

THE EFFECT OF PHYSICAL ACTIVITY ON THE HEALTH-RELATED
QUALITY OF LIFE OF COLLEGE STUDENTS

by

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QUALITY OF LIFE OF COLLEGE STUDENTS

A Thesis for the Degree

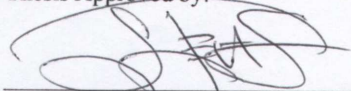
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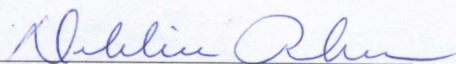
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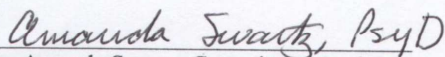
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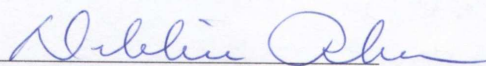
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Abstract

College students are increasingly suffering from various health conditions, such as depression and anxiety. Coincidentally, most college students are sedentary as more than half are not meeting the physical activity recommendations to stay healthy. The purpose of this investigation was to assess the relationship between the physical activity (PA) level and health-related quality of life (HRQoL) of college students. Health-related quality of life is a multifaceted measure utilized to assess an individual's physical, emotional, mental, and social functioning. This study also sought to understand how factors such as gender, age, academic classification, residence status, and previous high school and club sports involvement influence this relationship. Finally, the study aimed to assess how differences in these variables and in PA level influence HRQoL. Participants included 597 college students from a private university. A revised 4-factor version of the Short Form-36 (SF-36) was utilized to assess HRQoL. A statically significant positive correlation was found between PA level and three factors of HRQoL. Differences in HRQoL were found between PA level (sedentary, moderate PA, vigorous PA). The results suggest that PA level was associated with a higher HRQoL across three of the 4-factor SF-36 subscales (physical functioning, role limits due to emotional health problems, and positive emotional energy). Campus staff and health professionals could utilize these findings to educate college students about the benefits of regularly engaging in moderate or vigorous PA.

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Chapter 1

Introduction

The transition from high school to college is both exciting and challenging. Going to college represents the beginning of adulthood and serves as an opportunity for growth. In college, students are expected to make their own decisions, manage time, and learn how to balance both academic obligations with their social involvements. However, during college, students adjust to a wide variety of lifestyle changes in eating habits, living environments, and daily physical activity that can influence their health-related quality of life (HRQoL). During this adjustment, students might see changes in their physical, emotional, and social functioning.

Many stressors associated with academics and lifestyle changes in college attenuate certain physical health conditions such as the risk for weight gain (Ferrara, 2009). In fact, researchers acknowledge that 70% of college students gain weight over the course of four years (Gropper, Simmons, Connell, & Ulrich, 2012). This weight gain may be attributed to staying up late, eating unhealthy foods, and having a lack of healthy food options (Gropper, Simmons, Connell, & Ulrich, 2012). Concurrently, college students are more sedentary as many do not engage in regular physical activity. The age group of 18-24 years old tend to experience the largest decline in physical activity, while exhibiting the largest increase in becoming classified as overweight or obese (Grim, Hertz, & Petosa, 2011; Ogden, Carroll, Kit, & Flegal, 2014). The lack of physical activity among college students can impact future exercise habits because 85% of adults continue the same amount of physical activity that they established during their last year of college (Sparling, 2003). Interestingly, this trend is growing even as universities are investing millions of dollars into constructing large, state-of-the-art campus fitness facilities that offer many physical activity opportunities for students (Kampf, 2010).

Besides physical health ailments, college students today are also facing many mental and emotional health issues, such as anxiety and depression. According to the 2016 Center for Collegiate Mental Health (CCMH) report, 61% of students seeking treatment at college counseling centers cite anxiety as their major health concern. Also, approximately 23% of college students note how anxiety negatively influenced their academic performance (American College Health Association, 2016). Many of the students suffering from anxiety consider schoolwork to be their main stressor (Hoffman, 2015). Depression is documented as the 2nd most common mental health issue, with 49% of students seeking counseling in a college setting (CCMH, 2016). According to a 2016 American College Health Association (ACHA) survey, approximately 37% of college students reported feeling so depressed that they couldn't function. Both anxiety and depression remain major mental health issues among the college student population (ACHA, 2016).

Overall, college students cope with many different physical and mental health issues. This study provides a better understanding of how engaging in physical activity influences the overall health of college students, by assessing whether those who engage in regular vigorous or moderate physical activity report a HRQoL than students who do not engage in regular physical activity. Furthermore, the researcher of this study hoped to determine how factors, such as gender, age, and residence status (living on-campus/off-campus) influence the physical activity level of college students.

Statement of Purpose

The primary purpose of this study was to determine the relationship between the level of physical activity and health-related quality of life of college students. This study also examined how factors like gender, age, academic classification, residence status, and high school/club sport

participation influence the relation between level of physical activity and reported HRQoL among college students. Also, this study assessed how differences in these variables and physical activity level influence HRQoL.

Significance of Research

The results of this investigation sought to fill a gap in the HRQoL literature by including college students without any chronic illnesses. Most research has assessed HRQoL in elderly and diseased populations (Kelley, Kelley, Hootman, & Jones, 2009; Emery, Long, & Olson, 2013). The results of this study may help further understand how physical activity influences the five dimensions of HRQoL: physical functioning, emotional functioning, social functioning, cognitive functioning, and health status. Therefore, the results of this investigation may be valuable to campus recreation staff, health educators, campus administrators, mental health professionals, and exercise psychologists.

In addition, assessing gender, academic classification, residence, and previous high school or club sport participation may help understand how these factors influence the level of physical activity and HRQoL of college students. Because few studies have assessed the effects of these factors on physical activity and HRQoL, the results of this study are unique and could represent a new line of research. Campus recreation staff may be able to better communicate to college students about how physical activity influences overall health and also create programs that help promote healthy living.

Definition of Terms

The research guiding this investigation makes frequent usage of some language specific to the fields of sport and exercise psychology. The following terms appear in this investigation and will be defined here:

1. Physical activity (PA)- “all bodily activity that results in increases in physical exertion beyond that which occur during normal activities of living” (Lox, Martin Ginis, & Petruzzello, 2014, p. 4).
2. Quality of Life- “an individual’s perception of their position in life in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns” (WHOOL Group, 1998, p. 1). Composed of four domains:
 - a. Physical health- consists of “activities of daily living, energy and fatigue, mobility, pain and discomfort, sleep and rest, and work capacity” (Power, Bullinger, & Harper, 1999, p. 51).
 - b. Psychological- includes “bodily image and appearance, negative feelings, positive feelings, self-esteem, spirituality, concentration/memory” (Power et al., 1999, p. 51).
 - c. Social relationships- composed of “personal relationships, social support, and sexual activity” (Power et al., 1999, p. 51).
 - d. Environment- “financial resources, freedom, physical safety and security, home environment, participation in opportunities for recreation activities, physical environment, and transport” (Power et al., 1999, p. 51).
3. Subjective well-being- “multidimensional aspect of a person’s life and includes cognitive judgments of life satisfaction and affective evaluations of moods and emotions” (Berger, Weinberg, & Eklund, 2015, p. 51).
4. Health-related quality of life (HRQoL)- a “subjective rating of the impact of an individual’s health on his or her overall well-being” (Monahan, Bracken-Minor,

McCausland, McDevitt-Murphy, & Murphy, 2012, p. 289). Is composed of five dimensions:

- a. Physical functioning- one's "aerobic fitness, strength, endurance, balance, flexibility, and ability to perform activities of daily living" (Lox, Martin Ginis, & Petruzzello, 2014, p. 4).
- b. Emotional functioning and well-being- includes "depression, anxiety, anger, and feelings of happiness, hope, and tranquility" (Lox et al., 2014 p. 4).
- c. Social functioning- "ability to fulfill social roles, including involvement with community and social groups, and ability to fulfill role of spouse, employee, and so forth" (Lox et al., 2014, p. 4).
- d. Cognitive functioning- includes "memory, attention, concentration, comprehension, problem solving, and decision making" (Lox et al., 2014, p. 4).
- e. Health status- "physical health, symptoms, and states (e.g. energy, fatigue, pain, sleep)" (Lox et al., 2014, p. 4).

Delimitations

A delimitation of the current study was that participants who are currently NCAA or club team athletes were excluded from this investigation. Due to the demands of their sports, the HRQoL of collegiate and club athletes may be different from those who are not a member of an athletic team. Another delimitation was that participants who reported any chronic illnesses were asked to not participate in this study. The researcher aimed to only assess the HRQoL of college students without chronic illnesses. In addition, in order to condense variables, participants who were not 18-25 years old or did not identify as a male or female were excluded from this study.

Assumptions

This investigation relied on the participation and cooperation of each participant. Two assumptions were made in completing this study. First, college students would understand and provide truthful responses to the questionnaires. If participants were not truthful, then the accuracy of this study is limited. Second, it was assumed that the measures in this study would accurately assess the responses of all participants.

Research Questions

Because of the limited research assessing the relationship between the level of PA and HRQoL of college students, the following questions were proposed:

1. In college students, what is the relation between PA level and reported HRQoL?
2. How does gender, age, academic classification, residence status (living on or off campus), and previously being a high school/club team athlete influence the relationship between physical activity level and HRQoL?
3. How do differences in gender, age, academic classification, residence status (living on or off campus), PA level and past participation in high school/club sports influence HRQoL?

Chapter 2

Review of Literature

The purpose of this literature review is to present past findings regarding PA and HRQoL among college students. Furthermore, this review details how factors such as gender, age, residence and previous high school/club sport involvement influence PA levels. This literature review also presents research on the benefits of engaging in PA and maintaining a healthy lifestyle particularly, among college students. These findings are not only relevant for college students, but also for exercise psychologists, health educators, campus recreation staff, mental health professionals, and university administrators who work with this population.

Physical Activity

Physical activity (PA) can be described as “all bodily activity that results in increases in physical exertion beyond that which occur during normal activities of living” (Lox, Martin Ginis, & Petruzzello, 2014, p.4). Physical activity is a broad term that includes movements that range from performing household tasks to competing in a sporting event. Some common examples of PA include walking, gardening, climbing stairs, running, swimming, and lifting weights. According to the American College of Sports Medicine (ACSM) and American Heart Association (AHA), adults should engage in moderate-intensity aerobic exercise for thirty minutes or more on five or more days or engage in vigorous intensity exercise for at least 20 minutes on three or more days (Haskell et al., 2007). Adults should also engage in two or more days of strength training involving 8-10 muscles groups with 8-12 repetitions each. Participating in regular PA elicits many positive benefits that promote overall mental and physical health while reducing the risk of acquiring various chronic diseases (Warburton, Nicol, & Bredin, 2006).

PA Habits of College Students. Many college students today do not participate in regular PA. According to the 2016 American College Health Association (ACHA) survey, more than half of college students today are not meeting the ACSM and AHA physical activity guidelines. Only 47.2% of college students are meeting these recommendations (ACHA, 2016). Also, 22.1% of college student respondents indicated that they participated in zero days of moderate PA for more than 30 minutes, while approximately 35% of college students are classified as being overweight or obese (ACHA, 2016). Compared to older adult age groups, college students between the ages of 18-25 report the lowest amount of PA and average less than 30 minutes of moderate or vigorous exercise per day (Wilson-Salandry & Nies, 2012). College students are increasingly spending more time being inactive, which may result in a sedentary life once they graduate (Lackman, Smith, & McNeill, 2013).

Research also indicates a sharp decline in PA from high school to college (Nelson, Gortmaker, Subramanian, & Wechsler, 2007). In one study, participants reported a lower participation in vigorous PA in college compared to high school. In addition, there were differences in PA participation among male and female college students. According to ACHA, only 44.6% of college females and 49.1% of college males meet ACSM and AHA exercise recommendations (ACHA, 2016). Overall, male college students exercise more frequently than females and also exercise at a higher intensity (Buckworth & Nigg, 2004; ACHA, 2016).

Factors that Influence the PA Habits of College Students

Psychosocial Factors. Various psychosocial factors may influence the exercise behaviors of both male and female college students. A major psychosocial factor is perceived lack of time (Ebben & Brudzynski, 2008). Many college students indicate how preparing for exams and completing school work prevents them from engaging in regular PA. Inactive college students

indicate that they would feel more inclined to exercise if they had “more time, fewer demands, and more motivation” (Ebben & Brudzynski, 2008, p. 6).

Another psychosocial factor is fear of exercising in public. College students who are obese or overweight often feel uncomfortable when exercising in public because they believe they are being evaluated and judged by other students (Taylor & Nichter, 2016). Also, students with high levels of social physique anxiety, which is the anxiety experienced when an individual feels his or her physique is being evaluated negatively, engage in less PA (Hart, Leary, Rejeski, 1989; Kowalski, Crocker, & Kowalski, 2001). Other psychosocial factors include lack of motivation, laziness, and lack of social support (Ebben & Brudzynski, 2008).

Self-efficacy also influences PA (Doerksen, Umstattd, & McAuley, 2009; McAuley & Blissmer, 2001). Self-efficacy describes how much individuals believe in their ability to accomplish certain tasks or change their behavior (Womble, Labbe, Shelley-Tremblay, & Norrell, 2014). Students who report strong self-efficacy are more likely to overcome exercise barriers and to participate in vigorous PA (Doerksen et al., 2009). In addition, self-efficacy has also been shown to be a predictor of vigorous PA (Petosa, Suminiski, Hertz, 2003). Dunn (2011) found that college females with higher self-efficacy were more likely to engage in PA.

Environmental Factors. Various environmental factors may also influence exercise behaviors. College students who live on-campus exercise more than off-campus students (Lee & Park, 2008; Peachey & Baller, 2015). For on-campus residents, campus recreation centers are more accessible and closer in distance which may lead to more involvement in intramural and recreational activities than those students who reside off-campus. (Lee & Park, 2008). Living on-campus also requires students to engage in physical activities, such as walking and biking, in

order to access academic buildings, residence halls, dining facilities, and recreation centers (Miller, Staten, Rayens, & Noland, 2005).

On the other hand, off-campus students mainly use driving as their main form of transportation across campus (Miller et al., 2005). In a longitudinal study which assessed the PA habits of students over seven semesters, moving off-campus was associated with declines in both moderate and vigorous PA (Small, Bailey-Davis, Morgan, & Maggs, 2013). As students moved from on-campus to off-campus housing, college students who live off-campus report lack of time and transportation to exercise facilities as barriers to PA (Small et al., 2013). It also was found that among non-traditional college students 25 years or older, living on-campus was associated with a higher probability of engaging in moderate or vigorous exercise and meeting PA recommendations (Leung et al., 2016.) Overall, on-campus students tend to have better access to PA facilities and are more likely to meet moderate and vigorous physical activity guidelines (Ajibade, 2011; Small et al., 2013).

Research indicates how other physical environmental factors such as transportation and condition of sidewalks influence PA (De Bourdeaudhuij, Sallis, & Saelens, 2003; Zhang, Dunn, Morrow, & Greenleaf, 2017). It was found that engaging in walking or moderate PA was related to the quality of sidewalks and accessibility to public transportation (De Bourdeaudhuij et al., 2003). Reed and Ainsworth (2007) also found that the presence of sidewalks influenced the PA habits of college students as those who positively perceived the presence of sidewalks were more likely to engage in moderate exercises, like bicycling and walking. Another study found that among female college students the presence of sidewalks was negatively related with daily sit time, which indicates that the presence of sidewalks is associated with greater PA (Shaffer, Bopp, Papalia, Sims, & Bopp, 2017).

Perceived safety is another factor that influences PA habits. Living in a neighborhood that is perceived to be unsafe at night serves as a barrier to PA, especially for females (Bennett et al., 2007). Students who live on-campus also tend to feel safer than those who live off-campus, which could influence PA habits (Peachey & Baller, 2015). Zhang and colleagues (2017) also found that crime safety was positively related to PA in college females. Whereas, college females who reside in areas that are perceived as unsafe are less likely to engage in PA (Buckworth, 2001).

Age. Another factor that influences PA is age. Much research indicates how participation in PA decreases as age increases (Butt, Weinberg, Breckon, & Claytor, 2011; Guthold, Ono, Strong, Chatterji, & Morabia, 2008). In college students, a negative relationship was found between age and exercise habits (Mazerat et al., 2011). This suggests that as college students move closer to graduating, they are exercising less. It was found that most non-traditional college students being male and of younger age were significant predictors of meeting PA recommendations (Leung et al., 2016). The researchers indicated how younger college students are more likely to engage in PA, as they were found to be more motivated than older students to improve their physical appearance and attractiveness.

Gender Motives for PA

Male and female college students engage in PA for many different reasons. Male college students tend to have intrinsic motives to participate in PA (Kilpatrick, Hebert, & Bartholomew, 2005), including enjoyment, challenge, affiliation, stimulation, and social recognition. On the other hand, females are motivated by extrinsic factors to engage in physical activity. Females engage in exercise in order maintain good health, weight management, and for their overall appearance (Kilpatrick et al., 2005). During exercise, female college students tend to focus on

the amount of calories burned and also find activities such as weight training to be less enjoyable than males (Gao & Xiang, 2008). Also, females may be less likely to engage in weightlifting compared to males because they consider it to be too masculine and because of evaluative concerns. When weightlifting in public, female college students report feeling insecure about their appearance and feel they are judged by others (Salvatore & Marecek, 2010). Females also may not engage in strength training because they may be less familiar with weight training equipment than males (Leung et al., 2016). Moreover, females also report placing more of an emphasis on their body weight and appearance than males, which could explain why weight management is a major motive to participate in PA for women (Kilpatrick et al., 2005).

Physical Health Benefits of PA

Engaging in PA elicits many health benefits including improvements in muscle strength, bone strength, resting heart rate, and cardiovascular functioning (Lox et al., 2014). Other benefits include improved overall sleep, energy, decreased pain, and fatigue (Lox et al., 2014). Physical activity is also associated with the prevention of many chronic diseases such as diabetes, hypertension, osteoporosis, obesity, and cancer (Warburton, Nicol, & Bredin, 2006). Furthermore, being inactive can lead to adverse health conditions including diabetes, and an increase in the risk of cardiovascular mortality (Wilmot et al., 2012). Not engaging in sufficient PA is also a risk factor of early death among adults, as those who are physically active for seven hours or more per week have a 40% chance of living longer than individuals who do not exercise (US Department of Health Services (HHS), 2015). Therefore, engaging in regular PA can be advantageous to overall physical health.

Mental Health Benefits of PA

Participating in PA also leads to improvements in mental health. Individuals who participate in PA tend to report less symptoms of depression and anxiety and instead report improvements in overall mood and self-esteem (Sharma, Madaan, & Petty, 2006; Guskowska, 2004). Evidence suggests PA enhances memory, cognitive function, and overall satisfaction with life (Sharma et al., 2006). Engaging in PA can also increase the frequency of positive emotions such as joy and physical freshness, while decreasing negative emotions like fear and anger (Pašková, 2010).

PA also may help to enhance the ability to cope with stressful encounters (Stults-Kolehmainen & Sinha, 2014). In other words, PA can serve as a healthy way to reduce stress. This is especially important because stress negatively influences efforts to be more physically active (Stults-Kolehmainen & Sinha, 2014). When individuals are stressed, they are more likely to engage in unhealthy and sedentary behaviors, such as binge eating, increased smoking, and television viewing (Stults-Kolehmainen & Sinha, 2014). The results of this study suggest that college students who encounter stressful situations, should engage in PA as a way to buffer negative emotions like stress.

Social Influences of PA

There are many social factors associated with participating in regular PA. For example, a social influence that affects PA habits is social support. Social support is defined as “the perceived comfort, caring, assistance, and information that a person receives from another” (Lox et al., 2014, p. 101). Social support can be provided by family, friends, fellow exercisers, and exercise instructors. Individuals who receive social support from their personal environment are twice as likely to be physically active compared to people with low social support (Stahl et al.,

2001). Personal environment encompasses support provided by friends, family, school, and workplace. In fact, lacking low personal environmental social support is associated with being sedentary (Stahl et al., 2001). These findings highlight the important role a person's social environment and relationships with others play in determining PA habits.

In addition, research indicates how social support can significantly predict the exercise habits of male and female college students (Wallace, Buckworth, Kirby, & Sherman, 2000). For males, social support from friends was a predictor of exercise behavior change. For females, family social support was a predictor of exercise behavior change. This finding suggests that males and females may respond differently to the source of social support they receive. Minton (2008) also found that college students who engaged in high intensity PA received more social support from family and friends than those who either participated in moderate or low intensity exercise. Researchers recommend that universities develop and create exercise intervention programs that emphasize social support for all students, but especially for those who might not receive the social support to engage in PA from family or friends (Wallace et al., 2000).

Another influence on PA is socializing. Socializing is defined as having five or more friends or spending two or more hours a day with friends (VanKim & Nelson, 2013). College students who report high socializing were more likely to meet vigorous PA recommendations in college. Moreover, these students were less likely to report having poor mental health and perceived stress than college students who scored low on socializing (Vankim & Nelson, 2013). The researchers attest how many of the benefits of "vigorous physical activity on mental health and perceived stress occur through a socializing pathway" (VanKim & Nelson, 2013, p. 6). In other words, many of the positive benefits of PA may be elicited through social interactions.

Influence of PA on Academic Performance

Engaging in PA can also enhance academic performance. Research indicates a relationship between frequency of PA and grade point average (GPA) in college students. College students who devote more time to studying or have a higher GPA are more likely to engage in exercise (Flynn, Piazza, & Ode, 2009). Students with a 3.5 or higher GPA were approximately three times more likely to engage in PA compared to students with a GPA less than 3.0 (Flynn et al., 2009). Also, college students who study more than three hours per day are more likely to engage in PA than students who study less.

Research also shows how PA is associated with better academic performance. College students who spent three or more days a week exercising at their university recreation center reported a higher GPA than those college students who utilized the recreation center less than three times per week (Todd, Czyszczon, Wallace Carr, & Pratt, 2009). Thus, frequent use of the university recreation center is favorably associated with academic achievement (Todd et al., 2009).

PA Opportunities in College

Colleges offer an array of different PA opportunities for students. Some examples include PA classes, intramural sports, club sports, and having access to campus recreation centers (Lackman, Smith, & McNeill, 2015). Because of these options, colleges remain a viable and ideal location where students can engage in positive PA and redirect negative emotions in a healthy manner (Cooper & Theriault, 2008). Many of these opportunities also help educate students about the importance of maintaining a healthy lifestyle and providing advice on staying active.

PA Classes. Many colleges offer PA courses as either electives or classes that are required to meet the necessary credit hours for graduation (Lackman et al., 2015). Some common PA classes include, “scuba diving, yoga, body conditioning, aerobics, and bowling” (Melton, Hansen, & Gross, 2010, p. 785). However, the number of four-year colleges requiring students to enroll in PA courses has significantly declined. In 1920, 97% of college students had to enroll in PA classes, whereas, in 2010 only 39% of college students were required to take a PA class (Cardinal, Sorensen, & Cardinal, 2012). Research indicates that these activity classes influence and promote the importance of maintaining a healthy lifestyle while bringing awareness to the prevention of chronic diseases (Lackman et al., 2015). Interestingly, 80% of college alumni who were enrolled in either fitness or wellness classes indicated that the classes were useful in providing advice on how to live a healthy lifestyle and also positively influenced their current exercise habits (Roberts, Evans, & Ormond, 2006). These individuals also indicated how their current PA habits were positively influenced by the information they learned in these classes. In addition, 86% of college alumni who were enrolled in these classes believe that a PA and wellness class should be mandatory for all incoming freshmen students (Roberts, Evans, & Ormond, 2006).

College students tend to enroll in PA classes for many reasons including to meet a class requirement, to have fun, engage in exercise, interact with others, and to increase knowledge about exercise (Lachman et al., 2015). Interestingly, male college students seem to enroll in team sports classes, whereas females mostly enroll in fitness/wellness PA classes (Lachman et al., 2015). For example, males are more likely to take sports courses like basketball and soccer (Lachman et al., 2015). Also, males are more motivated to enroll in PA classes for social recognition and competitive reasons (Kirkpatrick et al., 2005), whereas females enroll in PA

classes in order to enhance or maintain their overall fitness level. However, both males and females reported that being in PA classes help them to stay physically active (Weinfeldt & Visek, 2009).

Campus Recreation Facilities. Campus recreation centers also influence the PA habits of college students. Over the last 20 years, many colleges have invested millions of dollars in designing state-of-the-art recreation centers (Kampf, 2010; Turman & Hendel, 2004). In fact, 50% of colleges have reported either constructing or renovating a new campus recreation center (Downs, 2003). Many campus recreation facilities not only house a standard weight room, but also have areas where students can swim, play sports such as basketball and racquetball, and have locations for recreational and intramural programs (Kampf, 2010).

Colleges are also updating and redesigning their recreation centers as a way to recruit prospective students and increase enrollment (Kampf, 2010). In fact, according to the National Intramural and Recreation and Sports Association (NIRSA), 68% of college students indicate that campus recreation centers influenced their decision about which college to attend (Forrester, 2014). Additionally, 62% of college students enroll in a college based on the type of programs offered at the campus recreation center.

Differences exist in regards to the frequency per week that college students utilize the recreation center. According to the NIRSA, 75% of college students utilized campus recreation centers (Forrester, 2014). However, only 39% of respondents indicated that they use the campus recreation center or its services three or more times a week, whereas 79% of students report using the campus recreation center once a week (Forrester, 2014).

The frequency of the use of the campus recreation center may also be influenced by gender, ethnicity, and whether students live on or off campus. At the University of South Florida,

65% of male students utilized the campus recreation center compared to 56% of females (Hardy & Hellman, 2011). This study also found that African-American students overwhelmingly use the recreation center more than other ethnicities. Seventy-five percent of African Americans reported utilizing the recreation facility more than a few times a month, compared to 60% of Caucasian students and 54% of Asian/Hispanic students (Hardy & Hellman, 2011). Moreover, the study indicated over 70% of students living on-campus utilized the recreation center more than a few times a month, while only approximately 50% of students who reside off-campus utilize the campus recreation center (Hardy & Hellman, 2011).

As students progress academic levels through college (i.e. freshman to sophomore) they tend to utilize the campus recreation center less. Similarly, at the University of Illinois campus recreation center, freshmen students reported the highest percentage of using the campus recreation center, whereas senior students reported the lowest attendance (Kamath, Golebiowski, & Kaiser, 2008). The discrepancy in the usage of the recreation center between freshmen and senior students may be due to the proximity from residency to exercise facilities (Kamath et al., 2008). At the University of Illinois, freshmen students are required to live in on-campus dorms, whereas, upperclassmen students are not required to live on-campus (Kamath et al., 2008). Since freshmen students live closer to the campus recreation centers than seniors, that could be why they utilize the facilities more regularly. Overall, current literature indicates that on/off-campus residency is a major determinant of campus recreation center usage, as students who live on-campus utilize campus recreation centers more frequently than students who live off-campus.

Quality of Life

Campus recreation centers also serve as venues where college students can engage in regular PA, which could help to decrease stress and improve quality of life. Quality of life refers

to the general well-being of an individual and is used as a subjective and objective measure that measures an individual's positive and negative aspects of life (WHOQOL Group, 1998). Quality of life (QOL) is a multidimensional concept utilized in various fields including healthcare, psychology, and political science (Fernández-Ballesteros, 2011). Because QOL is a multidimensional concept, it is interpreted and defined in many different ways.

According to the World Health Organization (WHO), QOL is defined as “an individual's perception of their position in life in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns” (WHOOL Group, 1998, p. 1). According to WHO, QOL can be divided into four dimensions: psychological, physical health, social relationships, and environmental. The psychological dimension refers to both negative and positive thoughts, self-esteem, perceived body appearance, spirituality, personal beliefs, thinking and learning, and sensory processes (Power, Bullinger, & Harper, 1999). Physical health is composed of an individual's general overall health, level of pain or fatigue, dependence on medications, mobility, and ability to complete activities of daily life (Power et al., 1999). The social relationships dimension consists of an individual's relationships with others and their level of sexual activity (Power et al., 1999). The environmental dimension refers to one's freedom, physical safety, participation in home/work environments, accessibility to health care, and opportunities to participate in leisure activities (Power et al., 1999).

Subjective well-being (SWB) is a term that is commonly used when assessing QOL. Subjective well-being refers to the “multidimensional aspect of a person's life and includes cognitive judgments of life satisfaction and affective evaluations of moods and emotions” (Berger, Weinberg, & Eklund, 2015, p. 51). Moreover, it is composed of an evaluation of an

individual's positive affect, negative affect, and life satisfaction (Berger et al., 2015). Quality of life is considered to be an indication of an individual's subjective well-being (Haas, 1999).

Quality of life can also be divided into three components, 1) subjective satisfaction with life, 2) social functioning/self-care, and 3) availability of social support and physical resources (Katschnig & Krautgartner, 2002). Researchers indicate how most of the QOL literature mainly focuses on assessing subjective satisfaction, but should instead assess an individual's objective functioning in self-care and social roles and also evaluate accessibility to physical and material resources (Katschnig & Krautgartner, 2002). They also indicate how measuring QOL is a complicated issue that needs to be assessed from a multidimensional approach (Katschnig & Krautgartner, 2002).

Health-Related Quality of Life

Throughout the last few decades, interest in QOL has grown across many different fields. Quality of life is a key concept in the social, medical, environmental and psychological sciences fields (Abdel-Khalek, 2010). It is also an important assessment tool in health care (Abdel-Khalek, 2010). Healthcare researchers refer to this component as health-related quality of life (HRQoL). It is defined as a "subjective rating of the impact of an individual's health on his or her overall well-being" (Monahan et al., 2012, p. 289). Health-related quality of life is used to assess how individuals evaluate their overall health and particularly how it influences daily living (Lox et al., 2014).

Health-related quality of life is composed of five core dimensions: 1) physical functioning, 2) emotional functioning, 3) social functioning, 4) cognitive functioning, and 5) health status. Physical functioning refers to the overall strength, flexibility, and endurance of an individual and also is used to describe the ability in which activities of daily living can be

performed. Emotional functioning consists of experiencing negative or positive feelings, such as happiness and depression. Social functioning refers to the capacity of fulfilling certain social roles, such as the role of spouse, parent, student, and employee. Cognitive functioning refers to the mental processes of gaining knowledge, measured through memory, problem solving and concentration. Health status refers to one's overall physical health and experiencing symptoms, like pain and tiredness. Assessing these dimensions provides a better understanding of how individuals feel about certain elements of their overall health.

Health-related quality of life is considered to be an important measure in health care that can be employed as a general overall health assessment tool (Lox et al., 2014). It is utilized as “an outcome measure in clinical trials and health services research, for assessing the health needs of populations, for the planning of clinical care of individual patients, and for resource allocation” (Katschnig, 2006, p. 140). Moreover, assessing HRQoL as an outcome measure is useful to identify those patients who are at risk of developing adverse health outcomes. In addition, measuring HRQoL is beneficial for those individuals suffering from a chronic disease in order to better understand how the symptoms of their disease influence daily living. For example, patients with cirrhosis generally report having an impaired HRQoL (Orr et al., 2014). Understanding the patient's emotional, physical and lifestyle responses to their illness and treatments can lead to the identification of new therapies that are more life-enhancing and target specific symptoms, thus improving HRQoL (Orr et al., 2014).

Assessing HRQoL is also useful for exercise psychologists. Exercise psychologists can incorporate HRQoL when determining the effectiveness of different exercise interventions on overall health (Lox et al., 2014). Exercise psychologists can assess how exercise influences physical, mental, and social functioning. Improvements in HRQoL are viewed as a benefit of

exercise, especially among individuals at risk or diagnosed with a chronic illness (Lox et al., 2014).

HRQoL and PA. Physical activity is associated with increases in HRQoL within certain populations. For instance, research suggests that engaging in PA is associated with a higher HRQoL particularly among healthy older individuals and individuals suffering from a chronic disease (Kelley, Kelley, Hootman, & Jones, 2009). Exercising, whether in the form of resistance or endurance training, may positively influence HRQoL in older individuals (Rejeski & Mihalko, 2001). In addition, PA leads to improvements in self-esteem, self-efficacy, and positive affect which is associated with a higher HRQoL (Elavsky et al., 2005). Engaging in PA also may continue to elicit positive long-term effects on HRQoL, including enhanced physical self-esteem and positive affect (Elavsky et al., 2005).

Physical activity may enhance HRQoL in individuals suffering from chronic diseases. For example, Motl & Gosney (2008) found that exercise training led to improvements in HRQoL among people with multiple sclerosis. Physical activity may also positively influence the HRQoL in individuals with chronic heart failure and cancer (van Tol, Huijsmans, Kroon, Schothorst & Kwakkel, 2006; Mishra et al., 2012). Specifically, individuals reported improvements in physical functioning, emotional well-being, sleeping patterns, and health status (Mishra et al., 2012). Physical activity is also beneficial for those suffering from chronic mental illnesses, such as schizophrenia (Faulkner, Gorzynski, & Arbour-Nicitopoulos, 2013).

Individuals who are physically active report a higher HRQoL than sedentary individuals. One study assessed the HRQoL and PA habits of a sample of English adults aged 40-60 years. It was found that high levels of PA were associated with reporting a higher HRQoL (Anokye, Trueman, Green, Pavey, & Taylor, 2012). The researchers indicated how there is a lack of

research that assesses the relationship between PA and HRQoL in the general population (Anokye et al., 2012).

Few studies have assessed how PA influences the HRQoL of college students. One study examined how factors like self-efficacy, social support, and physical environmental factors influenced the PA and HRQoL of female college students (Zhang et al., 2017). It was found how engaging in PA was positively related to HRQoL. Also, self-efficacy, social support, and environmental factors, such as living in a safe community were all found to be significantly related to the students' PA and HRQoL (Zhang et al., 2017).

HRQoL of Non-Clinical College Students. There is a lack of research that assesses the HRQoL of the non-clinical college student population, and most studies tend to focus on the HRQoL of non-American college students. For example, Fallahzadeh & Mirzaei (2013) assessed the HRQoL of Iranian college students and sought to identify factors associated with their HRQoL. Participants reported the highest scores on the physical functioning subscale and the lowest on the general health subscale (Fallahzadeh & Mirzaei, 2013). No significant difference in HRQoL was found between male and female college students. Factors that were found to influence HRQoL included marital status, smoking, employment, and academic achievement (Fallahzadeh & Mirzaei, 2013). Students who regularly engaged in moderate exercise did report a higher total mental composite score (mean of emotionally related subscales of SF-36) than those who did not engage in moderate exercise.

Another study assessed the HRQoL of Belgrade University students and the results indicated that the highest average SF-36 subscale score (93.7) was for physical functioning for both male and female college students (Pekmezovic, Popovic, Tepacevic, Gazibara, & Paunic, 2011). Male college students scored higher than female students across all eight subscales except

for the role functioning physical subscale (Pekmezovic et al., 2011). College students who lived at home with parents reported higher SF-36 scores compared to those students who lived alone in leased apartments, which suggests that support from family may influence one's HRQoL (Pekmezovic et al., 2011). The results also indicated that students who engage in PA every day reported a higher total SF-36.

The HRQoL of Lebanese college students was also studied and the results indicated that students who were sedentary scored lower on the "social functioning" and "vitality" subscales of the SF-36 than those who engage in regular exercise (Sabbah, Sabbah, Kharmis, Sabbah, & Droubi, 2013). Also, female college students reported a lower HRQoL than males and were found to be less physically active than males. Interestingly, students who studied health reported a lower HRQoL than those studying business and economics (Sabbah et al., 2013).

Another study assessed QOL and exercise habits of college students while measuring factors, such as self-efficacy, self-esteem and affect (Joseph, Royse, Benitez, & Pekmezi, 2014). Physical self-esteem and positive affect were found to be the strongest mediators between exercise habits and QOL (Joseph et al., 2014). This may indicate how physical self-esteem and positive affect play an integral role in the relationship between exercise habits and QOL. Therefore, researchers concluded that health education programs for young people should encourage regular PA while focusing on enhancing physical self-esteem and positive affect in order to improve the QOL of young adults (Joseph et al., 2014).

HRQoL and Alcohol use. Research has also assessed the relation between alcohol use and HRQoL in college students. For example, researchers assessed the HRQoL among heavy-drinking college students utilizing depression as a mediating variable (Monahan et al., 2012). Approximately 80-90% of college students reported consuming alcohol, while 44% of these

students reported engaging in binge drinking. Depression negatively influences HRQoL, as it was found that individuals with mood disorders scored low on emotional functioning (Monahan et al., 2012). These results may indicate that even in college students who routinely engage in binge drinking, depression is more prominently associated with lower HRQoL than alcohol consumption or adverse alcohol-related consequences (Monahan et al., 2012). It is recommended that college health professionals screen for college students who are suffering from depression because when binge drinking they are more likely to experience impairment to their health and are at risk to experience adverse consequences, such as missing class and engaging in risky behavior (Monahan et al., 2012).

Another study also analyzed the relationship between alcohol use and HRQoL among college students who engage in three or more binge drinking episodes in a month. These findings support other research that shows how individuals who reported engaging in frequent binge drinking reported a lower HRQoL and reported more unhealthy days than students who do not engage in frequent binge drinking (Okoro et al., 2004).

HRQoL and Stress. Stress has a major effect on mood, well-being, and on overall physical and emotional health and may also influence a person's HRQoL (Schneiderman, Ironson, & Siegel, 2005). Among college students, stress is a major issue often triggered by factors, such as family and relationships, academics, and financial worries (Marshall, Allison, Nykamp, & Lanke, 2008). In third-year pharmacy students, it was found how those with high stress levels reported low mental HRQoL scores and female pharmacy students reported higher levels of stress and lower mental HRQoL scores than males (Marshall et al., 2008). Another study examined the relation between experiencing a recent stressful life event in the past year and the HRQoL among college students (Damush, Hays, & DiMatteo, 1997). The results

indicated that students who experienced stressful events reported a lower HRQoL as encountering a stressful event (i.e. suicidal thoughts) was strongly related to reporting a poor HRQoL. Also, college students who recently experienced a stressful event involving their parent or family reported greater anxiety, depression, bodily pain, and poorer cognitive/social functioning than other college students (Damush et al., 1997).

Another study assessed the stress and HRQoL of Nepalese students studying in South Korea (Bhandari, 2012). It was found that both perceived stress and acculturative stress, the stress when adapting to a new culture, were negatively related to HRQoL. Stress was found to be associated with negative emotions, like depression and suicidal ideations (Bhandari, 2012).

Effect of Past Athletic Experiences on Current PA Habits of College Students

The transition from high school to college can also influence exercise habits and result in a decline in participation in PA (Kwan, Cairney, Faulkner, & Pullenayegum, 2012). Only 38% of college students engage in vigorous PA compared to 65% of high school students (Nelson, Gortmaker, Subramanian, & Wechsler, 2007). However, college students who were previously high school athletes seem to be more active than college students who were not high school athletes. In one study, 63.7% of former male high school athletes engaged in weekly PA, compared to only 37.9% of college students who were not high school athletes (Nelson et al., 2007). For females, 54.2% of former high school athletes engaged in weekly PA compared to 34.8% of college students with no prior high school athletic experience. Although the PA levels of former high school athletes decreased from high school to college, they are still more active than other college students.

Even though most former high school athletes are exercising frequently, many are no longer involved in team sports. Research indicates that 50% of college students reported

previously participating in a high school sport, but only 15% of those students are involved in intercollegiate sports (Nelson et al., 2007). Therefore, increasing team/organized sports options in college may increase participation in exercise. In addition, engaging in recreational sports is suggested to be a positive coping method following exit from competitive sports (Helms, 2010). So, participation in these types of activities may be a good way for former high school athletes to remain active in team sports and thus stay physically active.

The athletic identity among former high school athletes also may influence their level of PA. Athletic identity can be defined as “the degree in which an individual identified with the athletic role” (Brewer, VanRaalte, & Linder, 1993, p. 237). Research indicates that among former high school athletes, having a higher athletic identity is associated with reporting greater levels of PA in college (Brooks, 2012). Former high school athletes with higher athletic identities are likely to experience emotional stress as a result of no longer being involved in varsity athletics and instead seek out social support (Grove, Lavellae, & Gordon, 1997). As a result, many of these individuals tend to engage in PA in order to maintain their athletic identity (Brooks, 2012). Research indicates how recreational sports can serve as a positive coping method from no longer being involved in team competitive sports (Grove et al., 1997). This finding is related to other research that indicates how involvement in recreational and intramural sports helps to promote social interaction among college students (Chen, 2002). In fact, the goal of recreational sports is to provide more opportunities for social interactions in order to stimulate social development (Dalgarn, 2001). Intramural team sports may provide students who played high school sports with social support and may help ease the transition from no longer being involved in athletics.

Summary

There is much research that supports how engaging in PA can benefit overall health. Moreover, there is also research that shows how factors, such as past athletic experiences, influence one's PA habits. However, there is little investigation into how PA influences the HRQoL of college students. This investigation will identify whether a relationship exists between the PA level and HRQoL of college students. In addition, the findings may help understand how factors, like gender, age, academic classification, residence status, PA level, and prior high school or club sport participation influence this relationship.

Chapter 3

Methods

The primary purpose of this investigation was to examine the relationship between PA level and reported HRQoL among college students. A secondary purpose of this investigation was to determine how variables such as gender, age, academic classification, residence status (on or off campus), and prior high school or club sport involvement influence the relationship between current level of PA and HRQoL. Specific methods were employed to answer the research questions guiding this investigation. This chapter discusses the methods that were utilized in data collection for this project, including participants, measures, procedures, and design.

Participants

Completion of this investigation required the participation of male and female college students. Participants were recruited from a single, private university in North Texas. This university had a total enrollment of 10,394 students and a gender ratio of approximately 60% female to 40% male. The sample originally consisted of 656 students. However, the responses of 59 participants were removed because they had met exclusion criteria: indicated an active eating disorder or were not 18-25 years old. Thus, the responses of 597 participants were utilized in the data analyses.

Measures

To gather data for this investigation, three measures were utilized. First, a demographic questionnaire was employed to gather relevant personal information about each participant. Next, participants completed the NASA/JSC Physical Activity Rating Scale (PA-R), which

assessed each participant's current level of PA. Finally, the RAND Short Form-36 Health Survey (SF-36) was administered to evaluate the HRQoL of each participant.

Demographic questionnaire. To obtain data pertaining to the backgrounds of each participant, a demographic questionnaire was developed and issued to each participant (Appendix A). Each participant completed the demographic questionnaire to record: age, gender, academic level, previous participation in high school or club sports, current residence status (on-campus/off-campus), and whether the participant currently had an active eating disorder.

NASA/JSC Physical Activity Rating Scale (PA-R). The PA-R (Jackson et al., 1990) was utilized to assess each participant's PA level for the previous month (Appendix B). Participants chose an appropriate response and corresponding number (0-7) that describes their general activity level. A "0-1" rating represented avoiding exercise or not regularly exercising. A rating of "2-3" represented regularly participating in recreational and moderate activities such as golf and weightlifting for either 10-60 minutes per week or more than 1 hour per week. Finally, a rating of "4-7" denoted engaging in heavy aerobic exercises such as running, brisk walking and swimming. The PA-R is widely utilized in PA research and has shown a high reliability ranging from .81-.86 (Culpepper, 2017).

Because the participants as a whole were found to be physically active, for the statistical analyses, each participant's PA-R score was recoded into three categories: "Sedentary Physical Activity (1)," "Moderate Physical Activity (2)," and "Vigorous Physical Activity (3)". The first category "Sedentary PA" included participants who self-reported a score of 0 or 1, indicating that they do not engage in any exercise. The second category "Moderate PA" included participants who reported a 2 or 3. This included individuals who regularly engage in moderate exercises like golf and weightlifting. The third category "Vigorous PA" included participants

who reported a 4, 5, 6, or 7. These participants indicated that they regularly engage in vigorous and heavy exercises such as running and cycling. Parkhad & Palve (2014) similarly utilized the PA-R and divided the scores into the same categories when assessing the PA levels of adolescents.

RAND Short Form-36 Health Survey (SF-36). The RAND SF-36 (Ware & Sherbourne, 1992) was utilized to measure each participant's reported HRQoL. The SF-36 includes eight subscales including physical functioning, role limitations due to physical health, role limitations due to emotional problems, vitality, emotional well-being, social functioning, pain, and general health (Ware & Sherbourne, 1992). From the eight subscales, two constructs are calculated which include physical composite score (PCS) and mental composite score (MCS). In this current study, item 11 from the original SF-36 was mistakenly omitted from the version that was provided to the participants. This question, which was part of the physical functioning subscale, asked the extent in which an individual is limited by his or her health when "walking one block". As a result, the version utilized in this study was renumbered and had only 35 items for all participants (Appendix C). Table 1 illustrates the SF-36 subscales and items associated with each subscale.

Table 1

SF-36 Subscales and Items

Subscale	Items
Physical functioning	3, 4, 5, 6, 7, 8, 9, 10, 11
Role limitations due to emotional problems	16, 17, 18
Role limitations due to physical health	12, 13, 14, 15
Vitality	22, 26, 28, 30
Emotional well-being	23, 24, 25, 27, 29
Social functioning	19, 31
Pain	20, 21
General Health	1, 32, 33, 34, 35

The SF-36 is composed of Likert-style and Yes/No questions with a total score ranging from 0-100. A low score indicates a lower HRQoL, while a higher score would indicate a high HRQoL. In past research, the SF-36 was utilized to assess the positive effects of exercise interventions on HRQoL across populations including women with breast cancer, cardiac rehabilitation patients, the elderly, and in the adolescent population (Lox et al., 2014; Snyder et al., 2010). Among the elderly and disabled populations, the eight subscales have a high internal reliability ranging from .83 to .93 (Gandek, Sinclair, Kosinski, & Ware, 2004). However, among the non-clinical college student populations, few studies have utilized the SF-36 to measure the HRQoL (Fallahzadeh & Mirzaei, 2013; Pekmezovic et al., 2011; Sabbah et al., 2013)

In the current study, because four of the SF-36 subscales were found to be unreliable, revised subscales of the SF-36 were created and utilized in the data analyses. As a result, PCS and MCS were not calculated. The reliability of the SF-36 and subscales used in this study is discussed further in Chapter 4.

Procedures

Approval to conduct data collection for this investigation was sought by the University Institutional Review Board and Departmental Review Board (Appendix D). Once it was approved, the researcher began recruiting participants. The researcher contacted professors in various departments on campus, such as kinesiology, nursing, communication sciences, sociology, performing arts, biology, and pre-health. Professors were sent an email (Appendix E) that contained a flyer (Appendix F) advertising the study. The flyer contained a QR (quick response) code, which allowed students to easily access the surveys on a mobile device. The professors were asked to share the research flyer with the students in their classes. Also, Department Chairs from Kinesiology, Communication Sciences, Music, and Pre-Health

forwarded the email containing the flyer to all undergraduate and graduate students in their department.

The researcher also had access to the email addresses of current undergraduate and graduate students in the Communication and Psychology departments. These students were sent an email invitation (Appendix G) that briefly explained the research project and contained a direct URL link to access the survey materials on Qualtrics. The researcher also engaged in active recruiting by soliciting participation in different public areas on campus. Participants who were interested in participating were asked to provide their email address or scan the QR code on the research flyer. An email invitation was later sent to participants who provided their email address. Before completing the measures, the participants were presented with an informed consent form (Appendix H) that indicated that participation was voluntary, anonymous, and could be terminated at any time. In order to be eligible to complete the surveys, the participants had to agree that they identified as a male or female and were a current college student aged 18-25 years old. In addition, any participant that was a current member of a NCAA/club team or diagnosed with a chronic illness was asked to remove themselves from answering the surveys. By completing the measures, participants provided consent for participation.

After completion of the measures, participants were thanked for their cooperation and asked if they would like to enter their email address for a random drawing to win one of three \$50 Amazon gift cards. One week after the initial email invitations, a follow-up email (Appendix I) was sent reminding participants who had not completed the measures to please do so. Once data collection was completed, the gift card drawing occurred and the three gift cards were given to three random participants.

Design/Data Analyses

This study was designed as a cross-sectional research study using online survey instruments. Independent variables included gender, academic classification, age, residence status (living on or off campus), PA level, previous high school/club sport involvement. Dependent variables included the HRQoL 4-factor SF-36 subscales: physical functioning, role limits due to emotional health, role limits due to physical health, and positive emotional energy. Once all questionnaires were completed, statistical procedures were conducted to examine the relationship between participants' PA level and HRQoL. All statistical analyses in this investigation were conducted using Statistical Package for the Social Sciences (SPSS) V.23 (IBM Corporation, Armonk, NY).

First, in order to test the reliability of the SF-36, Cronbach alpha coefficients were calculated for each subscale. An 8-factor exploratory principal component factor analysis with varimax rotation (PCA) was also conducted to further test the fit and reliability of the SF-36. Next, Cronbach alpha coefficients were then re-run to test the 4-factor SF-36 subscales. Further discussion of the 4-factor SF-36 utilized in the data analyses is presented in Chapter 4.

Descriptive statistics were conducted to determine frequencies and average PA-R scores of each variable (gender, academic classification, age, residence status, previous high school/club sport participation). Pearson correlation coefficients were also calculated to examine the first research question regarding the relationship between PA level (PA-R scores) and HRQoL (SF-36 scores) among college students. Next, to examine the second research question, a two-way multivariate analysis of variance (MANOVA) was utilized to determine if variables such as gender, age, academic classification, residence status, and high school/club sports participation influence the relationship between PA level and HRQoL. Finally, a one-way

multivariate analysis of variance (MANOVA) was used to assess whether there were significant differences in HRQoL within each independent variable. A Scheffe post hoc test was also utilized to assess significant differences and interactions between the different PA levels. For all statistical analyses, an alpha level of 0.05 was used.

Summary

The main purpose of this study was to determine if there was a relationship between the PA level and reported HRQoL of college students. It was of additional interest to examine how variables, such as gender, age, academic classification, residence, and prior high school/ club sports involvement influence this relationship. Also, this study aimed to assess whether there were any significant differences in HRQoL scores within these variables and in PA levels. Data collection included three measures that were employed to obtain information about each participant. After data was collected, the research questions were assessed using statistical analyses. The outcomes of these analyses are presented in the following chapter.

Chapter 4

Results

This chapter presents the findings of the analyses regarding the three research questions. Before assessing the research questions, the reliability of the SF-36 was tested and descriptive statistics were calculated for each of the demographic characteristics (gender, age, academic classification, residence, and previous high school/club sport participation). The first research question examined the relationship between level of PA and HRQoL in college students. The second research question assessed how gender, age, academic classification, residence (living on or off campus), and previous high school/club sport involvement influenced the relationship between PA level and HRQoL. The third research question aimed to understand how differences in gender, age, PA level, academic classification, residence status, and past participation in high school/club sports influenced HRQoL.

Descriptive Statistics

The demographic characteristics of the sample are presented in Table 2 and Table 3. Originally, 656 college students participated in this study. The responses of 59 students were removed because they indicated that had a current active eating disorder or were not between the ages of 18-25 years old. Therefore, the responses of 597 participants were assessed. In order to condense the PA-R scores, the researcher recoded the original PA-R scores (0-7) into three categories for data analyses (Sedentary PA (1), Moderate PA (2), and Vigorous PA (3)).

Table 2

Descriptive Characteristics of Sample and Means and Standard Deviations of PA-R (N=597)

Variable	N	%	PA-R	
			M	SD
Gender				
Male	130	27.8%	4.66	2.040
Female	467	78.2%	2.55	2.064
Age				
18-20	329	55.1%	2.59	1.982
21-25	268	44.9%	2.52	2.151
Academic Classification				
Undergraduate	567	94.9%	2.56	2.044
Graduate	30	5.0%	2.50	2.191
Residence				
On-campus	329	55.1%	2.59	1.992
Off-campus	268	44.9%	2.53	2.139
Previous HS/club sport athlete				
Yes	480	80.4%	2.65	1.950
No	117	19.6%	2.21	2.191

Table 3

Number of Participants by PA-R Level

PA-R level	N	%
Sedentary	85	14.24%
Moderate PA	92	15.41%
Vigorous PA	420	70.35%

Psychometrics and Reliabilities of SF-36 Subscales

In order to test the reliability of the SF-36, Cronbach’s alpha coefficients (α) were calculated for each of the eight subscales (Table 4). Four subscales (physical functioning, role limitations to physical health, role limitations due to emotional health, and pain) were found to have high reliability. The remaining subscales (vitality, emotional well-being, social functioning, and general health) indicated very poor reliability.

Table 4

Reliability of each SF-36 Subscale

Subscale	α	Items
Physical Functioning	.901	3, 4, 5, 6, 7, 8, 9,10,11
Role limitations due to emotional problems	.831	16,17,18
Role limitations due to physical health	.865	12,13,14
Vitality	-.089	22, 26, 28, 30
Emotional well-being	-.311	23, 24, 25, 27, 29
Social functioning	-4.274	19, 31
Pain	.750	20, 21
General health	-.026	32, 33, 34, 35

An exploratory principal component factor analysis with varimax rotation (PCA) was conducted to further test the fit of the SF-36 (Table 5). First, it was found that eight factors accounted for 67.84% of the known variance. Based on the work of Conroy, Motl, & Hall (2000), any item that had a primary loading less than .40 was removed and not included in any further analyses. The researcher removed 13 items (components) of the SF-36 that did not meet this criteria.

A PCA was then re-run on the remaining 22 items and it was found that the total variance of 67.54% was explained by four factors. The PCA indicated how 22 items loaded strongly on the four factors (Table 5). Items 4-11 loaded strongly on the first factor ranging from .712-.917, which were all part of the “physical functioning” SF-36 subscale. The researcher classified this factor as “physical functioning”. Items 16, 17, 18, 24, 27, 31 loaded strongly on the second factor and ranged from .527 to .812. Items 16-18 were part of the “role limits due to emotional health problems” subscale. Items 24, 28 were part of the “emotional well-being” subscale, while item 31 was part of the “social functioning” subscale. These items were classified as “role limits due to emotional problems” because most of the items indicate the

extent in which negative emotions interfere with daily living. Items 12-15 loaded strongly on the third factor and ranged from .694 to .907. Since these items were part of the “role limits due to physical health” subscale, the researcher used the same classification. Items 22, 25, 26, & 29 loaded strongly on the fourth factor and ranged from .693 to .869. Items 22 & 26 were from the “vitality” subscale, items 25 and 29 were from “emotional well-being.” The researcher classified the fourth factor as “positive emotional energy” because the items together represented the extent an individual experienced positive emotions while also feeling energized. Cronbach alpha (α) coefficients were then calculated to assess the reliability of each 4-factor SF-36 subscales (Table 6).

Table 5

Items and Factor Loadings for 4-Factor SF-36

Factor 1		Factor 2		Factor 3		Factor 4	
Item	Physical functioning	Item	Role limits due to emotional problems	Item	Role limits due to physical health	Item	Positive emotional energy
4	.726	16	.793	12	.768	22	.752
5	.817	17	.766	13	.694	25	.683
6	.723	18	.812	14	.907	26	.802
7	.712	24	.527	15	.907	29	.750
8	.880	27	.590				
9	.896	31	.616				
10	.917						
11	.912						

Table 6

Reliability of the 4-Factor SF-36 Subscales

Subscale	α	Items
Physical Functioning	.933	4, 5, 6, 7, 8, 9, 10, 11
Role limitations due to emotional problems	.831	16, 17, 18, 24, 27, 31
Role limitations due to Physical health	.865	12, 13, 14, 15
Positive emotional energy	.816	22, 25, 26, 29

Relationship Between PA level and HRQoL

The first research question examined the relationship between PA level and HRQoL in college students. The independent variable was the revised PA-R score (1-3) and the dependent variables were the 4-factor SF-36 subscales (physical functioning, role limits due to emotional problems, role limits due to physical health, and positive emotional energy). To evaluate this relationship, Pearson-product moment correlation coefficients were calculated between the PA-R score and each of 4-factor SF-36 subscales (Table 7).

A positive correlation was found between PA level and physical functioning, which was statistically significant ($r=.124, p=.019$). A positive correlation was also found between PA-R and role limits due to emotional health problems, ($r=.221, p=.003$). The relationship between PA level and role limits due to physical health was not significant ($r=-.032, p=.429$). Lastly, a positive correlation was found between PA level and positive emotional energy, ($r=.096, p=.000$).

Table 7

Pearson-Product Moment Correlation Coefficients Between PA Level (PA-R) and HRQoL (4-Factor SF-36)

Measure	r	p
1. PA-R	1	
2. Physical Functioning	.124	.019
3. Role limits due to emotional problems	.221	.003
4. Role limits due to physical health	-.032	.429
5. Positive emotional energy	.096	.000

Interaction of Participant Characteristics and PA Level on HRQoL

The second research question examined how the characteristics of each participant (gender, age, academic classification, residence status, previous high school/club sport participation) influenced the relationship between PA level and HRQoL. In regards to gender, 78.2% of the participants were female and 80.4% of all participants engaged in high school/club sports. There was little variance in academic classification, as 95% of the participants were undergraduate students. Due to the lack of variance in gender, academic classification, and previous high school/club sport participation, these variables were removed from the analysis.

To determine whether there was an interaction between the remaining participant characteristics (age, residence status) and level of PA on HRQoL, a two-way multivariate analysis (MANOVA) was conducted (Table 8). The independent variables included age and residence status and the dependent variables included: the 4-factor SF-36 subscales (physical functioning, role limits due to emotional problems, role limits due to physical health, positive emotional energy).

Table 8

Interaction of PA Level with Age and Residence Status on HRQoL (MANOVA)

	Wilk's Λ	F	<i>p</i>
PA-R *Age	.990	.719	.675
PA-R *Residence	.986	1.029	.412

No interaction was found between age and PA level on HRQoL, $F(8, 1164)=.719, p=.675$ and between residence status and PA-R on HRQoL, $F(8, 1164) =1.029, p=.412$. These results suggest that PA-R and the participant characteristics did not have a significant effect on HRQoL. Therefore, further analyses were not utilized to test this model because it was not supported.

Differences Among Participant Characteristics and HRQoL

The final research question examined whether any significant differences in mean scores of the HRQoL were present in regards to gender, PA level, age, academic classification, residence status, and previous high school/club participation. Again, due to lack of variance in the present study, gender, academic classification, and previous high school/club athletic participation were removed from this analysis. Instead, PA level, residence status, and age were the only demographic characteristics examined. Descriptive statistics for these variables are included in Table 9.

Table 9

Means and Standard Deviations for HRQoL Based on PA Level, Age, and Residence Status

Group	PA-R		Physical functioning		Role limits due to emotional problems		Role limits due to physical health		Positive emotional energy	
	M	SD	M	SD	M	SD	M	SD	M	SD
Sedentary PA	.89	.310	94.41	10.116	69.91	29.526	93.82	18.661	51.59	17.915
Moderate PA	2.59	.495	91.51	19.820	73.86	27.880	87.22	30.222	59.89	18.927
Vigorous PA	5.73	1.000	96.79	13.108	78.54	29.526	90.06	24.868	62.85	15.890
18-20	4.58	1.982	95.12	15.170	78.01	24.816	89.21	25.851	60.64	16.795
21-25	4.53	2.151	96.27	12.677	74.85	26.964	91.32	24.032	60.97	17.524
On-campus	4.55	1.992	95.25	15.441	77.71	25.040	89.21	26.071	61.02	17.022
Off-campus	4.56	2.139	96.11	12.281	75.21	26.748	91.32	23.738	60.50	17.251

A two-way MANOVA was then conducted to assess differences between age (18-20, 21-25), PA level (Sedentary, Moderate PA, Vigorous PA), residence status (living on/off campus) and HRQoL (4-factor SF-36 subscales). For this analysis, the independent variables included age, living on/off campus, and PA level. The dependent variables included: the 4-factor SF-36 subscales (physical functioning, role limits due to emotional problems, role limits due to physical health, positive emotional energy). No significant differences in HRQoL were found in age or residence status. However, a significant difference was found in HRQoL based on a participant’s PA levels $F(8, 1182)=7.924, p<.001; \text{Wilk's } \Lambda=.920$ (Table 10).

Table 10

MANOVA between PA-R, Age, Residence Status, and HRQoL

	Wilk's Λ	F	<i>p</i>
PA level	.920	6.272	.000
Age	.988	1.832	.121
Residence	.993	.971	.423

The one-way MANOVA indicated that PA level had a statistically significant effect on physical functioning $F(2,594)=5.745, p<.01$, role limits due to emotional problems $F(2,594)=4.607, p=.01$, and positive emotional energy $F(2,594)=16.234, p<.001$. However, no significant effect was found between PA level and role limits due to physical health (Table 11).

Table 11

Summary of MANOVA Between PA Level and Each HRQoL Subscale (4-Factor SF-36)

HRQoL subscale	Sum of Squares	df	Mean Square	F	<i>p</i>
Physical functioning	2250.166	2, 594	1125.083	5.745	.003
Role limits due to emotional health problems	6073.752	2, 594	3036.876	4.607	.010
Role limits due to physical health	1935.811	2, 594	967.906	1.545	.214
Positive emotional energy	9045.541	2, 594	4522.771	16.234	.000

To further assess group differences that were significant, post-hoc tests were used. Scheffe's test was utilized to assess group differences between the 4-factor SF-36 and PA level (Table 12). For physical functioning, a significant difference ($p<.01$) was found between the moderate and vigorous PA groups. No other significant differences in physical functioning were found between the different levels of PA. For role limits due to emotional problems, a significant difference was found between those who are sedentary and those who engage in vigorous PA ($p<.05$). For positive emotional energy, a significant difference ($p<.0001$) was found between the

sedentary and vigorous PA groups. In addition, a significant difference ($p < .01$) was found between the sedentary and moderate PA groups.

Table 12

Differences in HRQoL Within each PA Level (Scheffe's Test)

PA level	(I) PA-R	(J) PA-R	Mean Difference (I-J)	95% Confidence Interval		<i>p</i>
				Upper Bound	Lower Bound	
Physical functioning	Sedentary	Moderate PA	2.90	-2.26	8.07	.387
		Vigorous PA	-2.37	-6.46	1.71	.362
	Moderate PA	Sedentary	-2.90	-8.07	2.26	.387
		Vigorous PA	-5.87	-9.23	-1.32	.005
	Vigorous PA	Sedentary	2.37	-1.71	6.46	.362
		Moderate PA	5.28	-1.32	9.23	.005
Role limits due to emotional problems	Sedentary	Moderate PA	-3.95	5.53	-13.43	.594
		Vigorous PA	-8.63	-1.13	-16.12	.019
	Moderate PA	Sedentary	3.95	-5.53	13.43	.594
		Vigorous PA	-4.68	-11.93	2.57	.286
	Vigorous PA	Sedentary	8.63	1.14	16.12	.019
		Moderate PA	4.68	-2.57	11.93	.286
Role limits due to physical health	Sedentary	Moderate PA	6.59	-2.65	15.84	.217
		Vigorous PA	3.76	-3.54	11.07	.450
	Moderate PA	Sedentary	-6.60	-15.84	2.65	.217
		Vigorous PA	-2.83	-9.90	4.24	.617
	Vigorous PA	Sedentary	-3.76	-11.07	3.54	.450
		Moderate PA	2.83	-4.24	9.90	.617
Positive emotional energy	Sedentary	Moderate PA	-8.30	-2.14	-14.47	.004
		Vigorous PA	-11.26	-16.13	-6.39	.000
	Moderate PA	Sedentary	8.30	2.14	14.47	.004
		Vigorous PA	-2.95	-7.67	1.76	.307
	Vigorous PA	Sedentary	11.26	6.39	16.13	.000
		Moderate PA	2.95	-1.76	7.67	.307

Summary

The research questions were examined to further understand the level of PA and HRQoL of college students. For the first research question, three of the revised SF-36 subscales were found to have a significant positive correlation with PA. For the second research question, a non-significant interaction was found between age, residence status, and PA level on HRQoL. For the

third question, differences among PA levels were found to influence three of 4-factor SF-36 subscales. For physical functioning, a statistically significant difference was found between individuals who participate in moderate and vigorous PA. For role limits due to emotional problems, a statistically significant difference was found between those who are sedentary and those who engage in vigorous PA. For positive emotional energy, a statistically significant difference was found between those who participate in vigorous and moderate PA and also between sedentary individuals and those who engage in moderate PA. Discussion and final conclusions regarding these results are presented in the following chapter.

Chapter 5

Discussion

This chapter examined the descriptive statistics, findings of each research question, suggests practical implications, and proposes future directions for research. The main purpose of this study was to examine the level of PA and HRQoL of college students. The first research question examined the relationship between PA level and HRQoL. The second question examined how variables such as gender, age, academic classification, residence status, and previous high school/club sports participation influence the relationship between level of PA and HRQoL. The final question assessed how differences in gender, age, level of PA, academic classification, residence status, and previous participating in high school/club sports may influence HRQoL.

Relationship Between PA and HRQoL

The first research question examined the relationship between the PA level and HRQoL of the participants. The 4-factor SF-36 subscales of physical functioning, role limits due to emotional health, and positive emotional energy had a significant, positive correlation with PA level. This finding supports previous research that shows a positive relationship between PA and HRQoL in college students (Dunn, 2011). Also, across the general adult population, a higher PA level is associated with better HRQoL (Anokye et al. 2012; Bize, Johnson, Plotnikoff, 2007). Engaging in regular PA elicits many health benefits, such as enhancing physical and emotional functioning (Kravitz, 2007), which could explain why much of the research demonstrates a positive relationship between HRQoL and level of PA.

Interestingly, role limits due to physical health did not significantly correlate with HRQoL. This might be indicative of the sample as individuals with chronic illnesses were

excluded from this study. Also, 85% of the participants engaged in either moderate or vigorous regular PA. Because this sample was very fit and young, they might not be limited by any physical health ailments, unlike older individuals or those with chronic illnesses.

Interaction of Participant Characteristics and PA Level on HRQoL

The second research question examined how gender, age, academic classification, residence status, and previous high school/club participation influenced the relationship between PA level (PA-R) and HRQoL. After removing gender, academic classification, and previous high school/club team involvement because of the lack of variance in the sample, a two-way MANOVA was conducted to assess the effect of age, residence status, and PA level on HRQoL, but no significant interactions were found.

This finding supports previous research that indicates how age may influence PA as younger college students tend to be more physically active than older students (Leung et al., 2016). This study indicated that because younger students were more motivated than older students to improve their appearance and physical attractiveness, they were more likely to engage in PA. In the current study, college students aged 18-20 reported a slightly higher average PA-R score than those 21-25 years of age. However, the effect of age and PA level did not significantly affect HRQoL even though both age groups (18-20, 21-25) were found to be physically active. The lack of heterogeneity in the level of PA among students aged 18-20 and 21-25 may explain why no significant interaction effect was found.

Previous research does indicate that residence status may also be a determinant of PA, as those who live on-campus tend to be more physically active because of access and proximity to exercise facilities (Leung et al., 2016; Small et al., 2013). This was not supported in this study as those who reside off-campus reported a slightly higher PA-R score than those who live on-

campus. This finding could be due to the many PA opportunities located in the vicinity of the university. For example, there are many parks and walking trails within a short distance. Also, much of the off-campus housing is close to campus, so access to the campus recreation center may not be an issue for many of these students. Students who reside in off-campus apartments might have access to exercise facilities within their apartment complex that they utilize. In this current study, no significant effect was found between residence status and PA level on HRQoL, which could be due to the lack of variance between those who live on-campus or off-campus. Most of the participants engaged in moderate or vigorous PA, regardless of their residence status or age.

The lack of significant findings between the interaction of age, residence status, and PA level on HRQoL suggest that other factors may influence this relationship. One factor was that 80.2% of the participants in this study previously participated in high school or club sports. Research indicates that former high school athletes are more likely to engage in PA than non high school athletes during college (Nelson et al., 2007). Even though many former high school athletes are no longer involved in organized sports in college, they are still more likely to engage in PA during college. Another possible factor is socioeconomic status (SES). Research does support how SES is a determinant of PA, as those with higher SES tend to report high levels of PA (Huure, Aro, & Rahkonen, 2003; Talaei et al., 2013). Unlike those with lower SES, individuals with high SES tend to have better access to neighborhood PA resources such as parks, trails, community centers. (Lee, Mama, Adamus-Leach, & Soltero, 2015) Since most students attending private universities are of a higher SES (Jerrim, Chmielewski, & Parker, 2015), this could be another factor that influenced the PA level of the participants in this study.

Differences Among Participant Characteristics and HRQoL

The final question assessed how differences in gender, age, academic classification, residence status, level of PA, and previous participation in high school/club sports may influence HRQoL. A MANOVA was conducted to assess how differences in level of PA, age, and residence status influenced HRQoL. Due to a lack of variance in gender and academic classification, these variables were excluded from the analysis. The results revealed that there were significant differences in HRQoL between different PA levels and HRQoL.

On the physical functioning subscale, the results indicated a significant difference in scores between those who engage in vigorous PA versus those who participate in moderate PA. This may suggest that vigorous PA rather than moderate PA may help to enhance physical functioning. Few studies have assessed how physical functioning is influenced by PA among college students without chronic illnesses. Pekmezovic and colleagues (2011) assessed the HRQoL of college students and found that engaging in moderate PA did improve physical health. However, the study only asked participants if they engaged in moderate PA, not vigorous PA. Previous research indicates how participating in moderate or vigorous PA can enhance the physical functioning of the elderly and adults with osteoarthritis (Chmelo et al., 2013; Manini & Pahor, 2009). Based on the findings of the current study, college students may benefit from vigorous PA in order to improve their physical functioning.

In regards to role limits due to emotional problems subscale, a significant difference was found between participants who were sedentary and those who engaged in vigorous PA. This finding suggests that those who engaged in vigorous PA are more adept than sedentary individuals at managing emotional problems. This supports other research that indicates how

participating in vigorous PA is associated with better mental health, less depressive thoughts, and perceived stress (Harbour, Behrens, Kim, & Kitchens, 2008; VanKim & Nelson, 2013).

In the current study, no significant difference was found between those who participated in moderate and vigorous PA; therefore, engaging in either moderate or vigorous PA may help in managing emotional problems. Past research indicates how engaging in moderate PA may reduce depression and anxiety symptoms and improve mood (Birkeland, Torsheim, & Wold, 2009; Reed & Ones, 2006; Sharma et al., 2006). Thus, college students should be encouraged to engage in either moderate or vigorous PA as a way to help manage emotional problems.

On the role limits due to physical health subscale, no significant differences were found among the three PA-R groups. This finding may indicate how PA level does not influence one's ability to manage physical health problems. Interestingly, individuals who reported they were sedentary scored higher on this subscale than those who reported engaging in moderate or vigorous PA. Again, because this sample was composed of young, mostly physically active college students, these individuals may not be limited by physical ailments. Overall, the reason there were no significant differences on this subscale between the three PA groups is unknown. The sample reported similar scores on this subscale, regardless of their PA level. Even though the results do not indicate that PA can help decrease the likelihood of physical health problems interfering with activities of daily living, in other populations, like the elderly and those with physical ailments, moderate and vigorous PA is often recommended as a way to improve physical functioning (Cooney et al., 2011; Paterson & Warburton, 2010; Taylor, 2014).

For positive emotional energy, no significant differences in scores were found between those who participate in moderate PA and those who engage in vigorous PA. However, significant differences in scores were found between sedentary and moderate PA and sedentary

and vigorous PA. These results suggest that moderate or vigorous weekly PA could help individuals feel more energized, peaceful, and happy. There is a lack of consensus on the intensity of PA individuals need to engage in to feel better mentally. The findings of this study contradict research that indicates how only engaging in vigorous PA helps to reduce depressive and anxious thoughts (Noh et al., 2015). Conversely, Guskowska (2004) found that moderate or vigorous daily PA reduces depressive and anxious thoughts in healthy adults. Based on the current findings, college students, especially those who are sedentary, should be encouraged to engage in moderate or vigorous PA in order to feel more revitalized and cheerful.

Practical Implications

This study sought to examine the relation between the PA level and HRQoL of college students. The study also examined how factors such as gender, academic classification, age, PA level, residence status, and previous high school/club sport participation influence HRQoL. Results from this study not only contribute to the HRQoL literature, but produce findings relevant for college students, campus recreation staff, health educators, campus mental health professionals, university administrators, and exercise psychologists.

For college students, the results highlight the importance and benefits of engaging in regular PA, especially in combating depression and anxiety. College students should be encouraged to engage in either moderate or vigorous PA in order to promote their overall physical and mental health. Campus recreation staff could utilize the results to create programs that not only promote PA but also educate college students on the positive health benefits of being physically active. Even though universities spend millions of dollars redesigning and updating campus recreation centers, 47.2% of students are not meeting recommended moderate or vigorous physical activity guidelines. (ACHA, 2016). In addition, according to NIRSA, only

39% of students indicate that they utilize the campus recreation facility three days or more per week (Kampf, 2010). Campus recreation staff could focus on increasing the usage of campus recreation facilities perhaps by increasing access (e.g. hours of operation) or by offering more fitness classes. Also, campus recreation staff could also identify barriers that are preventing students from utilizing the university recreation center and focus on improving services to the entire student population. The results could also be useful for mental health clinicians working at universities. These clinicians could encourage students who might be suffering from an emotional health condition, such as anxiety or depression, to engage in PA as a means to alleviate stress and improve mood.

Additionally, health educators could use the findings to promote the usage of PA to improve overall health. For example, health educators could teach college students how PA could improve mood, decrease stress, and lead to more pleasant thoughts. This information could be helpful to those students who are sedentary, especially those who might not be aware of the benefits of PA. Also, health educators could teach college students and the public about how health is a multidimensional concept influenced by not just physical aspects, but by other factors like mental and social functioning. For example, they could discuss how a combination of good physical, social, emotional, and psychological health can serve as a buffer against low academic performance, behavioral problems, and drug and alcohol usage (Sabbah et al., 2013). Therefore, health educators can utilize the results to help teach individuals about the benefits of PA and of living a healthy lifestyle.

It is also important to make sure that the PA classes offered by universities include important health and fitness topics. For example, college students could be taught how to properly use fitness equipment, create an exercise plan, the importance of stretching, and also

about the signs of overtraining. It is recommended that health educators incorporate assessment tools when evaluating the PA levels of students and focus on increasing the “user-friendliness” of physical education by offering a diverse array of classes that students can choose to enroll in (Roberts et al., 2006). Previous studies have shown that 94% of college students who were enrolled in PA classes reported having a better understanding of fitness and wellness topics after the class (Roberts et al., 2006). Therefore, it is imperative that the PA course curriculum includes educating students on key health and fitness topics that can be used to help students stay physically active during and after college.

University administrators could also use this information by offering more college-credit PA classes and requiring that all students enroll in at least one PA class. Research indicates how the number of fitness classes offered by universities has steadily declined (Lackman et al., 2015). In addition, the majority of universities in the U.S. no longer require students to take a PA class. But since this current study indicates how PA promotes physical and mental health, offering mandatory PA classes could be significantly beneficial for college students. For example, the results of the current study suggest that engaging in moderate or vigorous PA could help to improve emotional health. This is significant as health issues such as depression and anxiety are two of the most common health problems facing college students (CCMH, 2016).

In addition, because many college students indicate “time” as a barrier to PA (Gómez-López, Gallegos, & Extremera, 2010), offering classes during various times of the day could provide students with an opportunity to engage in PA. Also, since PA is associated with higher academic achievement (Al-Drees et al., 2016; Flynn et al., 2009), providing more PA opportunities could help students perform better academically. University administrators should also be encouraged to invest in constructing new PA facilities that are equally accessible to both

on and off campus students. For example, administrators should ensure that there is sufficient parking near PA facilities, as a lack of parking is often cited as a concern for students who live off-campus (Hardy & Hellman, 2011). In addition, they should also consider updating or constructing safe, lighted walking paths that can be utilized for PA. Research indicates how environmental aspects such as the presence of sidewalks and perceived safety on college campuses positively influence PA (Reed & Ainsworth, 2007; Zhang et al., 2017). Overall, the results from this study could help to justify the need for universities to offer more PA opportunities, and perhaps consider requiring that all students enroll in PA classes.

The findings of this study may also be helpful to exercise psychologists in regards to promoting PA and healthy living. They could utilize the results of this study when consulting with college students by highlighting the benefits of PA. For example, exercise psychologists could encourage students to engage in moderate or vigorous PA in order improve mood.

Exercise psychologists could utilize the Transtheoretical Model of Behavior change (TTM) when consulting with sedentary college students. According to this model, any behavior change is a gradual process (Lox et al., 2014). Therefore, exercise psychologists should aim to first progress these sedentary individuals from the “precontemplation stage” to the “contemplation” stage. Individuals in the precontemplation stage typically do not understand the benefits of PA and instead focus on perceived barriers to PA (Lox et al., 2014). Therefore, it is important that exercise psychologists discuss the benefits of PA and also assist sedentary students in formulating an exercise plan to overcome any perceived barriers to PA. For example, they could help individuals decide where to exercise and also how to schedule PA sessions into a busy schedule (Lox et al., 2014).

Once individuals are able to adopt new PA habits, exercise psychologists should aim to progress them to the “maintenance stage”. In this stage, these once sedentary individuals are consistently engaging in PA. In this stage, exercise psychologists could encourage these individuals to engage in different forms of PA or make their workouts more challenging to prevent boredom. Also, exercise psychologists can discuss techniques such as goal setting, self-monitoring, and visualization that could be utilized to track progress and prevent relapse in becoming sedentary (Lox et al., 2014). Finally, because there still remains a lack of research on the HRQoL of American college students, exercise psychology researchers could continue to conduct studies and create new research questions from this study.

Limitations

Although the findings of this study provide insight on the level of PA and HRQoL of college students, there were some limitations. One limitation was the usage of the SF-36, as it was found to be an unreliable measure of HRQoL. Because of this, many of the original SF-36 subscales were either removed or merged into new subscales. Merging the SF-36 into the 4-factor SF-36 version used in this study could have also decreased the validity of 4-factor SF-36 because many of the original SF-36 subscales were not assessed. This raises an issue as to whether the SF-36 is an appropriate measure of HRQoL in a non-clinical college student population. Also, for the role limitations to physical health subscale, some of the items ask whether an individual has difficulty walking up a flight of stairs, carrying groceries, or bathing oneself. Most college students are most likely not limited by these tasks, so these items might not effectively assess the physical health of college students. The SF-36 also does not assess an individual’s weight or sleeping patterns. Assessing these health issues would be more relevant and beneficial since weight gain and sleep deprivation are two major physical health issues

facing college students (Ferrara, 2009; Hershner & Chervin, 2014).

Another limitation was that there is no specific criterion or gold standard measure to assess HRQoL (Guyatt, 1997; Lin, 2013). Because of this, the assessment of HRQoL varies based on the specific measurement tool. For example, Dempster & Donnelly (2000) note how the SF-36 assesses different subscales of HRQoL than the Nottingham Health Profile Part I (NHP). Unlike the NHP, the SF-36 does not use “sleep” as a subscale and instead incorporates subscales such as role limits due to physical health and emotional health (Dempster & Donnelly, 2000).

Another limitation was that the PA-R is a self-report measure that does not provide specific information about an individual’s daily PA habits. For example, the PA-R does not indicate specifically how much time an individual devotes to PA either per day or week. Also, this study only assessed the level of PA and HRQoL of students from a small private university. Therefore, the results of this study may not be generalized to all college student populations. Another limitation was a lack of heterogeneity among gender, academic classification and those who previously participated in high school or club sports. As a result, these demographic variables, which previously were found to influence level of PA, were not tested due to the lack of variance. Overall, the sample was homogenous and except for PA-R scores, no significant differences were found in the participant characteristics.

Future Directions

Based on the results of this study, there are many possibilities for future research. Since this study only assessed college students from a single private university, reproducing this study using students from other private and public universities would help to better understand whether the results of this study are representative of other college students. In addition, future research should assess whether differences exist in PA and HRQoL in private and public university

students. Other factors such as socioeconomic status and ethnicity should be assessed to understand how these might influence PA in college students. Also, more research is needed to determine what intensity of PA is optimal to manage emotional problems in this population. In this study, engaging in moderate or vigorous PA was found to be beneficial in not allowing emotional problems to interfere with daily life, but results from other studies vary.

Participants in this study were reported to be overall physically active, therefore it would be interesting to replicate this study in a less active college student population to see if HRQoL scores would differ. More information is also needed to fully understand the PA habits of college students, especially those who reside off-campus. For example, studies should identify where students are exercising (i.e. university recreation center) and the type of PA college students are engaging in (i.e. aerobic exercise). Having a better understanding of the PA habits could be useful in determining whether a certain type of PA (i.e. aerobic vs anaerobic) might be more beneficial for college students.

Because the SF-36 is typically utilized to measure HRQoL in clinical and older populations, more studies are needed to validate SF-36 in a college population. Future investigations could also utilize other HRQoL methods, such as the World Health Organization Quality of Life scale (WHOQOL-BREF) or the Center for Disease Control (CDC) HRQoL-14. Researchers could test whether these measures can serve as a reliable measure to assess the HRQoL of college students. Also, researchers could consider creating a HRQoL instrument that is constructed specifically to measure the HRQoL of college students. Longitudinal research is also needed to understand how the HRQoL and PA level of college students change during a student's time in college. This current study only assessed the participants' PA level and HRQoL at a certain time period (April 2017); it would be of interest to see if PA level and HRQoL vary

during different times of the school year and if it changes as a student progresses through college. Because there is a major void in the HRQoL research of college students without chronic illnesses, researchers should be encouraged to further study this topic because the health of college students remains a relevant and important topic for this population.

Summary

The results of this study provide an understanding of the level of PA and HRQoL of college students. Findings from this study suggest that there was a significant relationship found between level of PA and the following 4-factor SF-36 subscales: physical functioning, role limits due to emotional health, and positive emotional energy. Across the same subscales, significant differences were found in students who were sedentary versus those who participated in moderate and vigorous PA. Variables such as age and residence status did not have a significant interaction effect with level of PA on HRQoL.

The findings of this study have many implications. Campus recreation staff and health educators should aim to promote PA by educating students about the benefits of engaging in regular PA and of maintaining a healthy lifestyle. University administrators could help to promote PA by increasing PA opportunities and by requiring that all college students enroll in a PA class. Future research is also needed to validate the usage of the SF-36 in a college population and to test other measures of HRQoL in the same population. Due to the lack of research, further studies should continue to assess the relationship between PA and HRQoL in college students.

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APPENDIX A

Demographic Questionnaire

Demographics Questionnaire

Gender (please select)

Male

Female

What type of student are you? (please select)

Undergraduate

Graduate student (Master's, Doctoral)

Age (please select)

18-20

21-25

Other

Do you currently reside on or off campus? (please select)

On campus

Off campus

Do you currently have an active eating disorder? (please select)

Yes

No

APPENDIX B

NASA/JSC Physical Activity Rating Scale (PA-R)

NASA/JSC Physical Activity Rating Scale (PA-R)

Directions. Use the appropriate number (0-7) which best describes your general activity level for the previous month.

Does not participate regularly in programed recreation, sport, or physical activity.

0	Avoids walking or exercise (for example, always uses elevators, drives whenever possible instead of walking).
1	Walks for pleasure, routinely uses stairs, occasionally exercises sufficiently to cause heavy breathing or perspiration.
Participates regularly in recreation or work requiring modest physical activity (such as golf, horseback riding, calisthenics, gymnastics, table tennis, bowling, weight lifting, or yard work).	
2	10–60 minutes per week
3	Over 1 hour per week
Participates regularly in heavy physical exercise (such as running or jogging, swimming, cycling, rowing, skipping rope, running in place) or engages in vigorous aerobic type activity (such as tennis, basketball, or handball).	
4	Runs less than 1 mile per week or spends less than 30 minutes per week in comparable physical activity.
5	Runs 1–5 miles per week or spends 30–60 minutes per week in comparable physical activity.
6	Runs 5–10 miles per week or spends 1–3 hours per week in comparable physical activity.
7	Runs more than 10 miles per week or spends more than 3 hours per week in comparable physical activity.

APPENDIX C

RAND Short Form-36 Health Survey (SF-36)

36-Item Short Form Survey Instrument (SF-36)

RAND 36-Item Health Survey 1.0 Questionnaire Items

Choose one option for each questionnaire item.

1. In general, would you say your health is:

- 1 - Excellent
- 2 - Very good
- 3 - Good
- 4 - Fair
- 5 - Poor

2. **Compared to one year ago**, how would you rate your health in general **now**?

- 1 - Much better now than one year ago
- 2 - Somewhat better now than one year ago
- 3 - About the same
- 4 - Somewhat worse now than one year ago
- 5 - Much worse now than one year ago

The following items are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
3. Vigorous activities , such as running, lifting heavy objects, participating in strenuous sports	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
4. Moderate activities , such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
5. Lifting or carrying groceries	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3

	Yes, limited a lot	Yes, limited a little	No, not limited at all
6. Climbing several flights of stairs	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
7. Climbing one flight of stairs	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
8. Bending, kneeling, or stooping	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
9. Walking more than a mile	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
10. Walking several blocks	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
11. Bathing or dressing yourself	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health?**

	Yes	No
12. Cut down the amount of time you spent on work or other activities	<input type="checkbox"/> 1	<input type="checkbox"/> 2
13. Accomplished less than you would like	<input type="checkbox"/> 1	<input type="checkbox"/> 2
14. Were limited in the kind of work or other activities	<input type="checkbox"/> 1	<input type="checkbox"/> 2
15. Had difficulty performing the work or other activities (for example, it took extra effort)	<input type="checkbox"/> 1	<input type="checkbox"/> 2

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

	Yes	No
16. Cut down the amount of time you spent on work or other activities	<input type="checkbox"/> 1	<input type="checkbox"/> 2
17. Accomplished less than you would like	<input type="checkbox"/> 1	<input type="checkbox"/> 2
18. Didn't do work or other activities as carefully as usual	<input type="checkbox"/> 1	<input type="checkbox"/> 2

19. During the **past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

1 - Not at all

2 - Slightly

3 - Moderately

4 - Quite a bit

5 - Extremely

20. How much **bodily** pain have you had during the **past 4 weeks**?

1 - None

2 - Very mild

3 - Mild

4 - Moderate

5 - Severe

6 - Very severe

21. During the **past 4 weeks**, how much did **pain** interfere with your normal work (including both work outside the home and housework)?

1 - Not at all

2 - A little bit

3 - Moderately

4 - Quite a bit

5 - Extremely

These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the **past 4 weeks**...

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
22. Did you feel full of pep?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
23. Have you been a very nervous person?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
24. Have you felt so down in the dumps that nothing could cheer you up?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
25. Have you felt calm and peaceful?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
26. Did you have a lot of energy?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
27. Have you felt downhearted and blue?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
28. Did you feel worn out?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
29. Have you been a happy person?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
30. Did you feel tired?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6

31. During the **past 4 weeks**, how much of the time has **your physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)?

- 1 - All of the time
- 2 - Most of the time
- 3 - Some of the time
- 4 - A little of the time
- 5 - None of the time

How TRUE or FALSE is **each** of the following statements for you.

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
32. I seem to get sick a little easier than other people	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
33. I am as healthy as anybody I know	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
34. I expect my health to get worse	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
35. My health is excellent	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5

APPENDIX D

IRB

INSTITUTIONAL REVIEW BOARD**PROTOCOL REVIEW REQUEST**

The TCU Institutional Review Board (IRB) is responsible for protecting the welfare and rights of the individuals who are participants of any research conducted by faculty, staff, or students at TCU. Approval by the IRB must be obtained prior to initiation of a project, whether conducted on-campus or off-campus. While student research is encouraged at both the undergraduate and graduate level, only TCU faculty or staff may serve as Principal Investigator and submit a protocol for review.

Please submit this protocol electronically to [IRBFacultySubmit](#) (pdf preferred). Include the Protocol Approval Form as a word document with highlighted sections filled in. Also submit a consent document, HIPAA form if applicable, Protecting Human Research Participants Training certificates, recruitment materials, and any questionnaires or other documents to be utilized in data collection. A template for the consent document and HIPAA form, instructions on how to complete the consent, and a web link for the Protecting Human Research Participants Training are available on the TCU IRB webpage at www.research.tcu.edu. Submission deadline for protocols is the 15th of the month prior to the IRB Committee meeting.

1. **Date:** 3/10/17
2. **Study Title:** The effect of exercise on the health-related quality of life (HRQoL) of healthy college students
3. **Principal Investigator - must be a TCU student:** Christopher Nieves
4. **Department:** Kinesiology
5. **Other Investigators - list the faculty mentor first as well as other faculty, staff, and students conducting the study including those not affiliated with TCU:** Dr. Stephanie Jevas, Dr. Amanda Swartz, Dr. Debbie Rhea
6. **Project Period:** 3/30/17-
7. **Funding Agency:** NA
8. **Amount Requested From Funding Agency:** NA
9. **Due Date for Funding:** NA
10. **Purpose - Describe the objectives and hypotheses of the study and what you expect to learn or demonstrate:** The primary purpose of this study is to determine the relationship

between the exercise habits of college students and their health-related quality of life. This study will also examine how factors such as gender, academic classification, living on or off campus, and high school athletic participation influence the relation between exercise habits and reported health-related quality of life among college students. Because of the limited research assessing the relationship between the exercise habits of college students and their (HRQoL), the following questions are proposed:

4. In college students, what is the relation between exercise habits and reported HRQoL?
5. How does gender, academic classification, living on/off campus and previously being a high school athlete influence the relationship between exercise habits and HRQoL?

11. **Background** - Describe the theory or data supporting the objective(s) of the study and include a bibliography of key references as applicable:

Health-related quality of life (HRQoL) is a multidimensional concept used to measure overall health. HRQoL is defined as a “subjective rating of the impact of an individual’s health on his or her overall well-being” (Monahan, Bracken-Minor, McCausland, McDevitt-Murphy, & Murphy, 2012, p. 289). HRQoL is used to assess how individuals evaluate their overall health and particularly how it influences daily living (Lox et al., 2014).

HRQoL is composed of five core dimensions: a) physical functioning, b) emotional functioning, c) social functioning, d) cognitive functioning, and e) health status (Lox et al., 2014). Physical functioning refers to the overall strength, flexibility, and endurance of an individual and also is used to describe the ability in which activities of daily living can be performed. Emotional functioning consists of experiencing negative or positive feelings such as, happiness and depression. Social functioning refers to the capacity of fulfilling certain social roles, such as the role of spouse, parent, student, and employee. Cognitive functioning refers to the mental processes of gaining knowledge, measured through memory, problem solving and concentration. Health status refers to one’s overall physical health and experiencing symptoms like, pain and tiredness. Assessing these dimensions will provide a better understanding of how individuals feel about certain elements of their overall health.

Research indicates how engaging in exercise enhances the health-related quality of life (HRQoL) of individuals with chronic illnesses such as, multiple sclerosis, heart failure and congenital heart disease (Kelley, Kelley, Hootman, & Jones, 2009; Emery, Long, Olson, 2013). In addition, research also suggests that healthy older individuals who were physically active experienced in improvements in self-esteem, positive affect, and self-efficacy, which enhanced overall HRQoL (Lox, 2014). However, there is a lack of research assessing the relationship between exercise and HRQoL particularly among healthy college students.

- Lox, C.L., Martin Ginis, K.A., & Petruzzello, S.J. (2014). *The psychology of exercise: Integrating theory and practice*. Scottsdale, AZ: Holcomb Hathaway Publishers.
- Monahan, C. J., Bracken-Minor, K. L., McCausland, C. M., McDevitt-Murphy, M. E., & Murphy, J. G. (2012). Health-related quality of life among heavy-drinking college students. *American Journal of Health Behavior*, 36, 289-299.

- 12. Participant Population - Describe the characteristics of the participant population including the inclusion and exclusion criteria and the number of participants you plan to recruit:** The participants for this study will consist of healthy male and female college students from Texas Christian University. This study will exclude students who are currently diagnosed with a chronic illness, a current member of a NCAA intercollegiate team/school club team, and who currently have an eating disorder. Participants who do not meet the above criteria will be asked to not participate in this study. The researchers of this study plan on recruiting at least 300 undergraduate students.
- 13. Recruitment Procedure - Describe your recruitment strategies including how the potential subjects will be approached and precautions that will be taken to minimize the possibility of undue influence or coercion.** At TCU, students will be recruited from physical activity (PEAC), kinesiology, nursing, communication, communication sciences, and social work classes. The primary researcher will discuss the main purposes of the study with the students and will provide them with a web address linking to the study. In addition, the primary researcher will be publicizing the research study by placing flyers around Rickel Hall and in the University Recreation Center. To make participating more user-friendly, the flyers will have a quick response (QR) code, which will allow the study to be completed on mobile devices. In addition, the primary researcher will solicit potential participants in different public spaces on campus such as, the BLUU, King Family Commons, and library. Also, an announcement discussing the study and encouraging participation will be posted on the “TCU Announce” page.
- 14. Consenting Procedure - Describe the consenting procedure, whether participation is completely voluntary, whether the participants can withdraw at any time without penalty and the procedures for withdrawing, whether an incentive (describe it) will be offered for participation. If students are used as subjects, indicate an alternative in lieu of participation if course credit is provided for participation. If a vulnerable population is recruited, describe the measures that will be taken to obtain surrogate consent (e.g., cognitively impaired subjects) or assent from minors and permission from parents of minors.**

Informed consent will be obtained by providing potential participants with an informed consent form to read prior to participating in the study. A copy of this form is in Appendix A. The consent form will notify participants that they are not obligated to participate in this or any other study and are free to withdraw at any time without penalty. The consent form will also contain IRB contact numbers should concerns arise, and will explain that their data will be confidential. Before completing the surveys, participants will have the opportunity to print off the informed consent form for their records. By proceeding with the research study and completing the three surveys, participants will have provided consent.

In addition, after completing the surveys, participants will have an opportunity to enter a random drawing to win one of three \$50 Amazon gift cards. In order to enter this drawing, participants will need to provide their email address.

- 15. Study Procedures - Provide a chronological description of the procedures, tests, and interventions that will be implemented during the course of the study. Indicate the**

number of visits, length of each visit, and the time it would take to undergo the various tests, procedures, and interventions. If blood or tissue is to be collected, indicate exactly how much in simple terms. Flow diagrams may be used to clarify complex projects.

Participants will be provided with a link to the Qualtrics website, where they will complete the three questionnaires (Demographics questionnaire, SF-36, and PA-R). The demographic questionnaire (Appendix C) will be used to gather personal and background information about each participant. The PA-R (Appendix D) will assess the physical activity level of each participant. The SF-36 (Appendix E) will be used to measure each participant's HRQoL. It will take approximately 10-15 minutes to complete all the assessments.

16. Data Analyses - Describe how you will analyze your data to answer the study question.

Due to the exploratory nature of the investigation, we will be using both descriptive and inferential statistics to address the purposes. To investigate the relationship between HRQoL and exercise habits, Pearson correlation coefficients will be calculated between SF-36 and PA-R. To test the effect of factors such as, gender, age, living on/off campus, and past athletic activity, structural equation modeling (SEM) and regression analyses will be performed to analyze the data. In addition, independent sample t-test will also be performed to assess the differences in SF-36 scores among the same variables.

17. Potential Risks and Precautions to Reduce Risk - Indicate any physical, psychological, social, or privacy risk which the subject may incur. Risk(s) must be specified. Also, describe what measures have been or will be taken to prevent and minimize each of the risks identified. If any deception is to be used, describe it in detail and the plans for debriefing.

There is minimal risk in participating in this study. Completing these surveys brings no risks beyond those of daily life.

18. Procedures to Maintain Confidentiality - Describe how the data will be collected, de-identified, stored, used, and disposed to protect confidentiality. If protected health information is to be re-identified at a later date, describe the procedure for doing so. All signed consents and hard data must be stored for a minimum of 3 years in a locked filing cabinet (and locked room) in the principal investigator's office, or a storage closet at TCU. Your professional society may recommend keeping the materials for a longer period of time.

All of the surveys will remain confidential. The identifying information linking the participant to his/her data will be stored on a password-protected computer in the Sport Psychology Lab (Rickel 257), which will only be accessible by the researchers.

19. Potential Benefits - Describe the potential benefits of the research to the participants, to others with similar problems, and to society.

The results of this study may help further understand how exercise influences the five dimensions of health-related quality of life: physical functioning, emotional functioning, social functioning, cognitive functioning, and health status. Therefore, the results of this investigation may be valuable to campus recreation staff and university mental health practitioners. For example, campus staff may be able to better communicate to college students about how exercise influences overall health and also create programs that help to promote healthy living.

20. Training for Protecting Human Research Participants – Submit training certificates for all the study investigators. The training link is available on the TCU IRB webpage at: www.research.tcu.edu.

21. Checklist for the Items that Need to be Submitted: Please combine all the files into one pdf document before submitting the materials electronically to the Departmental Committee Chair. To prevent any delay in the approval of your protocol, use the most recent template for the protocol, consent document, and HIPAA form by downloading them from www.research.tcu.edu or <http://www.harriscollege.tcu.edu/research.htm> each time you prepare your materials.

- a. Protocol
- b. Consent document
- c. HIPPA form (if applicable)
- d. Protecting Human Research Participants Training Certificate for each investigator
- e. Recruitment fliers, letters, ads, etc.
- f. Questionnaires or other documents utilized in screening and data collection





APPENDIX E

Letter of Invitation to Professors



Harris College of Nursing & Health Sciences

Kinesiology

Hello Professor,

My name is Chris Nieves and I am a current graduate student in the Kinesiology department. For my thesis, I am running a study assessing the health-related quality of life (HRQoL) and exercise habits of college students. In this study, I will be utilizing students here at TCU as participants. I am wondering if I could share my study with the students in your class. The study is online on Qualtrics and consists of three brief surveys. I have attached a flyer that provides information about the study. If you are willing to share it, I could also send you a URL link to the study. Please let me know.

Thank you very much,

Chris Nieves BS, ATC, LAT, CSCS
Texas Christian University
Graduate Student- Kinesiology
c.nieves@tcu.edu
516-424-1756

APPENDIX F

Research Flyer



PARTICIPANTS NEEDED!

Want to win a \$50 Amazon gift card?!

You may be eligible to participate in a study assessing the health-related quality of life (HRQoL) of college students.

Eligibility Requirements:

1. Current college student (18-25 years old)
2. Not a member of a NCAA/club team
3. Physically healthy (e.g. no chronic diseases)

What does this study entail?

Completing online questionnaires (10-15 minutes)

All responses will be confidential

*****Once your surveys are complete you can enter your email address for a chance to win one of three \$50 Amazon Gift Cards!!**

For more information or if you are interested please contact
Chris Nieves at c.nieves@tcu.edu

APPENDIX G

Letter of Invitation to Participant



Harris College
of Nursing & Health Sciences

Kinesiology

Subject: Invitation to Participate in Health study!

Hello!

My name is Chris Nieves and I am a graduate student here in the Kinesiology department. For my thesis, I am assessing the health-related quality of life (HRQoL) of college students. Anyways, I am looking for participants! The study consists of three brief surveys and should only take about 5-10 minutes. I have attached a [research flyer](#) that explains the study. By participating, you can also enter to win one of three \$50 Amazon gift cards! To participate, here is the link to the survey http://https://tcu.co1.qualtrics.com/jfe/form/SV_1BV5ktPCWwLUzIP
Let me know if you have any questions!

Thank you!

Chris Nieves
c.nieves@tcu.edu

APPENDIX H

Informed Consent



**Texas Christian University
Fort Worth, Texas**

CONSENT TO PARTICIPATE IN RESEARCH

Title of Research: The effect of exercise on the health-related quality of life (HRQoL) of healthy college students

Funding Agency/Sponsor: N/A

Study Investigators: Dr. Stephanie Jervas, Christopher Nieves

What is the purpose of the research?

The purpose is to understand the relation between health-related quality of life (HRQoL) and exercise habits among a healthy college student population.

How many people will participate in this study?

At least 300 college students.

What is my involvement for participating in this study?

Your participation requires completion of 3 different measures (Demographic Questionnaire, Short Form-36, NASA/JSC Physical Activity Rating Scale).

How long am I expected to be in this study for and how much of my time is required?

Completion of the surveys on Qualtrics should take you between 10 and 15 minutes and that is the extent of your participation.

What are the risks of participating in this study and how will they be minimized?

The information being collected is not in any way harmful to the individual.

What are the benefits for participating in this study?

The results of this study may help to further understand how exercise influences HRQoL. Therefore, the results may be valuable to campus recreation staff and university mental practitioners. Campus staff may be able to better communicate to college students about how exercise influences overall health and also create programs that help to promote healthy living.

Will I be compensated for participating in this study?

Participants will be able to provide their email address for a gift card drawing. Three participants will be randomly selected to win a \$50 Amazon gift card.

What is an alternate procedure(s) that I can choose instead of participating in this study?

There is no alternate procedure.

How will my confidentiality be protected?

All of the survey responses will be kept confidential. The survey responses will be stored on a password-protected computer in the Sport Psychology Lab (Rickel 257).

Is my participation voluntary?

Your participation is completely voluntary.

Can I stop taking part in this research?

You can stop participation at any time without penalty.

What are the procedures for withdrawal?

To withdraw do not complete and/or submit your questionnaires.

Will I be given a copy of the consent document to keep?

You will be given a copy of the consent form to keep.

Who should I contact if I have questions regarding the study?

Dr. Stephanie Jevas: s.jevas@tcu.edu, 817-257- 5733

Christopher Nieves: c.nieves@tcu.edu, 516-424-1756

Who should I contact if I have concerns regarding my rights as a study participant?

Dr. Tim Barth, Co-Chair, TCU Institutional Review Board, Phone 817-257-6427.

Dr. Anna Petursdottir, Chair, TCU Institutional Review Board, Phone 817 257-6436

Dr. Bonnie Melhart, TCU Research Integrity Office, Telephone 817-257-7104.

To be eligible to participate in this survey, you must:

- Identify as a male or female
- Be a current college student between the ages of 18-25

Exclusion criteria:

- Current NCAA/club team athlete
- Diagnosed with a chronic illness

**** If you meet any of the exclusion criteria, please do not complete the surveys

Proceeding further with this study indicates that you have read and understand the information above, received answers to all of your questions, and provided consent to participate in this study.

APPENDIX I

Reminder Email



Harris College
of Nursing & Health Sciences

Kinesiology

SUBJECT: Invitation to Participate in Health study! LAST REMINDER*****

Hello!

My name is Chris Nieves and I am a graduate student here in the Kinesiology department. For my thesis, I am assessing the health-related quality of life (HRQoL) of college students. Anyways, I am looking for participants! The study consists of three brief surveys and should only take about 5-10 minutes. I have attached a [research flyer](#) that explains the study. By participating, you can also enter to win one of three \$50 Amazon gift cards! To participate, here is the link to the survey: https://tcu.co1.qualtrics.com/jfe/form/SV_1BV5ktPCWwLUzIP Let me know if you have any questions!

Thank you!

Chris Nieves
c.nieves@tcu.edu