not found in VPA between SM sharers and non-sharers. Baseline PAE showed no significant differences between wearable users and non-users; however, follow-up PAE was reportedly higher for wearable users than non-users ($t = 2.75$, $p = 0.01$). Results from social media sharing t-tests are found in table 6 of Appendix A. Significant differences were not found in PAE between SM sharers and non-sharers. Baseline SEE showed no differences between wearable users and non-users, but follow-up reported that non-users had higher SEE than wearable users ($t = 2.85$, $p = 0.01$). Baseline SEE showed insignificance between SM sharers and non-sharers at baseline, but SEE was reportedly higher for non-sharers at follow-up ($t = -2.32$, $p = 0.03$).

Asian American Students

Differences by race are shown in Table 1 of Appendix A. Asian American students accounted for 197 students in the total sample with 57.4% females and 42.6% males. There were more seniors than juniors, sophomores, or freshmen (45.7%, 23.4%, 16.2%, 4.6%). Mean BMI at baseline was 22.45 $\pm$ 4.84 kg/m^2 and 23.38 $\pm$ 4.33 kg/m^2 at follow-up. Baseline VPA participation was 126.0 $\pm$ 174.8 minutes per week and 116.8 $\pm$ 119.1 minutes per week at follow-up. PAE baseline mean was 51.2 $\pm$ 14.4, and follow-up PAE mean was 49.9 $\pm$ 15.6. SEE baseline mean was 26.2 $\pm$ 9.4, and follow-up SEE was 26.9 $\pm$ 10.5. At baseline, 15.7% of Asian American students used social media for fitness posts; at follow-up, 0.0%. 22.3% of the students used wearable fitness devices at baseline with only 8.7% using devices at follow-up.

VPA, PAE, and SEE correlations are found in tables 2, 3, and 4 of Appendix A, respectively. VPA had a positive correlation with PAE at both baseline and follow-up time points. VPA also had positive correlations with SEE at initial and final time points. PAE correlated positively with SEE at the initial and final time points.

Results from wearable device usage t-tests are found in table 5 of Appendix A. No significant differences between VPA of wearable users and non-users were evident at baseline or follow-up. Baseline VPA was significantly higher for SM sharers at baseline ($t = 2.05$, $p = 0.04$), but not at follow-up. PAE at baseline and follow-up showed no significant differences between wearable users and non-users. Results from social media sharing t-tests are found in table 6 of Appendix A. Significant differences were not found in PAE between SM sharers and non-sharers. No significant difference was found between wearable users and non-users for SEE at baseline or follow-up. There were no significant differences in SEE between SM sharers and non-sharers.

Other Race Students

Other Race students contained student identifying as Pacific Islander (n = 5), Native American (n = 6), other race not listed (n = 87), and multiracial (n = 68). Of the 166 students who did not identify as one of the race/ethnicities listed above or were multiracial, 56.6% were female and 42.8% were male (table 1). 57.2% were senior students while 21.7% were juniors, 9.6% sophomores, and 5.4% freshmen. The baseline BMI was 22.37 $\pm$ 4.29 kg/m^2 and follow-up BMI was 22.94 $\pm$ 4.75 kg/m^2. Baseline VPA participation was 153.9 $\pm$ 173.1 minutes per week while follow-up was 133.7 $\pm$ 138.1 minutes per week. Baseline mean PAE was 51.9 $\pm$ 15.2 and follow-up was 50.3 $\pm$ 15.7. Baseline SEE was 29.6 $\pm$ 11.7 and follow-up was 27.5 $\pm$ 11.2. 21.1% of other race students made fitness posts on social media at baseline, which decreased to 1.8% of students at follow-up. Wearable fitness devices were used by 25.9% of students at baseline and only 10.8% of the students at follow-up.

VPA, PAE, and SEE correlations are found in tables 2, 3, and 4 of Appendix A respectively. VPA had a positive correlation with PAE at both baseline and follow-up time points. VPA also had positive correlations with SEE at initial and final time points. PAE correlated positively with SEE at the initial time point

Results from wearable device usage t-tests are found in table 5, and social media sharing t-tests are found in table 6 of Appendix A. No significant differences were seen between wearable users and non-users as well as social media sharers and non-sharers for VPA at baseline and follow-up. Wearable use and social media sharing also made no significant differences in PAE. Wearable users reported higher SEE at baseline than non-users (t = -2.06, p = 0.04). SEE was approaching significant value at baseline; sharers had a slightly higher SEE value than non-sharers (t = 1.95, p = 0.05), but no significance difference was found at follow-up.

Limitations

As with all studies, this project was not without limitations. First, self-report measures were used to collect PA activity and psychosocial measures. Second, the cross-sectional nature of the study prevents long-term or causal relationships to be drawn from the results. Third, the demographics of the sample, being college-aged students from a large university in a college town, many prevent transferability to other geographic locations. Despite these limitations, this study found significant differences between races/ethnicities for PA, psychosocial variables, social media sharing, and wearable usage.

Discussion

Few studies have focused on the differences in physical activity and physical activity behaviors of college students by race/ethnicity. The aims of this study were four-prong, each analyzing differences in the PA data by race. Significant differences in PA and PA behaviors were found between groups as well as over the course of one semester.

We hypothesized that differences would be found between racial/ethnic groups for physical activity and related variables such as exercise enjoyment and self-efficacy. Data analyses confirmed our hypothesis; NH white and Hispanic/Latino students had the highest baseline VPA participation, which mostly coincides with the literature that suggests white Americans tend to engage in more physical activity (Miller et al., 2005). NH White and Hispanic/Latino students also had higher PAE at baseline. NH White students had the highest SEE at baseline, and Asian Americans had both the lowest PAE and SEE at baseline. Due to the lack of research, to the best of our knowledge, on racial differences in PA behaviors, this information is new and interesting. This information also supports the idea that race/ethnicity should be considered when creating health interventions for students. A lack of cultural tailoring in interventions for this population may have been the cause for disparities in physical activity behaviors.

Our hypothesis was further confirmed for the variables of social media sharing and wearable usage. Significant differences were noted by race in SM sharing at baseline; African Americans had significantly higher rates of sharing exercise-related posts on social media at baseline. We also noted differences by race in wearable usage at both baseline and follow-up. NH white and Other race students had higher percentages of students using wearable fitness devices at both time points than other races. This information may be important in the marketing of technology to students. Since our results show that more NH white students reported wearable device usage than any other race/ethnicity, marketing companies may want to find ways to target more demographics for their products.

Analyses also sought to examine if PA would be positively correlated with PAE and SEE for all races by the follow-up time point. Interestingly, all races but African Americans had positive correlations between VPA and PAE as well as VPA and SEE at baseline and follow-up. VPA is often associated with PAE and SEE, so it is notable that in this sample, the correlation was not seen for African Americans. Over the duration of a school-based PA program, PA enjoyment and self-efficacy were found to increase as PA increased (Dishman et al., 1985). Yet another study on African American women in Alabama found that some women perceived cultural differences as a factor affecting PA levels (Sanderson, Littleton, & Pulley, 2002). Barriers such as these may be associated with the lack of positive correlation between PA, PAE, and SEE in our study. However, the African American group had the smallest sample size compared to any other group in our study, which may have contributed to the lack of a significant correlation in the variables.

Our examination of wearable device usage and social media sharing with VPA, PAE, and SEE yielded some unexpected findings. Previous literature has indicated that wearable devices could have positive impacts on exercise goals if the device was simple and easy to use while other studies had varying results with wearable use (Lunney et al., 2016). One study that implemented wearable devices reported that participants had positive trends in self-efficacy, muscle strength, fasting glucose, and diastolic blood pressures; however, the participants used the wearable devices less frequently over the course of the study, preventing an associations from being drawn between the positive trends and the devices themselves (Wilson et al., 2017).

In the current study, wearable usage decreased overall for every race over the course of the semester, similar to other studies of the same premise. When comparing VPA, PAE, and SEE between wearable device users and non-users, results did seem to vary by race. NH white students had higher VPA, PAE and SEE on the whole for wearable users than non-users. NH African Americans and Asian Americans seemed to have no discernible trends for the variables between users and non-users. Hispanic/Latino students, in contrast to the NH white students, had higher VPA, PAE, and SEE for non-users. Students of other races reported higher VPA and PAE for non-users but higher SEE for users. From our results, there seem to be racial/ethnic differences in the effect of wearable devices on VPA, PAE and SEE.

Research seems to be unclear as to whether social media sharing of exercise has an effect on PA behaviors. One study found that exercise social media sharing made no significant change in overall PA of middle-aged women, and sharing tended to decrease over time (Williams et al., 2014). Yet a lack of research prevent any definitive associations from being formed between SM sharing and PA behaviors. Research is lacking on social media interventions for physical behavior in young adult populations and should be explored further.

Due to the high usage of social media in college student demographics, we chose to hypothesize that sharing would in fact by associated with PA variables, despite some of the literature that showed otherwise. Similar to the wearable usage, results of the study seemed to vary by race. For NH white, Asian, and other race students, VPA, PAE, and SEE were reportedly higher for SM sharers compared to non-sharers. NH African Americans reported higher VPA and PAE for non-sharers while SEE was higher for sharers. Hispanic/Latino students reported higher PAE for sharers with seemingly no trends for the other two variables. Based on these results, one can say that there appear to be racial differences for the effect of SM on PA behaviors. This information could be used in subsequent physical activity interventions in order to culturally tailor to populations.

This study also examined changes over time. We hypothesized that physical activity behavior would increase over the course of the semester with participation in a physical activity class. In studies of college students, results vary as to whether physical activity interventions can make long-term behavioral changes in participants. The Task Force for community preventive services noted that there was insufficient evidence for interventions targeting college-based PE, though they noted the potential for effective college-based health interventions (Zaza et al., 2005). Since large portions of the U.S. population are insufficiently active or inactive, it is critical for policy makers to find a way to promote healthy behaviors at this macro-level (Physical Activity Guidelines Advisory Committee, 2018).

In the current study the overall value of weekly VPA decreased for NH White, Asian, and Other race students, but VPA increased over the semester for NH African Americans and Hispanic/Latino students. PAE and SEE stayed relatively steady for all races over the semester, but both SM sharing and wearable usage decreased for all races. The decrease in VPA for three races was surprising considering that in the time between surveys, the students were participating in physical activity courses that would likely increase their weekly activity levels. PAE and SEE also failed to increase, contradicting the original hypothesis. However, the decrease in SM sharing and wearable usage seem to be consistent with previous studies. The unanticipated results for VPA, PAE, and SEE may be due to a decrease in survey responses at the follow-up time point. A lack of representation from highly active students may have causes a negative trend in the results. Future studies should attempt to maintain higher attrition throughout the study so that more reliable results could be obtained.

The results found in this study were exploratory in nature, resulting in broad and varying results. Due to a somewhat low response rate at follow-up, the ability to draw strong associations between races or variables is limited. Future research should investigate more thoroughly how social media sharing and wearable usage may be determinants or consequences of physical activity participation. Our study was also based on self report measures; further studies may choose to implement objective measures for physical activity behaviors to increase reliability. We also lacked a comparison group, and the racial/ethnic groups were of unequal size, although representative of this particular student population.

Despite these limitations, this study found many differences in PA behaviors and technology use between college students of different racial/ethnic groups. The results of this study provide insight on how different races/ethnicities respond to health interventions and may aid in future cultural tailoring of health interventions. Our results on wearable technologies also imply that fitness devices are not as widely used by groups other than NH white, which may direct future marketing campaigns. Finally, the use of social media in health interventions is in need of further research; the differences we found in sharing between races/ethnicities and the overall lack of research on the subject suggest that further research is necessary.

Chapter 3

Summary and Future Recommendations

This study uncovered multiple disparities in physical activity behaviors within the sample of undergraduates. First, differences were found between racial/ethnic groups for the PA variables analyzed at baseline and follow-up. As predicted from the literature reviewed, NH white students had the highest VPA, but Hispanic/Latinos also had high rates of VPA compared to other groups. Asian Americans had the lowest PAE and SEE at baseline and follow-up, indicative that PA courses are not currently well tailored to the needs of these students.

Second, PAE and SEE were found to positively correlate with VPA at both time points for all racial/ethnic groups except African Americans. Literature frequently finds that VPA is positively associated with PAE and SEE, so it is interesting to find that this wasn't the case for African Americans in the sample. Further studies should investigate physical activity for African Americans to determine how to better promote self-efficacy and enjoyment during exercise.

Third, our findings on wearable fitness devices and social media sharing seemed to contradict some previous studies. While previous research suggested trackers and sharing may be related to positive trends in self-efficacy and activity, our study showed a significant decrease in both device usage and SM sharing while PAE and SEE increased on the whole. Differences by race were further found in the correlations between device usage/social media sharing and the three PA variables.

Finally, changes in VPA, PAE, and SEE were found over time in our study. Three of the racial/ethnic groups showed overall decreases in VPA over the time points while the two remaining groups showed increases. PAE and SEE stayed relatively steady between time points for all groups, and device usage and social media sharing decreased for all groups between time points.

While this study displayed significant findings between racial/ethnic groups in PA behaviors, future research is certainly necessary in this field. Lower attrition throughout the study would likely increase reliability. Future studies may also choose to use more objective measures in comparison to this study's self report measures. Due to the lack of research on the subject, more effort should be applied to investigating how social media and wearable devices may be determinants of PA. Lastly, future research should explore how to more effectively tailor PA courses and interventions to different racial/ethnic groups. This study shows that PA courses have different effects by race/ethnicity on VPA, PAE, and SEE; due to the diverse nature of North American undergraduate institutions, it will be important to further study how courses could be better tailored towards students of all backgrounds.

Appendix A

Results Tables

Table 1. Characteristics of the Sample (n=2349)

		NH White (n = 1848)		NH African American (n = 35)		Hispanic/Latino (n = 103)		Asian American (n = 197)		Other (n = 166)	
Variable		n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)
Individual level											
Age			21.09 (1.47)		22.0 (3.18)		21.03 (1.18)		20.78 (1.43)		21.14 (1.529)
Sex											
	Male	807 (34.6)		16 (0.7)		53 (2.6)		84 (3.6)		71 (3.0)	
	Female	1036 (44.1)		19 (0.8)		49 (2.1)		113 (4.8)		94 (4.0)	
Year in School											
	Freshman	49 (2.1)		0 (0)		1 (<0.1)		9 (0.4)		9 (0.4)	
	Sophomore	145 (6.2)		2 (<0.1)		7 (0.3)		32 (1.4)		16 (0.7)	

Variable	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)
Junior	270 (11.5)		4 (0.2)		17 (0.7)		46 (2.0)		36 (1.5)	
Senior	1181 (50.3)		25 (1.1)		66 (2.8)		90 (3.8)		95 (4.0)	
Body Mass Index (kg/m^2)										
Initial		23.17 (4.48)		23.21 (5.63)		22.79 (5.54)		22.45 (4.84)		22.37 (4.29)
Final		23.67 (4.21)		25.08 (2.04)		24.31 (3.86)		23.38 (4.33)		22.94 (4.75)
Vigorous Physical Activity (mins/week)										
Baseline		174.7 (173.8)		146.1 (154.4)		173.6 (187.3)		126.0 (174.8)		153.9 (173.1)
Follow-up		164.2 (166.7)		173.5 (201.9)		203.2 (253.8)		116.8 (119.1)		133.7 (138.1)
Physical Activity Enjoyment (sum 0-70)										
Baseline		54.9 (12.6)		51.1 (14.45)		54.8 (13.5)		51.2 (14.4)		51.9 (15.2)
Follow-up		54.6 (13.2)		60.4 (9.2)		55.4 (12.8)		49.9 (15.6)		50.3 (15.7)
Self-Efficacy of Exercise (sum 0-50)										
Baseline		30.7 (10.4)		29.5 (11.8)		29.4 (11.1)		26.2 (9.4)		29.6 (11.7)

Follow-up	30.3 (11.1)	28.0 (6.0)	31.2 (11.0)	26.9 (10.5)	27.5 (11.2)
% Reporting Social Media Usage					
Baseline	212 (11.5)	9 (25.7)	11 (10.7)	31 (15.7)	35 (21.1)
Follow-up	64 (3.5)	0 (0.0)	0 (0.0)	11 (5.6)	3 (1.8)
% Reporting Wearable Use					
Baseline	528 (25.6)	7 (20.0)	23 (22.3)	36 (18.3)	43 (25.9)
Follow-up	318 (17.2)	3 (8.6)	9 (8.7)	32 (16.2)	18 (10.8)

Table 2. Correlations with Vigorous Physical Activity (n=2349)

	NH White (n = 1757)		NH African American (n = 33)		Hispanic/Latino (n = 96)		Asian American (n = 193)		Other (n = 158)	
Variable	r	p	r	p	r	p	r	p	r	p
Psychosocial Elements										
Physical Activity Enjoyment										
Initial	0.37**	<0.01	- 0.06	0.75	0.44**	<0.01	0.30**	<0.01	0.42**	<0.01
Final	0.31**	<0.01	0.03	0.93	0.52**	<0.01	0.32**	0.004	0.51**	<0.01
Self-Efficacy of Exercise										
Initial	0.44**	<0.01	0.05	0.80	0.69**	<0.01	0.35**	<0.01	0.43**	<0.01
Final	0.37**	<0.01	0.56	0.20	0.58	0.001	0.30*	0.012	0.48**	<0.01

Note: * p<.05, **p<.01, ***p<.001

Table 3. Correlations with Physical Activity Enjoyment (n=2349)

	NH White (n = 1757)		NH African American (n = 33)		Hispanic/Latino (n = 96)		Asian American (n = 193)		Other (n = 158)	
Variable	r	p	r	p	r	p	r	p	r	p
Psychosocial Elements										
Vigorous Physical Activity										
Initial	0.38**	<0.01	-0.06	0.75	0.44**	<0.01	0.30**	<0.01	0.42**	<0.01
Final	0.28**	<0.01	0.14	0.73	0.07	0.72	.27*	0.02	0.43**	<0.01
Self-Efficacy of Exercise										
Initial	0.55**	<0.01	0.28	0.19	0.56**	<0.01	0.56**	<0.01	0.56**	<0.01
Final	0.40**	<0.01	-0.02	0.96	0.10	0.61	0.37**	<0.01	0.29	0.06

Note: * p<.05, **p<.01, ***p<.001

Table 4. Correlations with Self-Efficacy of Exercise (n=2349)

	NH White (n = 1757)		NH African American (n = 33)		Hispanic/Latino (n = 96)		Asian American (n = 193)		Other (n = 158)	
Variable	r	p	r	p	r	p	r	p	r	p
Psychosocial Elements										
Vigorous Physical Activity										
Initial	0.44**	<0.01	0.05	0.80	0.69**	<0.01	0.35**	<0.01	0.43**	<0.01
Final	0.35**	<0.01	0.09	0.86	0.11	0.57	0.28*	0.02	0.42**	<0.01
Physical Activity Enjoyment										
Initial	0.55**	<0.01	0.28	0.19	0.56**	<0.01	0.56**	<0.01	0.56**	<0.01
Final	0.42**	<0.01	-0.05	0.92	0.42*	0.03	0.25*	0.05	0.14	0.37

Note: * p<.05, **p<.01, ***p<.001

Table 5. Comparing Wearable Users/Non-Users (n=2349)											
		NH White (n = 1757)		NH African American (n = 33)		Hispanic/Latino (n = 96)		Asian American (n = 193)		Other (n = 158)	
Variable		Mean Wearable Users (SD)	Mean Wearable Non-Users (SD)	Mean Wearable Users (SD)	Mean Wearable Non-Users (SD)	Mean Wearable Users (SD)	Mean Wearable Non-Users (SD)	Mean Wearable Users (SD)	Mean Wearable Non-Users (SD)	Mean Wearable Users (SD)	Mean Wearable Non-Users (SD)
Psychosocial Elements											
	Vigorous Physical Activity (mins/week)										
	Baseline	186.15 (171.75)	170.16 (174.5)	151.00 (88.58)	144.82 (168.09)	133.26 (118.05)	185.24 (202.03)	145.56 (159.50)	121.57 (178.17)	135.98 (157.31)	160.18 (178.48)
	Follow-up	178.60 (163.29)	158.93 (167.72)	72.00 (101.82)	198.88 (217.31)	95.75 (117.56)	237.52 (277.15)	103.00 (96.68)	119.39 (123.28)	85.67 (121.79)	147.71 (140.77)
	Physical Activity Enjoyment										
	Baseline	55.38 (12.24)	54.66 (12.80)	48.57 (19.75)	51.73 (13.10)	51.14 (14.39)	55.87 (13.21)	50.26 (13.68)	51.38 (14.55)	51.19 (15.78)	52.17 (15.04)
	Follow-up	55.94 (12.78)	54.18 (13.30)	64.50 (7.78)	59.38 (9.65)	45.75 (18.49)	58.78 (8.20)	55.38 (12.34)	48.82 (15.99)	44.09 (20.73)	51.95 (13.88)

Self-Efficacy of Exercise										
Baseline	31.11 (10.45)	30.55 (10.38)	32.67 (7.23)	28.53 (12.87)	27.21 (9.17)	29.94 (11.54)	26.60 (9.73)	26.16 (9.31)	33.00 (10.59)	28.44 (11.91)
Follow-up	30.56 (11.90)	30.15 (10.75)	31.00 (0.00)	27.50 (6.44)	22.00 (6.93)	34.18 (10.56)	26.73 (11.23)	26.98 (10.50)	29.00 (11.82)	27.00 (11.19)

Note: * $p<.05$, ** $p<.01$, *** $p<.001$

Table 6. Comparing Social Media Users/Non-Users (n=2349)												
		NH White (n = 1757)		NH African American (n = 33)		Hispanic/Latino (n = 96)		Asian American (n = 193)		Other (n = 158)	
Variable		Mean SM Users (SD)	Mean SM Non-Users (SD)	Mean SM Users (SD)	Mean SM Non-Users (SD)	Mean SM Users (SD)	Mean SM Non-Users (SD)	Mean SM Users (SD)	Mean SM Non-Users (SD)	Mean SM Users (SD)	Mean SM Non-Users (SD)
Psychosocial Elements											
	Vigorous Physical Activity (mins/week)										
	Baseline	230.78 (180.12)	167.47 (171.67)	109.78 (127.59)	158.62 (162.97)	243.27 (171.92)	165.30 (188.23)	184.48 (258.32)	115.02 (152.92)	186.03 (206.25)	145.33 (162.96)
	Follow-up	198.77 (152.15)	159.57 (168.08)	144.00 (0.00)	176.78 (213.81)	159.00 (93.34)	206.00 (261.35)	123.11 (112.66)	116.01 (120.56)	159.00 (218.11)	129.80 (124.81)
	Physical Activity Enjoyment										
	Baseline	59.31 (10.83)	54.28 (12.75)	49.78 (15.65)	51.54 (14.30)	61.73 (10.05)	54.00 (13.72)	52.43 (14.24)	50.95 (14.42)	54.62 (15.84)	51.18 (15.01)
	Follow-up	59.27 (12.34)	54.01 (13.18)	59.00 (0.00)	60.56 (9.70)	61.50 (2.12)	55.00 (13.09)	57.78 (14.65)	48.88 (15.49)	50.00 (14.85)	50.30 (16.01)

Self-Efficacy of Exercise										
Baseline	34.82 (10.05)	30.16 (10.33)	35.67 (10.39)	27.58 (11.75)	29.89 (14.50)	29.29 (10.74)	28.75 (10.03)	25.71 (9.16)	33.16 (11.43)	28.61 (11.65)
Follow-up	33.58 (11.62)	29.79 (10.91)	31.00 (0.00)	27.50 (6.44)	15.00 (5.66)	32.44 (10.41)	24.25 (8.48)	27.29 (10.78)	30.67 (13.84)	26.94 (10.88)

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