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Emily Berkeley

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Physical Activity, Stress, & Sexual Behavior: The Role of Exercise in Sexual Health for
Undergraduates

An honors thesis presented by

Emily Berkeley

To the Department of Psychology

In partial fulfillment of the requirements for

Honors

Connecticut College

New London, CT

May 3, 2023

Abstract

This Honors Thesis was conducted to examine and possibly influence the relationships between physical activity, stress, sexual self-concept, and sexual behavior in a sample of Connecticut College undergraduates. Prior research has shown conflicting results regarding physical activity, stress, and sexual behavior. While physical activity has been found to decrease stress and decrease sexual risk behavior in some contexts (Faurie et al., 2004; Wetherill & Fromme, 2007; Frauman, 1982; Park et al., 2021; Mor, et al., 2014), other research has also found that physical activity can increase both stress and sexual risk behavior (Vuori et al., 2011; Kulig et al., 2003; Quinn & Fromme, 2011). Most of the prior literature has also focused on student athletes or individuals who regularly exercise.

This study was conducted in two parts. The first part included an exercise intervention with sedentary undergraduate students. Participants in the exercise group walked for a 20-minute period once a day during at least 3 days of the week at the Connecticut College Fitness Center. Findings were not significant in this small sample intervention study. The second part was a correlational study that analyzed the relationships between physical activity level, stress, sexual self-concept, and sexual behavior in a sample with varying degrees of physical activity. Bivariate analyses revealed significant relationships between both sexual self-perception and sexual self-esteem, and sexual risk behavior and sexual self-perception. Group differences based on physical activity level were also found for sexual risk behaviors and perceived stress. These relationships point to the possible usefulness of creating exercise interventions to help decrease sexually risky behaviors and increase sexual health on undergraduate campuses.

Acknowledgements

This Honors Thesis has been an extremely long journey and there are many people I would like to thank for their help and encouragement along the way. Without them this research would not have been possible.

First off, I would like to thank my parents for their constant support and encouragement throughout this entire process. I would specifically like to thank my mom for showing me what true determination and perseverance is (and for raising me to not be afraid to talk about taboo and sometimes uncomfortable topics).

I would like to thank my Thesis Adviser, Professor Joshua Uhalt, for his help and guidance throughout this project. His constant willingness to brainstorm ideas and provide further insight has allowed me to build upon my critical thinking and analytical skills that are needed as an aspiring researcher.

I would also like to thank my readers, Professors Hyun-Joon Park and Audrey Zakriski, for their continual feedback and guidance, along with the Psychology Department for their outstanding support throughout these past four years. I would also like to thank Professor Ann Devlin for helping me discover my initial passion for psychology research and her support in cultivating my research skills during my time in PSY202.

Additionally, I would like to thank my best friends (you know who you are) for their constant support and encouragement throughout this project. Especially for putting up with my constant ramblings about sexual health and hook-up culture, and for supporting my adventures even when I did not think I was capable.

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Research involving the relationships between stress, physical activity, and sexual health in college aged students has become increasingly relevant in recent years, as reported cases of Sexually Transmitted Infections (STIs) have been found to be highest in college-aged students (Johnson & Jackson, 2021). Sexual behavior has changed, as sex is becoming increasingly typical and accepted outside of committed romantic relationships (Bogle, 2007, 2008).

College is also a time of immense stress for many students which can lead to unhealthy coping behaviors. Negative coping behaviors have been correlated with increased risk towards negative health and behavioral outcomes (Whatnall et al., 2020). Both long-term and short-term stress has been related to negative outcomes over the course of the lifespan and increased risk towards illness such as heart disease, high blood pressure, and even behavioral changes, such as smoking (McEwen, 2008). Stress has also been found to negatively impact an individual's self-esteem and perception of themselves and their abilities (Lee-Flynn et al., 2015).

Interventions to support college student health and wellbeing that address sexual health and stress are increasingly important. Previous research has utilized correlational and intervention studies to analyze the relationship between exercise and sexual behavior. These studies have revealed important knowledge of the correlation between sexual health and exercise. The research has revealed that increases in exercise are correlated to increased frequency of sexual behavior, sexual desire, and sexual satisfaction (White et al., 1990; Lindeman, King, & Wilson, 2007). These previous studies are still unable to explain how the relationship between physical activity and sexual behavior relate to the concepts of stress and sexual self-concept in undergraduate students.

This literature review will examine college student stress and its impacts on health and well-being with a focus on sexual health. It will also examine the role of physical exercise in

reducing stress and stress impacts, as well as its subsequent potential for improving sexual health. This review will lay the groundwork for an experimental study of physical exercise on sexual health and well-being among college students, by examining the impact of physical activity on those who do not typically regularly exercise.

Stress & Health in College Students

Stress is a cognitive, emotional, and biological reaction that a situation can evoke (Epel et al., 2018). In the psychology field, stress is commonly defined as when an individual perceives the demands of their environment as greater than their ability to meet, mitigate, or alter those demands (Lazarus et al., 1985). In other words, stress is the physical and physiological reaction when an individual feels any sort of threat from an environment, situation, or individual. An individual experiencing stress can often feel anxious or nervous, dizzy, difficulty breathing and concentrating, fatigued, rapid heartbeat, and more (McEwen & Sapolsky, 2006), though the exact symptoms of stress experienced vary from person to person.

Stress can have many negative effects on the human body both physiologically and mentally. Physiological arousal involved with stress often includes increased skin temperature, blood volume, and electromyographic activity (Wofford, 2016). Stress affects many parts of the nervous system and can even cause structural changes in various parts of the brain (Lupien et al., 2009). Long-term, chronic stress has even been linked to decreases in brain mass (Sarahian et al., 2014). Changes in the nervous system and the brain from stress have been linked to decreases in memory, decision-making, and even put an individual at increased risk for cognitive and mood disorders (Lupien et al., 2001; Bremner, 1999; Li et al., 2008). Increased stress has also been linked to increased risk of psychological disorders, such as depression and anxiety (Martin et al., 2009; Saveanu & Nemeroff, 2012). Stress can also have physical impacts on an individual and

their health. Recent research has linked stress to increased risk of cardiovascular disease, infectious diseases, and hypertension (Cohen et al., 2007). Chronic stress has been linked to health issues, such as lack of sleep, lack of physical activity, increased risk for obesity and diabetes, as well as a weakening of the immune system (McEwen & Sapolsky, 2006).

Stress is typically measured using unvalidated measures or through analyzing a single type of stress (Crosswell & Lockwood, 2020). Stress is very hard to measure as it is a perceived state that depends on the perception of the individual who is experiencing the stressor/s. Most stress measurements utilize self-report, which is subjective to the individual. The most commonly utilized measure of stress is the Perceived Stress Scale by Cohen (1983). This scale measures how unpredictable or overloaded an individual perceives their life. Overall, the most common trait of stress questionnaires is trying to assess how overwhelmed an individual perceives their life.

There are many different types of stress an individual can experience over the course of a lifetime. Stress can manifest in various ways in an individual's environment and relationships, and can be both chronic and short-term. Chronic or long-term, stress also has negative effects on an individual. For example, lower socioeconomic status has also been associated with multiple stressors, including social relationships, employment worries, health complaints, and financial worries, and is often linked to chronic stress (Baum et al., 1999; Senn, Walsh, & Carey, 2014; Weyers et al., 2010). There are various forms of chronic stress, such as racism, sexism, and homophobia. Racism and racial discrimination are a prevalent stressor that many individuals face daily. Increased stress for minority groups has been found, with increased risk towards negative physical and mental health outcomes (Lehavot & Simoni, 2014; Williams, 2018; Wong et al., 2015).

Interpersonal stressors, such as lack of social support, have been linked towards decreased resilience towards stress and even increased risk towards developing depression (Ozbay et al., 2008; Slavich et al., 2020). Intrapersonal stressors, such as lack of resilience or associated social capital, have been found to negatively affect an individual's mental health and were associated with increased levels of stress (Chang et al., 2021). There are many forms of stress which can impact an individual. It would take too long to go over all of the various stressors and levels of stress, but this section is to provide a basic overview to help with understanding of why this project is focusing one of its variables on stress.

Cognitive efforts, such as coping, have been related to risk and risk reduction for an individual in the face of stress. There are two major categories used to define coping. Approach, or positive, coping strategies and evasive, or negative, coping strategies (Zimmer-Gembeck & Skinner, 2016). Negative coping, or distraction and denial of a stressor, has been associated with increased risk of stress and depression (Freire et al., 2020). A two-part study utilizing a group of 1,507 adult males who drank alcohol and another group of 402 undergraduate students who also drank alcohol found that negative or stressful life events were positively associated with aspects of negative affect during coping mechanisms of an individual (Dermody et al., 2013). Vice-versa, positive coping, such as positive appraisal, positive self-efficacy, and planned problem solving has been correlated with lower psychological distress (Freire et al., 2020; Stewart et al., 1997).

Stress and coping strategies are an important focus area for college students. College is a time of immense stress. Undergraduates have been found to face an extreme amount of stress and perceived pressure during college. The stress college students face, with weekly tests, exams, homework, and balance of academic, social, and extracurriculars, is a stress that is not

experienced by non-collegiate peers of the same age (Hirsch & Ellis, 1996). A study by Pariat et al. (2014) found that academic stress was highly correlated with social and financial stress. This study was conducted using a sample of college students aged 19 to 23. Undergraduate academic stress has also been found to increase with upcoming examinations and increases in academic workload. (Ramli et al., 2018). Interestingly, various studies have linked college students' stress with negative coping strategies, such as self-distraction and avoidant coping (Graves et al., 2021).

Previous studies have linked stress and coping with being predictive of risk behavior (Sacco et al., 2007; Sánchez et al., 2010; Steptoe & Marmot, 2003). Risk behaviors include a wide variety of behaviors, including smoking, alcohol use, gambling, and more. One area of risk behavior that has been found to increase along with increases in stress is sexual risk behavior. A study by Folkman et al. (1992) found that non-monogamous gay and bisexual men found that unprotected anal sex was used as coping towards stressful events. Stress related to social class was also related to increased HIV risk behavior in African American and Latina women with lower incomes when compared to their higher income counterparts (Ickovics et al., 2002). Interpersonal stress as well was correlated towards lower and inconsistent condom usage in a study of sexual risk behavior and stress on a group of 701 African American females, ranging in ages 14 to 20 (Hulland et al., 2015). Negative coping behaviors in the face of stress have also been linked to increases in sexual risk behaviors. A study utilizing 4,456 high school students aged 13 to 18 found that positive coping behaviors were related to increased condom usage and lower likelihood of drug use at last sexual intercourse (Teva et al., 2010).

One area that has been of recent interest in stress-reduction techniques has been the impact of exercise and physical activity. Physical activity is seen as an adaptive response to

stress as it has been found to improve mental and physical health (Goldstein et al., 2020; Puterman et al., 2010; Wunsch et al., 2019). Participation in physical activity has been associated as a buffer against stress, with various studies found that individuals who participate in physical activity is correlated with increased ability to cope with stress and increased self-perceived resilience (Gerber et al., 2013; Heberg & Tone, 2015; Kettunen et al., 2016; Puterman et al., 2017). A cross-sectional study found that individuals who exercised at least two to three times a week had lower levels of perceived stress than those who did not exercise or exercise less frequently. This study utilized a sample of 3,403 individuals varying in age from 25-64 (Hassmén, Koivula, & Uutela, 2000).

Recently, there has been increased focus on research looking into what could reduce stress, specifically in college-aged students to help reduce the large load of academic and social stressors this age-group commonly has. Exercise, team sports participation, and physical activity is popular with college-aged students. Targeting physical activity and exercise interventions could be a potential way to help decrease perceived stress and increase resilience against stressors for undergraduates. Physical activity has been found to reduce perceived stress specifically in undergraduate college students. A study by Gerber et al. (2014) found that perceived stress decreased in undergraduate participants when they participated in vigorous physical activity. The study also found that perceived levels of stress of undergraduates did not change when moderate physical activity was performed. Pengpid et al., (2020) also found that undergraduate college students who participated in vigorous physical activity were less likely to report receiving stress than college students who did not participate in vigorous physical activity. This study contained information from undergraduates of 23 low to middle- income countries, including the Americas, Africa, and Asia. These findings have been further backed up by a study

done by Qu (2020), which found that there is significant difference in the mental health of college students who exercise versus those who do not, with exercise done at least one hour twice a week being found to positively impact mental health. For this study, mental health includes psychological stress faced by college students.

Though other studies have found that there is no significance association between physical activity and perceived stress reduction. A study by Margulis et al. (2021) found there was no significant reduction of perceived stress when a group of 355 active undergraduate college students took part in a 90-minute exercise intervention over the course of two weeks. One reason that would explain the lack of finding a significant relationship between stress and exercise in the study done by Margulis et al. (2021) is that the use of a non-sports affiliated, or non-exercising undergraduate control group was not utilized, so there was nothing to compare the perceived levels of stress to. Based on the above studies, it seems that stress levels can be impacted by the physical activity levels of college students. Looking at this relationship between stress, risk-taking behaviors, and physical activity are related, it is important to assess how sexual health and sexual risk behaviors are implicated in this relationship with stress and exercise.

Sexual Health & Risk-Taking Behaviors

Sexual health is commonly known as the physical and mental well-being in relation to sexuality and plays an especially important role in the lives of undergraduate students. College is a time when individuals are going through the period of development which is often referred to as emerging adulthood (Arnett, 2007). The college environment allows emerging adults to explore their sexuality and intimacy, often through 'hook-ups' or casual sex (Stinson, 2010). Given the increase in sexual encounters on college campuses, sexual health risks of college

students are important to consider. A study of college students by Downing-Matibag & Geisinger (2009) found that nearly half of their participants were not concerned about contracting an STI from intercourse or other sexual behavior during casual sex. Along with a decreased concern for sexual health, a report by the American College Health Association [ACHA] (2011) found that 29% of college students reported not using condoms and 11% reported not using birth control.

Sexual risk-behavior can be seen in many different actions during sexual activity, including no contraceptive use, casual-sex, multiple sexual partners, and engaging in behaviors that increase the risk of STIs. Hook-up culture, or the act of having sexual relations with non-committed partners, is seen as a large part of college life (Garcia & Reiber, 2008). Casual sexual encounters are commonly being seen as a part of the 'social script' for college, with peers often feeling pressure to participate in hook-up culture from inter and intra-personal pressures (Wade 2017; Kuperberg & Padgett 2017; Reagan & Dreyer, 1999). Casual sex and sexually risky behavior have major implications for the health of students on college campuses. According to a report from the Centers for Disease Control and Prevention [CDC] (2012), around 61% of chlamydia cases and 42% of gonorrhea cases in 2019 were among those between the ages of 15 and 24. With this in mind, it is important to look at sexual risk-taking occurring specifically in college aged students.

Increased levels of casual sex and numbers of sexual partners have been reported for college students compared to recent years (Montes et al., 2016; Romero-Estudillo et al., 2014). A study of 507 American college students found that 81% of participants had engaged in some form of sexual behavior during casual sex, of which 34% of participants participated in intercourse with a non-committed partner (Reiber & Garcia, 2010). Increased levels of sexual risk behaviors have been associated with increasing levels of STI prevalence among college-aged

students, and other health risks, such as unplanned pregnancy (Johnson & Jackson, 2021; Kaye et al., 2009). Sexual risk behaviors are also recorded in higher volume for individuals during this time of emerging adulthood. An ongoing study beginning in 2019 to 2022 from the ACHA's National College Health Assessment (2022) found that 23.4% of undergraduate students utilized the withdrawal method as a form of contraception and did not use a condom.

Contraceptive use, specifically condom use, is another sexual behavior that has major implications on an individual's health. In a safer sex intervention study LaBrie et al., (2005) found that alcohol consumption, expectancies about alcohol's impact on condom use, and partner type contributed to condom use, with decreased condom use seen particularly with increases in alcohol consumption with casual sexual partners. Along with alcohol consumption, an increased number of lifetime vaginal-penetrative sexual partners was associated with decreases in reported condom use during sexual activity, such as vaginal intercourse (Fehr et al., 2018). Participant's sex also influenced condom use in a population of undergraduate students, with 31.7% of male participants reported *never or rarely* using condoms, while 44.1% of females reported *never or rarely* using condoms (Fehr et al., 2018). Male undergraduates were found to use condoms less during sexual activity than female undergraduates. Fehr et al., (2018) also found that upperclassmen were *less likely* than underclassmen to use condoms, with upperclassmen reporting 46.8% *never or rarely* use condoms versus 35.3% for underclassmen. It should be noted that the data from Fehr et al., (2018) does come from a sample group where 60.8% of participants were in a monogamous relationship, but did account for this variance through statistical analysis that revealed monogamy did not significantly influence condom use.

Although common on college campuses, engagement in casual sex has been found to negatively impact well-being and increase psychological distress in American, undergraduate

students (Bersamin et al., 2014). Bersamin et al., (2014) found that casual sex was associated with lower self-reported scores of self-esteem, life satisfaction, eudaimonic well-being, psychological well-being, and increased scores in general anxiety and depression. Non-autonomous motives specifically for hookups, like self-imposed pressure or lack of intentionality, have further been linked to lower self-esteem and anxiety (Vrangalova, 2014). Autonomous motives for hookups, or motives emanating from oneself, were not related to any specific outcomes. The findings from Vrangalova (2014) reveal that perceived pressure and non-autonomous motives for sex negatively affect an individual's self-esteem and increase anxiety. A study with first-year college women found that hook-ups and casual sex were correlated to increased levels of depression, sexual victimization, and increased risk towards STIs (Fielder et al., 2014). The exact nature of these associations is still unclear. It is possible that these relationships can be associated with the non-autonomous motives discussed in Vrangalova (2014). STIs can negatively impact an individual's wellbeing, health, and overall quality of life.

Sexual behaviors can also affect an individual's mental health and self-esteem. A study using a sample group of 144 young Chinese men, aged 11-21, found that negative self-perception, including sexual depression and self-blame, and negative emotions increase the likelihood of sexual compulsivity and affect cognitive outcomes of an individual's sexual behaviors (Sui-Ming et al., 2019). Cognitive outcomes of sexual behavior in this specific study were defined as an individual's perception of the negative consequences of their sexual behaviors. The possibility of socio-cultural differences in sexual cognition and behavior when comparing the findings of this research to Western cultures must be considered. Though it is still useful to assess how collegiate academic stress can negatively impact sexual behavior of college students. Oree et al. (1989) found that females, age 12 to 15, who participated in sexual

behaviors had lower self-esteem scores than sexually active males of the same age. Overall, previous sexual behavior research has revealed that sexual self-concept impacts sexual health behaviors, with higher levels of sexual self-concept being related to increased levels of sexual risk behaviors.

Gender differences within the sexual behaviors of college students have been recorded in previous literature, which mostly focuses on cis-gender men and women. A study of undergraduates from the United Kingdom revealed females had increased ratings of sexual risk-behaviors as well as mental distress, including self-harm habits when compared to British men (Jaspal et al., 2021). Jaspal et al. (2021) also found that female undergraduates were more likely to have unprotected sexual intercourse when compared to their male counterparts. There has also been recorded gender differences in the amount of participation in sexual risk behavior. Various research has associated males with higher rates of hook-ups than females (Roberson et al., 2014). A study by Yi et al., (2018) found that undergraduate men on average have 2 more sexual partners than undergraduate females. Blayney et al., (2018) also found that sexual motives and frequency of penetrative casual sex behaviors were moderated by gender, specifically with increased reported oral and vaginal intercourse during casual sex for males. This study also found gender differences in hookup motives, with men exhibiting increased social enhancements, coping styles, and perceived peer-based motives towards casual sex. There are sex differences in sexual risk behavior, though the literature is unable to explain why or how these differences occur. One potential explanation of individual differences, and gender differences, in sexual behaviors and risk-taking behavior is the impact of stress.

Stress & Sexual Health

Most importantly for the present investigation, stress has been associated with increased sexual risk-taking behavior (Brown et al., 2022). Sexual risk behaviors, such as substance use during sexual activity, sexual activity in exchange for benefits, including monetary gain or drugs, have been associated with increased psychosocial stressors (Muzny et al., 2018). Hlland et al., (2015) found that increases in interpersonal stress was associated with lower and inconsistent condom use in a study with a mean population age of 17.6 years old. A study of first year undergraduate American women aged 18 to 20 found that frequency of weekly sexual intercourse was 1.6 times higher among women with *moderate to severe* stress and depression symptoms versus women *without moderate to severe* symptoms (Hall et al., 2014). Both Hall et al., (2014) and Muzny et al., (2018) used the Center for Epidemiologic Studies Depression Scale to assess the women's depressive symptoms and used regression models to estimate the relationship between stress, depressive symptoms, and sexual risk behaviors. These studies provide insight into how psychosocial stress, such as sexuality and educational enrollment, can negatively affect both sexual behaviors and health.

Furthermore, stress has been linked to poor self-control (Muraven & Baumeister, 2000). The link between stress and self-control may account for the increase in sexually risky behavior seen in adolescent and college aged individuals. Early age at first intercourse has been correlated with low self-control and risky sexual behaviors during young adulthood (Magnusson et al., 2019). High testosterone levels and low self-control were associated with higher sexual compulsive behaviors in a study done utilizing 70 heterosexual men, aged 18-35 years old (Rodríguez-Nieto et al., 2021). In opposition, high self-control led to decreased levels of sexual behaviors, including unprotected sex, during adolescence and first years of college (Quinn & Fromme, 2011). The relationship between stress and self-control can gravely impact the sexual

behaviors of college students, with increased stress being correlated to increased sexual risk behaviors.

Stress has also been implicated in sexual behavior disorders. Increased stress levels have also been found to be positively correlated with compulsive sexual behavior disorder (Park et al., 2021). This study was conducted using adults aged 20 to 39 years old from South Korea. Park, et al., (2021) also found that active coping strategies helped to mediate the relationship between stress and compulsive sexual behavior in individuals who had compulsive sexual behavior disorder. Overall, it seems increased stress is associated with negative sexual behavior and increased risk for negative sexual health outcomes.

Psychosocial stress also has important implications on sexual behavior. Both Munzy et al., (2018) and Hulland et al., (2015) focused on different populations of African American females. Both studies discussed the role of psychosocial stress from racism and discrimination playing a role in the increased sexual risk behavior and sexual frequency in African American women. A 2014 study published by the CDC also found that African American women made up 60% of new HIV infections among all American women. As well as racism, African American women are also faced by further discrimination and stress through sexism. These studies provide important insight into the relationship between race, gender, and social-based stress with sexual behaviors and sexual health.

Stress levels have been found to be correlated to sexual behaviors and sexual desires. Recent research has found higher levels of stress to be associated with decreased sexual desire and sexual arousal (Mües et al., 2022). Additionally, a study completed over the course of 3 months found that individuals in committed relationships who had higher levels of daily perceived stress had lower levels of sexual activity and satisfaction (Bodenmann et al., 2010).

Odenmann et al., (2010) had undergraduate students, both male and females, complete 12 questionnaires over the 3 months leading up to a major exam, allowing the findings to be useful to assess stress and sexual behavior in the context of academic and college-related stress.

Hamilton et al., (2008) found that increased levels of stress related cortisol, in a group of American women with a mean age of 28.5 years old, has also been linked to decreased levels of sexual desire and sexual arousal as well.

Although many studies have found higher levels of stress to reduce sexual behaviors and sex drives, some have also found higher levels of stress to increase sex drive and sexual behaviors. Numerous studies have found that sex can relieve stress (Burllesonet al., 2005; Ein-Dor & Hirscheberger, 2012), and as noted earlier can lead to increased risky sexual activity (Parket al., 2021; Magnusson et al., 2019). These findings are useful to see the range of potential detrimental effects of stress on sexual behavior and health. The findings of all of the above studies point to the possibility of stress having different impacts and relationships with sexual behavior and health given an individual's age and context of their life. One potential explanation of the relationship between stress and sexual behaviors and sexual risk-taking behavior is sexual self-concept.

Sexual Self-Concept and Sexual Health

Self-concept is a complex form of self-knowledge that continually shifts as an individual grows (Markus & Nurius, 1986). Self-concept is influenced by a variety of factors, including an individual's relationships, social groups, and achievements (Brewer & Gardner, 1996). Sexual self-concept is compromised of a variety of factors, including sexual self-esteem, sexual self-perception, and sexual anxiety (Brewer & Gardner, 1996; Rostosky et al., 2008). An individual can have a positive or negative self-concept of themselves based on their perception of these

various factors. Sexual behavior is one of the areas that can affect an individual's self-concept. For example, one study found that individuals with increased self-efficacy regarding sexual behavior, condom use, and sexual assertiveness had better health-protective sexual communication with new sexual partners (van der Straten et al., 1998). The topic of sexuality and self-concept has its own term called sexual self-concept.

Sexual self-concept is defined as an "individual's positive and negative perceptions and feelings about him or herself as a sexual being" (Rostosky et al., 2008, p. 227), and has been found to impact an individual's sexual behavior. A reciprocal relationship has been found between sexual risk cognition and sexual self-concept. Higher levels of sexual self-concept are found to predict higher levels of sexual risk cognitions (Hsu et al., 2014; Lou et al., 2010). For this study, sexual risk cognition was defined as "risk-escalating thoughts that occur in the heat of the moment of potential sexual risk-taking" (Shah et al., 1997). As increases in sexual risk-escalating thoughts are related to increases in sexual self-concept and sexually risky behavior, decreases in sexual risk-escalating thoughts are related to decreases in sexual self-concept are correlated with decreases in risky sexual behavior.

The existing literature has found that sexual self-concept affects many distinct aspects of an individual's sexual behavior. Sexual self-concept refers to an individual's perception of their sexual desires and actions (Pai et al., 2011). A review of the literature has found that sexual self-concept has been correlated to an individual's sexual behaviors. Research by Pai et al. (2011) found that positive sexual self-concept was related to higher levels of sexual risk-taking behavior, such as unprotected sex. Ambiguity of an individual's sexual self-concept has also been found to increase participation in health risk behaviors as well (Talley et al., 2014). Relationship status also has implications on an individual's sexual self-concept and sexual risk

behaviors. Individuals who are single, or who do not have a committed partner, were found to have lower levels of sexual self-esteem, satisfaction, and sexual depression than individuals who had a partner (Antičević et al., 2017). The study further found that sexual self-concept was related back to sexual satisfaction, in participants with and without partners, of which sexual self-concept was higher among individuals who had a partner.

The relationship between sexual self-concept and sexual behavior of adolescents has also been studied in previous literature. A study containing participants ranging in age from 16 to 19 years old found individual differences within sexual self-concepts. Breakwell and Millward (1997) assessed 14 areas that are involved in sexual self-concept and found that higher scores of sexual assertiveness (willingness to have sex before marriage or controlling when sexual acts occur). Sexual self-concept has also been related to contraceptive use. Winter (1988) also conducted a study on sexual self-concept and contraceptive usage with 149 unmarried students from New York University, ages 17-23. The findings revealed higher sexual self-concept at the time of the study being predictive of increased likelihood of contraceptive usage, and most predictive for participants who had prescription methods of contraceptives (Winter, 1988). As young adults are discovering their own identities and sexualities in high pressure environments, it is important to investigate ways that their self-concept affect their decision making in terms of sexual health and wellbeing.

Impacts of Physical Exercise

The literature largely supports that stress acts as a risk factor for mental health and wellbeing, which extends into an individual's sexual health. Negative sexual self-concept has been linked to increased levels of depression, stress, anxiety, and risky behavior (Heidari et al., 2017). With the connection of sexual self-concept to sexual health behaviors, it is important to look into

how stress interacts between these two factors and possibly affects the relationship. It is also important to examine ways of reducing stress to improve both mental health and sexual health behaviors. As young adults are discovering their own identities and sexualities in high pressure environments, it is important to investigate ways that their physical activity and exercise habits affect their decision making in terms of sexual health and well-being. Physical activity has been linked to both and will be examined next in this literature review.

Impacts on Stress

One activity that has been shown to decrease stress and improve mental health is physical activity (Eather et al., 2016; Krucoff & Krucoff, 2000; Mikkelsen et al., 2017; Sharma et al., 2006). Exercise has been proven to have many benefits, including decreasing the risk of cardiovascular and metabolic diseases. Physical activity plays an important role in maintaining and improving mental health. Vigorous physical activity, done at least three or more times per week for at least 20 minutes each session, has been found to increase stress resilience specifically among undergraduate students (Gerber et al., 2017). Along with these effects, exercise has also been found to impact sexual drive. More time spent exercising and being physically active has been correlated with increased participation in sexual behavior, desire of sexual activity, and physical sexual satisfaction in undergraduate students (Fraudman 1982; Lindeman et al., 2007). Older-aged college students who performed lower levels of physical activity were found to have increased risky sexual behavior and more liberal leaning sexual attitudes, which was explained as being more open to sexual activity and talking about sexuality as assessed through the 13-item Attitudes Toward Sexuality Scale (Yang et al., 2019). This study was completed using a sample from Zimba, which could account for the differences in findings when compared to the above

research studies. Overall, these findings highlight the importance of researching the relationships between physical activity, stress, and sexual behavior.

Impacts on Sexual Health

Physical activity has been found to impact participation in sexual risk behaviors, and impact sexual health. One group of individuals who engages regularly in physical activity is college athletes. They are a group that deserves attention as, although physical activity might have similar benefits for them, additional variables come into play (e.g., masculinity norms, peer pressures) that may affect these relationships. Individuals who participate in a college sport and are part of a college sports team have been shown to have increased participation in risky sexual behaviors compared to their non-athletic participating peers (Faurie et al., 2004; Wetherill & Fromme, 2007). More specifically, male college athletes have been found to have significantly higher numbers of sexual partners and increased rates of unprotected sex compared to female athletes (Huang et al., 2010). Furthermore, a study containing 2,298 collegiate student athletes and 683 nonathletic participating controls found that college student athletes have increased sexual risk-taking behavior than non-athletic participants, and within that, male student athletes had increased scores of sexual risk behaviors than female student athletes (Aurelia et al., 1997).

Motivations for sexual risk behaviors were also different between athletes and non-athletes. Student-athletes were found to have enhancement motivations for sexual risk behavior, which were also correlated with decreased intimacy motives and the likelihood of having multiple sexual partners more so than in non-athletes (Grossbard et al., 2007). Another motivating factor for differences in sexual behavior motives is the concept of popularity. Bogle (2008) found that male sports affiliation, or participating in sports, was one of the top qualities that determined increased likelihood of participation in casual sex for female students. Female

students were found to be more likely to have casual non-committal sex with a male student if he was a part of a sports team, signifying the possible motive of enhancing social standing and popularity for females based on a male athlete's social status. Since physical activity, sports, and exercise has been shown to decrease stress and improve sex drive in college-aged students, it is important to look specifically into how various levels of physical activity could affect sexual health and behavior as not all undergraduates exercise the same.

Along with this, it is important to note that the culture of being on a sports team is not the same as exercising a significant amount. Grossbard et al. (2007) also found an increase in alcohol usage before and during sex for student athletes compared to non-athletes. The culture among athletes, specifically pertaining to the concept of popularity and social identity, on a specific team can also contribute to sexual behavior. A study of 437 undergraduate college students composed of both athletes and nonathletes found that athletes who consider themselves a part of the most popular group in school reported higher sexual activity (Moore et al., 2011). Further studies have also found that self-reported athletic membership in a popular group was associated with increased probability of participation in risk taking sexual behaviors (La Greca et al., 2001; Miller et al., 2005). The differences between the sexual risk behavior of athletes and non-athletes is still useful to analyze the role of stress and sexual self-concept in college aged students.

Moderators of Impacts

Body image has been found to significantly impact undergraduates' participation in risky sexual behavior. A study of 465 college students at a Midwestern American university found that participants who had higher body image satisfaction were significantly more likely to have had sexual intercourse as well (Merianos et al., 2013). The mean age of these students was 21.62

years old, included students from all undergraduate class years, and 43.3% were single and not in a committed relationship. This study reveals interesting relationships between body image and sexual self-concept. Of the 465 students, 79% of the sample was sexually active. Of this percentage, 41% had one-night stands, 76% had had sexual intercourse while under the influence of alcohol, and 80% had had sexual intercourse without a condom.

Prior research has tried to explain why sexual behavior changes with variations in physical activity. Research by Frauman (1982), also supports that physical activity increases sexual behavior and the desire for sexual activity among undergraduate students. One of the possible explanations for why physical activity seems to impact sexual behavior is the effect which exercise has on an individual's body image. Some studies have found a correlation between exercise and physical appearance to increase along with sexually risky behaviors, with increased levels of perceived attractiveness being associated with increased participation in physical activity (Mor et al., 2014). Males who saw their bodily appearance more positively were more likely to report risky sexual behavior, such as decreased condom use, than females who self-evaluated their appearances more positively (Gillen et al., 2006).

Various studies have correlated positive body image to increased sexual functioning (; Holmes et al., 1994; Penhollow & Young, 2008; Weaver & Byers, 2006). These findings suggest that individuals who experience improvements in body image due to physical activity may also experience increases in sexual risky behaviors and decision-making. All three of the above studies utilized self-report measures, such as surveys, to assess their participants.

Prior research has found that exercise and lower BMI was correlated with decreased reported levels of body dissatisfaction and increased sexual functioning (Davis & Fox, 1993; Jagstaidt et al., 1997). These findings have been further supported by research by White et al.

(1990), which found that men who exercised reported greater levels of sexual activity, increased sexual arousal, and satisfying orgasms. Research by Weaver and Byers (2006) further supported this conclusion as they found that lower body dissatisfaction was associated with higher sexual self-esteem and sexual functioning. This research also found that body mass index (BMI) and exercise did not predict sexual functioning. The researchers explained that the lack of findings could be explained by the limited variance in the sample's BMI, as two-thirds of the sample was within the healthy BMI range.

Sexual self-concept has also been found to possibly be affected by physical activity. Davison and McCabe (2005) found that body image is implicated in sexual self-concept and sexual functioning. In a study of 437 men and women, aged 18-86, found that body image was associated with self-esteem. Furthermore, negative body image was correlated with issues regarding sexual functioning specifically for middle-aged men. This could be explained by a study done by Yamamiya et al. (2006), in which it was found that individuals who are dissatisfied with their body and have a negative body image are less confident and comfortable with having sexual intercourse than individuals who have positive body image perceptions of themselves. This concept is further backed up by a study conducted by Gillen et al., (2006) who found that male undergraduates, ages 17-19, who rated their appearances more positively were related to increased reports of sexually risky behavior.

Intervention Studies

As young adults are discovering their own identities and sexualities in high pressure environments, it is important to investigate ways that their self-concept and stress reactions affect their decision making in terms of sexual health and wellbeing, as well as how physical activity impacts the sexual risk behaviors of non-athletic students and non-athletic students who still

exercise. Most of the prior research that specifically looks at physical activity and sexual behavior focuses largely on both adolescents and men (Kulig et al., 2003; Miller et al., 2002; ; Vuori et al., 2011; White et al., 1990). These studies have found that increases in physical activity were associated with increased sexual activity and sexual desires for adolescents.

Though most prior research has found that as exercise increases so does frequency of sexual behavior and sexual drive (Mor, et al., 2014). There are also contrary findings. Physical activity has also been associated with decreased sexual risk behaviors (Nelson & Gordon-Larsen, 2006; Savage & Holcomb, 1999). A study utilizing 15-year-olds found that physical activity was not significantly associated with risky health behaviors, one of which included condom use (Vuori et al., 2011). Another study focusing on students aged 15 years old found that female student-athletes were less likely to practice risky sexual behaviors than non-student athletes and non-active female students (Kulig et al., 2003). Differences in findings from these studies could be due to their use of adolescents as the main subject pool, but it still opens questions into how the relationship between various levels of physical activity, stress, and sexual behavior interact with each other.

In existing intervention research, researchers have looked into the relationship between exercise and sexual functioning. These intervention studies have largely used at least a 3-day a week training program with at least 20 minutes of physical activity to establish statistical significance in results regarding sexual behaviors and exercise. White et al., (1990) found that three to five days of physical activity a week as 75 to 80% of an individual's max heart rate was related to increased levels of sexual activity and decreased levels of sexual dissatisfaction than a control group of individuals who did not exercise. An intervention study on patients with prostate cancer found that a 12-week exercise intervention aided participants with maintaining

their usual levels of sexual activity, while the control group of participants with prostate cancer who did not undergo the exercise intervention experienced decreases in sexual activity (Cormie et al., 2013). A study by Hamilton et al., (2008) found that in one 20-minute session of walking on a treadmill caused increases in physiological sexual arousal for women ages 18 to 45. All of the participants had had sexual activity with a man in the previous month before the study was conducted as well. These studies show that exercise has an effect on sexual desire and behavior, yet there is no literature available on an intervention study specifically focusing on male and female undergraduates.

These intervention study's findings are further supported by correlational research. A correlational study found that 20 minutes of physical activity at least 3 times a week was associated with higher levels of sexual satisfaction in sexually active undergraduate students (Lindeman et al., 2007). This has been further backed up by various studies which have found exercise time and intensity to be correlated to frequency of sexual intercourse, sexual desire, and sexual arousal then loss of interest (Frauman, 1982; Penhollow & Young, 2008; Marshall et al., 2014; Morris et al., 2008). A study by Mor et al., (2012) analyzed the sexual risk behavior of a sample of 182 homosexual and heterosexual males at various gyms in Tel Aviv, Israel who performed intensive anaerobic training. Mor et al. (2014) found that 61.9% of men who performed intensive anaerobic exercise were likely to engage in high-risk sexual behavior. The study also found that participants who had same-sex sexual activity engaged in riskier sexual behavior that put them at increased risk for HIV/STIs. Though the researchers did point out this relationship is multiplicative, there are other social factors that play into this relationship of sexual behavior and exercise.

Furthermore, walking at a steady pace on an incline has also been found to be a safe way to increase heart rate while also providing multiple health benefits, like reduced blood pressure and possibly reducing risk of musculoskeletal injury (Ehlen et al., 2011). A study by da Milic et al., (2020) had participants walk at 0%, 2%, and 7% inclines at around a baseline speed of 3 miles per hour and found that walking on an incline can be used to increase or decrease metabolic demand without increasing fatigability based on the individual's stride. For the purpose of this study, we will be using an approach similar to the prior literature by using a 20 minutes per day at least 3-days a week training schedule, and having participants get up to a speed of 3 miles per hour at a 1% incline.

The Present Study

Prior research leaves much still to be known about the relationships between physical activity, sexual self-concept, and sexual behavior. It is important to examine these relationships based on the evidence from correlational studies that stress, low physical activity, and negative self-concept negatively influence an individual's sexual health and general well-being. This study examines the relationship between these three variables to help bridge gaps in literature on this subject and investigate causal relationships through a two-part study. In Study 1, an exercise intervention was used to assess the relationship between physical activity, stress, and sexual risk behavior in traditionally inactive undergraduate students. In Study 2, a correlational survey was administered to assess the difference between undergraduate student's physical activity levels and their self-reported sexual risk behaviors and stress. The results from this study will be useful in helping to educate undergraduate students on their sexual health decisions, and hopefully to create informational educational programming and interventions for university students.

Hypotheses for Study 1

Hypothesis 1: It is hypothesized that increased levels of physical activity in the intervention group will decrease stress relative to the control group.

Hypothesis 2: It is hypothesized that increased levels of physical activity in the experimental group will lead to a more positive sexual self-concept relative to the control group.

Hypothesis 3: It is hypothesized that increased levels of physical activity in the experimental group will lead to increased self-reported risky sexual behavior relative to the control group as participation in physical activity increases production of sex hormones and sexual arousal.

Hypotheses: Study 2

Hypothesis 1: It is hypothesized that individuals who are a part of sports teams, club sports, and regularly exercise will have lower stress relative to those who do not participate in regular physical activity.

Hypothesis 2: It is hypothesized that individuals who are a part of sports teams, club sports, and regularly exercise will have higher levels of self-reported risky sexual behavior than individuals who are not a part of regular physical exercise as participation in physical activity increases production of sex hormones and sexual arousal.

Method: Study 1 and Study 2 Combined

Participants

A total of 38 undergraduate Connecticut College students from the Psychology Department and Introductory to Psychology courses participated in this research for course credits and a chance to win one of 12 \$25 Amazon gift cards through a raffle, as well as randomly recruited students from around campus. Demographics for participants in Study 1 (exercise intervention) are summarized in Table 1. Four participants were recruited for the intervention, only three participants fully finished the intervention. All three (100%) of the participants were randomly assigned to the experimental group. There were no participants in the control group. All three of the participants (100%) were female and were White. Two participants were heterosexual (66.7%) and one (33.3%) was bisexual. Two (66.7%) participants were not in a committed relationship and only one (33.3%) was in a committed relationship. One participant was 18 (33.3%), one was 19 (33.3%), and one was 20 (33.3%).

Table 1

Sample Demographics for Study 1

	<u>Intervention Group</u>	
	Frequency	%
Gender		
Female	3	100
Sexual Orientation		
Heterosexual	2	66.7
Bisexual	1	33.3
Age		
18	1	33.3
19	1	33.3
20	1	33.3
Ethnicity		
White	3	100

Note: Participants = 3

Demographics for the participants in Study 2 are summarized in Table 2. These participants were recruited in the same ways as participants from Study 1. Of the 35 participants, two participants did not answer the demographics. There were 9 (25.7%) males, 21 (60.0%) females, and 3 (8.6%) non-binary participants. 17 participants (48.6%) were heterosexual, 4 (11.4%) were homosexual, 8 (22.9%) were bisexual, and 3 (8.6%) participants reported their sexuality as other. Of the 35 participants, 24 (68.6%) identified as White, 6 (17.1%) as Hispanic or Latinx, and 2 (5.7%) participants reported their ethnicity as other. 15 (42.9%) participants reported being in a committed relationship, while 16 (45.7%) reported not being in a committed relationship. The participant pool varied in age from 18 to 22 as well.

Table 2*Sample Demographics for Study 2*

	Frequency	%
Gender		
Male	9	25.7
Female	21	60.0
Non-Binary	3	8.6
Sexual Orientation		
Heterosexual	17	48.6
Homosexual	4	11.4
Bisexual	8	22.9
Other	3	8.6
Age		
18	2	5.7
19	11	31.4
20	5	14.3
21	6	17.1
22	9	25.7
Ethnicity		
White	24	68.6
Hispanic/Latinx	6	17.1
Other	2	5.7

Note. Participants = 35. Two participants did not respond to the demographic questions.

Participants were also asked to define their current activity level at the time they took the survey. Table 3 includes information on the activity levels of the participants in Study 2. Three participants (8.6%) were a part of a varsity sports team, 7 (20.0%) were a part of a club sport, 15 (42.9%) exercised regularly, and 9 (25.7%) did not exercise regularly. Exercising regularly was defined as exercising 3 or more times per week, while not regularly exercised was defined as exercising 2 or less times per week.

Table 3

Activity Level Frequencies for Study 2

	Frequency	%
Activity Level		
Varsity Sport	3	8.6
Club Sport	7	20.0
Regularly Exercise	15	42.9
Not Regularly Exercise	9	25.7

Note. Participants = 35. One participant did not respond to the question.

Materials and Procedure

This was a student-led research project for Connecticut College's Psychology Department's Honors Thesis. This study was conducted in two parts. For both parts, participants were voluntarily recruited Connecticut College students through word-of-mouth and via flyers posted around campus.

For Study 1, once participants scanned the QR code on the flyer, they were taken to a Qualtrics survey where they were presented with 4 basic pre-screening questions (see Appendix C). Participants had to be 18 years old, not participate in a club sport, and not regularly exercise. If participants did not meet the qualification for the pre-screening questions, they were shown a disqualification message explaining that they are unable to partake in the study and can contact

the Primary Investigator to learn more about the study (see Appendix D). Participants who meet the qualifications for the pre-screening questions will then be able to sign up for 1 of 3 intake sessions (see Appendix E), which will take place during the week of January 30th. An additional 6 sessions were added on after the additional 3 intake sessions to help with participant recruitment (see Appendix F). Other Connecticut College students were recruited through the Connecticut College's SONA system for course credit through the Psychology Department. Participants were sent a reminder email the day before their intake session to remind them of the location and time of the in-take session they signed up for (see Appendix G). The intake sessions occurred in a computer lab in a reserved computer lab on the Connecticut College campus. The study was thoroughly explained to participants, and the Informed Consent was reviewed (see Appendix H). After everyone completed and handed in the consent forms, the PI asked any subjects who do not meet the basic inclusion criteria (Ex: have to be 18 years of age or older, a non-athlete, and not exercise over 3 days a week) to leave the study. The investigator then stepped out of the room for five minutes to allow individuals who did not wish to participate a chance to leave. Those who remained were a part of the intake session.

Remaining subjects were randomly assigned to either an exercise or control group via a number lottery. All participants were randomly assigned participant numbers to either Group #1 or Group #2, to allow tracking of participant specific physical activity and survey responses. Participant numbers were listed at the bottom of the randomly assigned QR code forms, which are group specific (e.g., 1-007 for Group #1 Participant 7). These QR code slips were given out randomly to ensure participants' anonymity.

After participant numbers were assigned, individuals who were in Group #2 were asked to leave the room for a few minutes so Group #1 could be given instructions on the intervention.

Group #1 was assigned as the Control Group. Participants were given a QR code that linked to a Google Form to fill out daily (see Appendix I). The control group was asked to go about their daily life as normal and to fill out the Google Form daily, which included a filler question and if they engaged in any physical activity (defined as walking significantly more than the participant usually does) that day. Group #1 was then asked to leave the intake room and wait in the hallway for a few minutes.

The PI then explained the intervention to the other group. Group #2 was assigned to the exercise group and given a QR code slip to a Group #2 specific Google Form (see Appendix J). This group was asked to complete an exercise intervention which was walking for at least 20 minutes at a 3 mile per hour pace, 3 days a week for 3 weeks under the supervision of those at the Connecticut College Fitness Center. Additionally, participants were asked to record their activity and time spent exercising, in a Google Form daily if possible. The Connecticut College Fitness Center has provided approval for the use of their facilities for Connecticut College student participants as well (see Appendix K). The PI reminded participants that their participation was voluntary, and they could choose to not participate in the study. Additionally, the participants in Group #2 were presented with a form which they signed to acknowledge that they understand and consent to participate in the specific protocol for the exercise (see Appendix L). Attrition was expected.

Participants in Group #1 were asked to return to the intake room after Group #2 was informed of their role in the study. The remaining participants all took a pre-experimental survey that was distributed in an anonymous fashion over the survey platform, Qualtrics. Participants took the survey online utilizing a personal computer or laptop, or computer from Connecticut College's Shain Library. They were first presented with the inclusion criteria (see Appendix M).

The in-take criteria were completely anonymous. Participant names and participant identification numbers were kept separate to ensure the participant's health information on the in-take form is kept anonymous. If participants did not meet inclusion criteria, they were shown a disqualification message (see Appendix N). Participants were then asked to enter their participant identification number (see Appendix O). This number will be used to link the pre-survey response to the post-survey response and is completely anonymous.

For Study 2, once participants scanned the QR code on the flyer, they were taken to a Qualtrics survey where they were presented with 2 basic pre-screening questions and whether they would be receiving course credit for participation in this study (see Appendix P). If participants did not meet the qualification for the pre-screening questions, they were shown a disqualification message explaining that they are unable to partake in the study and can contact the Primary Investigator to learn more about the study (see Appendix Q). Participants who meet the qualifications for the pre-screening questions were then shown the Informed Consent document and shown a message saying that they had qualified to take part in the study (see Appendix R). Participants were then asked to explain their current physical activity level and describe the type of activity they were a part of (see Appendix S). After that, participants were allowed to proceed to the rest of the survey.

The survey questions presented to participants in both Studies 1 and 2 were the same. The same attention check was used in both Studies' surveys to ensure participants are paying attention to the presented survey questions (see Appendix T). The survey questionnaires for both Study #1 and Study #2 included:

Perceived Stress Scale

Participant's perception of their experienced stress levels were assessed through the 10 Question version of the Perceived Stress Scale (PSS10) by Cohen et al., (1988) (see Appendix U). Participants will be presented with 10 questions pertaining to their perceptions of their stress levels within the past month. A sample question is, "In the last month, how often have you felt that you were unable to control important things in your life?". The scale used is rated from 0 (Never) to 4 (Very Often). Participants will choose only one rating number per question. Scores range from 0 to 40, with higher scores indicating higher perceived stress. Questions 4, 5, 7, and 8 will be reverse scored. The theoretical scale range for this survey would be 0 to 40. This survey has been found to have high internal consistency (Cronbach's alpha = .78) for being used across cultures (Baik et al., 2019). The Cronbach's alpha of the scales for Part 1 and Part 2 are below (see Table 4 & 5).

Sexual Self-Concept

Parts of the Sexual Self Perception and Adjustment Questionnaire (Steinke et al., 2013A) along with the Self-Esteem portion of the Sexuality Scale-- Short Form (Wiederman & Allfeier, 1993) were used to evaluate participants Sexual Self-Concept. The questions were put together into a single survey that participants answered. The Cronbach's alpha of both scales for Part 1 and Part 2 are below (see Table 4 & 5).

Sexual Self Perception and Adjustment Questionnaire. The Sexual Self Perception and Adjustment Questionnaire (SSPAQ), by Steinke et al., (2013A) aims to assess an individual's sexual self-efficacy, satisfaction, anxiety, and depression (see Appendix V). Past literature has found the Content Validity Index at 0.97. Cronbach's alpha was >.90 (Steinke et al., 2013B). For the purpose of this study, only the sexual self-efficacy and sexual satisfaction subscales were used to assess participant's sexual self-confidence. The subscales used were rated

from 0 (not at all a characteristic of me) to 4 (very characteristic of me). The theoretical scale range for these two subscales would be 0 to 56. A sample question from the Self-Efficacy subscale is, “I am able to handle my own sexual needs”. A sample question from the Self-Satisfaction subscale is, “I am satisfied with the status of my own sexual fulfillment”. Higher scores reflect a greater proportion of the constructed interest, for these specific subscales that would reflect more positive self-efficacy and higher satisfaction.

Sexuality Scale-- Short Form. The Sexuality Scale-- Short Form (Wiederman & Allfeier, 1993) measures three main constructs of sexuality, including sexual self-esteem, sexual-depression, and sexual-preoccupation (see Appendix W). The measure has 15-items scaled on a 5-point scale, where “agree” equals +2 and “disagree” equals -2. A sample question is, “I am a good sexual partner”. The short form scales have been highly correlated with the original subscales as well. For the purpose of this study, only the self-esteem subscale will be used that is 5 questions long. The theoretical scale range for this subscale is – 10 to 10. Higher scores are related to higher self-esteem for this specific subscale. High reliability coefficients were found for both men and women in the subscale of self-esteem, scoring around .92 and .94, respectively.

Sexual Risk Behaviors Scales

The Sexual Risks Behavior Scale (Fino et al., 2021) aims to assess risky sexual behavior among university students (see Appendix X). A sample question is, “How often have you had sex without a condom with someone you have just met?”. This is a 5-item measure that uses a 5-point Likert scale ranging from 0 (Never) to 4 (Always). The theoretical scale ranges from 0 to 20. The measures of this scale were found to be predictive of sexually transmitted infection diagnoses in the past 12 months. This scale has been found to be reliable and valid for assessing

sexually risky behavior in university-aged individuals. After answering all survey questions, participants were presented with the Demographics Form (see Appendix Y).

Table 4

Cronbach's Alphas of Scales for participants in Study 1 for Present Study

Measures	Cronbach's Alpha
PSS	.861
SSPA	.940
SSE	.962
SRBS	.893

Note. PS = Perceived Stress Scale. SSPA = Sexual Self-Perception Scale. SSE = Sexual Self-Esteem Scale. SRBS = Sexual Risk Behavior Scale.

Table 5

Cronbach's Alphas of Scales for Study 2 for Present Study

Measures	Cronbach's Alpha
PSS	.88
SSPA	.94
SSPA-SSE	.87
SSPA-SS	.92
SSE	.96
SRBS	.62

Note. PS = Perceived Stress Scale. SSPA = Sexual Self-Perception Scale. SSE = Sexual Self-Esteem Scale. SRBS = Sexual Risk Behavior Scale.

Specifically for Study 2, participants in both the control and exercise groups were asked to fill out a daily Google Form, using the QR Code provided to them during the intake session. If needed, participants were allowed to contact the Primary Investigator for a new QR code if they lost access to the one they were given. Participants were asked to leave their email and

participant identification number on a sheet of paper as they leave the intake session, so they could be contacted for the final session in 3 weeks. Participant emails and identification numbers were collected for contact purposes only and were not attached to any other information surrounding the study. This sheet of paper was kept in a confidential locked space to ensure participant confidentiality. During the weeks of February 20th-March 6th, participants in Study #2 were emailed a link to a follow-up survey on Qualtrics after the 3-week experimental session was over (see Appendix Z). Participants took the same 4 surveys as they took during the intake session.

For both Study 1 and Study 2, all participants were presented with the Debriefing Form after completing all survey questions (see Appendix AA). The survey took approximately 30 minutes to complete.

Results for Study 1: Exercise Intervention Study

All data were screened for completeness prior to analyses. The participants who completed the intervention but did not respond to all survey items were eliminated from the analyses. There were four participants who completed the pre-intervention survey, and only three participants completed the entire post-intervention survey. The fourth participant did not complete the post-intervention questionnaire, so their prior response was not able to be utilized. All three participants who fully completed the pre- and post-intervention survey were utilized in this data analysis.

Attention Check

An attention check was conducted to review if participants were paying attention to questions being asked. Participants were asked to select the fruit from among a variety of five other words. All participants whose data were utilized in both the pre-intervention and post-intervention surveys passed the attention check.

Descriptive Statistics

Descriptive statistics were run for all pre-intervention and post-intervention survey responses. Examining the means descriptively revealed higher levels of perceived stress ($M = 26.00$, $SD = 6.08$) reported pre-intervention than post-intervention ($M = 17.00$, $SD = 5.29$). Lower rates of sexual self-efficacy were indicated on post-intervention survey results ($M = 9.67$, $SD = 7.64$) compared to pre-intervention ($M = 15.67$, $SD = 5.51$). Other means were quite similar pre- and post-intervention. Table 6 describes the means of outcome measures by pre-intervention and post-intervention.

Table 6*Descriptive Statistics of Pre- and Post-Intervention Scales*

Outcome Variable	<u>Pre-Intervention</u>		<u>Post-Intervention</u>	
	Scale Range	<i>M (SD)</i>	Scale Range	<i>M (SD)</i>
PS	19 - 30	26.00 (6.08)	11-21	17.00 (5.29)
SSPA	21 - 56	39.67 (17.62)	23 - 62	40.00 (19.97)
SSE	12 - 22	15.67 (5.51)	3 - 18	9.67 (7.64)
SRBS	5 - 15	9.00 (5.29)	5 -14	9.00 (4.58)

Note. For all scales, higher scores indicate higher reported levels of the measured construct being present. PS = Perceived Stress Scale. SSPA = Sexual Self-Perception Scale. SSE = Sexual Self-Esteem Scale. SRBS = Sexual Risk Behavior Scale.

Non-Parametric Testing

An exact sign test was conducted to determine the effect of the exercise intervention on all of the dependent variables. Because no control group participants completed the study, tests were limited to pre-post score comparisons for the experimental group only. The nonparametric sign test analysis was conducted due to the extremely low sample size of the intervention group. In the case of this study, the exact sign test was run for each of the measures used to assess the relationship between the exercise and each measure's variable. Median scores were analyzed for all analysis using the exact sign test because median is a better measure for a skewed distribution than mean is, and the current results were skewed due to the small sample size.

Stress Measure

The sign test was first run to determine the effect of the exercise intervention on Perceived Stress (PS). For the 3 participants who completed the study, the post-intervention saw a decrease of perceived stress in all participants when compared to the pre-intervention. For all participants, their perceived stress levels were lower after the intervention than they were before the intervention. However, there was not a statistically significant median decrease in perceived stress when participants started the intervention ($Mdn = 29.00$) compared to when participants completed the intervention ($Mdn = 19.00$). Since this did not reach statistical significance, it was not possible to reject the null hypothesis ($Mdn = -9.00$), $p = .250$.

Sexual Health Beliefs

The sign test was then conducted to determine the effect of the exercise intervention on Sexual Self Perception and Adjustment (SSPA). Of the 3 participants, two of the participants showed an increase in sexual self-perception when compared to the pre-intervention scores. This goes along with the hypothesis that sexual self-esteem would increase post-intervention. One participant showed a decrease for sexual self-perception. That being said, there was not a statistically significant median increase in sexual self-perception when participants started the intervention ($Mdn = 42.00$) compared to when participants completed the intervention ($Mdn = 35.00$). Since this did not reach statistical significance, it was not possible to reject the null hypothesis that exercise has no effect on sexual self-perception ($Mdn = 2.00$), $p = 1.000$.

The subscales of the Sexual Self Perception and Adjustment Scale were also analyzed using the exact sign test to see if there were any changes that could be related to the exercise intervention. The test was first conducted to determine the effect of exercise on the subscale of Sexual Self-Efficacy (SSPA-SSE). Of the 3 participants, the post-intervention saw an increase of sexual self-efficacy in 2 participants when compared to the pre-intervention scores. One of the

participants showed no change in sexual self-efficacy scores. There was not a statistically significant median increase in sexual self-esteem from pre-intervention ($Mdn = 17.00$) to post-intervention ($Mdn = 13.00$). Since this did not reach statistical significance, it was not possible to reject the null hypothesis ($Mdn = -2.00$), $p = 0.500$.

The sign test was also conducted to determine the effect of the exercise intervention on the subscale of Sexual Satisfaction (SS). Two of the participants showed an increase and one participant showed a decrease when comparing the pre-intervention sexual satisfaction scores to post-intervention scores. There was not a statistically significant median decrease in sexual satisfaction scores from pre-intervention ($Mdn = 22.00$) to post-intervention ($Mdn = 22.00$). Since this did not reach statistical significance, it was not possible to reject the null hypothesis that exercise has an effect on sexual self-perception in this particular sample ($Mdn = 4.00$), $p = 1.000$.

The effect of the exercise intervention on Sexual Self-Esteem Scale (SSE) scores was also analyzed using the exact sign test. The post-intervention saw a decrease of sexual self-esteem in all participants. However, there was not a statistically significant median decrease from pre-intervention ($Mdn = 13.00$) compared to post-intervention ($Mdn = 8.00$). Since this did not reach statistical significance, the hypothesis that exercise would have an effect on sexual self-esteem was not supported ($Mdn = -5.00$), $p = .250$.

Sexual Behavior Measure

The effects of the exercise intervention on Sexual Risk Behavior (SRB) were analyzed as well. There were varying results of the sign test on pre- to post-intervention sexual behaviors. There was a decrease of sexual risk behavior levels in 1 participant, an increase in 1 participant, and a tie when comparing pre-intervention to the post-intervention sexual risk behavior scores.

There was not a statistically significant median decrease in sexual risk behaviors when participants started the intervention ($Mdn = 7.00$) compared to when participants completed the intervention ($Mdn = 8.00$). Since this did not reach statistical significance, it was not possible to reject the null hypothesis ($Mdn = .00$), $p = 1.000$.

Given the small sample size, the intervention was unlikely to produce a change in scores in the predicted direction for all three subjects. However, these findings can be used to help better design the next study with the recruitment of a larger sample size.

Results for Study 2: Correlational Study

All data were screened for completeness prior to analyses. The participants who did not respond to all items of the survey instruments were eliminated from the analyses. Demographics were not included in this elimination. If a participant answered all questions but had most of their demographics filled out, they were included in the analysis. There were 52 total participants, of which 34 fully responded to all survey questions. The 34 completed responses were used for data analysis. There were 9 non-regularly active participants, and 25 participants who were regularly active. When looking at the activity level of the regularly active participants, there were 3 participants who were members of a varsity sports team, 7 participants who took part in a club sports team, and 15 participants who reported exercising regularly (3 or more times per week).

Attention Check

An attention check was conducted to review if participants were paying attention to questions being asked. Participants were asked to select the fruit from among a variety of five other words. All participants whose data was utilized in Study 2 passed the attention check.

Bivariate Analyses

Bivariate correlation analyses were conducted to assess associations between outcome variables (see Table 7). These analyses found significant relations between Sexual Self Perception and Adjustment Scale and the Sexual Self-Esteem Scale, $r(34) = 0.46, p = 0.11$. This suggests individuals with higher sexual self-esteem have higher sexual self-perception, which supports the hypothesis. Sexual self-perception and sexual risk behavior were also found to be significantly correlated, $r(34) = 0.49, p = 0.003$. These results indicate that individuals have higher sexual risk behavior when they have higher sexual self-perception of themselves, which agrees with the above hypothesis.

Bivariate analyses also revealed significant relationships between the Sexual Self-Perception and Adjustment's Sexual-Satisfaction subscale and the Sexual Self-Esteem Scale were also found to be significant as well, $r(34) = 0.43, p = 0.10$, indicating that individuals with higher sexual self-esteem also have higher reported levels of sexual satisfaction. Sexual self-efficacy subscale was also found to be positively correlated with the Sexual Self-Esteem Scale, $r(34) = 0.43, p = 0.011$. The relationship between the Self-Efficacy subscale of the Sexual Self-Perception and Adjustment Scale and Sexual Risk Behavior was also found to have a significant relationship, $r(34) = 0.48, p = 0.04$, with sexual risk behaviors increasing with higher reported sexual self-esteem scores. Sexual satisfaction and sexual risk behavior also had a significant relationship, $r(34) = 0.44, p = 0.008$. This indicates that individuals with higher sexual satisfaction scores had higher sexual risk behaviors.

Table 7*Intercorrelations between Outcome Measures for the Correlational Group*

Measure	1	2	2A	2B	3	4
1. PSS	1.00	-0.27	-0.31	-0.22	-0.14	-0.20
2. SSPA		1.00	0.93**	0.95**	0.46**	0.49**
2A. SSPA- SSE			1.00	0.78**	0.43*	0.48**
2B. SSPA- SS				1.00	0.44*	0.44**
3. SSE					1.00	0.33
4. SRBS						1.00

Note. * $p < .05$. ** $p < .01$. Bolded numbers represent the scales Cronbach's Alpha.

Perceived Stress and Sexual Risk Behavior Associated with Activity Level

A one-way ANOVA was performed to compare the effect of the four different levels of physical activity of participants on the dependent variables (see Table 8). Comparisons were made between varsity sports, club sports, regularly exercising, and not regularly exercising groups. Though the athletic group was extremely small, with only 3 participants, it was kept separate from club sports as prior literature has identified differences in sexual behavior and stress levels between participants of varsity sports and individuals involved in club sports (Aurelia et al., 1997; Bogel, 2008; Grossbard et al., 2007; Faurie et al., 2004; Wetherill & Fromme, 2007). Due to these prior findings, the groups were kept separate to help further assess these possible differences. No significant group differences were found in either the sexual self-perception or sexual self-esteem while using the ANOVA.

A one-way ANOVA revealed that there was a statistically significant difference in mean perceived stress score between the four groups, $F(3, 30) = 4.36, p = .012, \eta^2 = 0.30$. A post-hoc test with a bonferroni correction found that the mean value of perceived stress scores was significantly different between participants in a club sport and those who do not exercise

regularly, $p = .032$, 95% C.I. = [-17.14, -0.54] (see Table 8). There was also a significant difference between participants who did not exercise regularly and those who exercise regularly ($p = .019$, 95% C.I. = [-14.83, -0.94]). Participants who exercised regularly had lower stress scores than participants who did not regularly exercise (see Table 8). There was no statistically significant difference in mean perceived stress between the other physical activity groups. Given the prior prediction, planned contrasts were run in addition to the bonferroni correction to compare active participants to non-active participants. Planned contrasts demonstrated a significant difference between perceived stress levels and activity level, with any level of regular physical activity relating to lower levels of stress than with non-regular physical activity, $B = -2.052$, $t(30) = -3.40$, $p = .002$, $\eta_p^2 = 0.278$.

A one-way ANOVA also revealed that there was no significant difference in mean sexual self-perception for the various levels of physical activity, $F(3, 30) = 1.749$, $p = .178$, $\eta^2 = 0.15$. The ANOVA was also run on the Sexual Self-Perceptions and Adjustment subscales. There was no statistically significant difference in mean of the Self-Esteem subscale between the activity groups, $F(3, 30) = 1.821$, $p = .165$, $\eta^2 = 0.15$. There was no statistically significant difference in the subscale mean of sexual-satisfaction between the activity groups, $F(3, 30) = 1.495$, $p = .236$, $\eta^2 = 0.13$. Planned contrasts demonstrated there was a marginal difference between sexual self-perception and activity, with physical activity participants displaying higher levels of sexual self-perception than non-active participants, $B = 2.537$, $t(30) = 1.860$, $p = .073$, $\eta_p^2 = 0.103$.

A one-way ANOVA also revealed that there was no significant difference in mean Sexual Self-Esteem Scale for the various levels of physical activity, $F(3, 30) = 0.686$, $p = .568$, $\eta^2 = 0.06$.

The ANOVA revealed that there was a significant difference in the mean sexual risk behavior of the four activity levels, $F(3, 30) = 3.292, p = .034, \eta^2 = 0.25$. The bonferroni post hoc test revealed that the mean value of sexual risk behavior was found to be approaching a significant difference between members of a club sport and those who do not exercise regularly ($p = .083, 95\% \text{ C.I.} = [-0.34, 8.98]$). Individuals involved with club sports reported higher mean scores of sexually risky behaviors than participants who did not regularly exercise. There was no other statistically significant difference in mean sexual risk behavior scores between any of the other activity levels. Planned contrasts revealed no significant difference between activity level and sexual risk behavior, $B = .413, t(30) = 1.220, p = .232, \eta_p^2 = 0.947$.

Table 8

Means, Standard Deviations, and One-Way Analyses of Variance by Physical Activity Groups on Dependent Variables

Measure	<u>Sports</u> M (SD)	<u>Club Sport</u> M (SD)	<u>Regular</u> <u>Exercise</u> M (SD)	<u>Inactive</u> M (SD)	F(3,30)	η^2
PSS	23.67 (6.66)	22.71 _a (7.13)	23.67 _{β} (6.05)	31.55 _{aβ} (3.74)	4.36	0.30
SSPA	54.33 (11.72)	59.71 (8.22)	50.73 (14.14)	44.78 (14.69)	1.75	0.15
SSPA-SSE	28.33 (6.66)	29.28 (4.39)	26.33 (6.25)	22.33 (7.30)	1.82	0.15
SSPA-SS	26.00 (5.19)	30.43 (4.16)	24.40 (8.32)	22.44 (9.26)	1.49	0.13
SSE	18.33 (5.51)	18.86 (3.76)	17.33 (5.64)	15.11(6.33)	0.69	0.15
SRBS	7.67 (2.51)	13.43 _a (3.10)	11.20 (3.92)	9.11 _a (3.92)	3.29	0.25

Note. Means that share a subscript in the same row are found to be significantly different.

Discussion

The present study sought to evaluate the effect of physical activity on self-reported levels of stress, sexual self-concept, and sexual risk-taking behaviors of undergraduate college students. It was expected that physical activity would decrease levels of stress, while increasing the reported levels of sexual self-concept and sexually risky behavior. For Study 1, it was hypothesized that the exercise intervention would decrease participants' stress scores and increase their sexual self-concept and reported sexual risk-taking behaviors. For Study 2, it was hypothesized that those who participate in regular exercise (e.g. participating in a varsity sport, club sport, or regular exercise) would have higher levels of sexually risky behavior and lower levels of stress when compared to participants who did not report regularly working out. Though it was difficult to recruit a large sample size, especially for the intervention study, the present data are useful in exploring how physical activity can impact stress, sexual self-concept, and sexual behavior in undergraduates.

Study 1: Exercise Intervention Responses

Perceived Stress & Sexual Behavior

Although the pre-post difference was not statistically significant, all participants reported decreased levels of perceived stress after the exercise intervention. This was in line with the hypothesized impact of the intervention but cannot be discussed as a result or a finding. This pattern of means is consistent with prior research which has found that exercise is a great way to decrease stress (Gerber et al., 2013; Heberg & Tone, 2015; Kettunen et al., 2016; Puterman et al., 2017). This points to the benefits of exercise and regular physical activity in managing the stress levels of college students. If shown to be a robust finding in a larger sample, colleges could consider how to increase student participation in regular physical activity (e.g., 20 minutes of

walking, 3 times per week) as a way to counteract stress levels of their students. Though it is important to note that this relationship was not significant, which can be related back to the extremely small sample size of this intervention study.

As prior literature linked increased physical activity levels with higher reported sexual risk behaviors, it was hypothesized that participants would report increased levels of sexual risk behavior due to the exercise intervention. Though the experimental group did not report increases in sexual risk, their sexual risk behavior scores did not drop. This was in line with the hypothesized impact of the intervention but cannot be discussed as a result or a finding. These findings neither support nor refute prior research which has linked increases in physical activity to increased sexual risk behaviors (Frauman, 1982). The mean sexual risk behavior scores stayed the same for the exercise group. Thus, the intervention did not seem to have an impact on sexual risk behavior.

That being said, both stress and risk behavior have also been linked by multiple studies, with increased stress correlating with increased sexually risky behavior (Bodenmann et al., 2010; Mües et al., 2022). As the participants reported lower levels of stress, their reported sexual risk behavior should have decreased, but it did not. There may not have been a large enough decrease in stress to also decrease the sexual risk behaviors of these participants as well. The short duration of the study could also be at fault for the lack of significance, as the intervention may not have been long enough to reduce stress enough to affect sexual risk behaviors (Cormie et al., 2013; White et al., 1990). This difference could also be explained by a lack of power, as the experimental group only contained 3 participants, and one of which was in a monogamous relationship during the time of the experiment which may serve as a protective factor for sexual risk behaviors. The exact relationship between stress, activity level, and sexual risk behavior is

very interwoven. Further investigation is needed to assess the exact role of stress within the relationship between physical activity and sexual risk behavior.

Sexual Self-Concept

It was hypothesized that sexual self-concept would increase from pre- to post-intervention due to the effects of exercise. Results were not significant. Participants' Sexual Self-Perception and Adjustment Scale scores slightly increased in post-intervention responses when analyzed with the exact sign test, which supports the hypothesis, but this difference was not enough to be significant. The slight increase in scores is consistent with prior research which found that physical activity can increase an individual's sexual self-concept (Davison and McCabe, 2005). That being said, these findings were insignificant and cannot be discussed as a result. When comparing the average mean scores for the Sexual Self-Perception and Adjustment Scale, there was only a 0.33 mean increase in scores for the entire sample. This small increase and statistical insignificance can be attributed to the very small sample size that was involved in the experiment. The lack of significance can also be related to the short period of the exercise intervention, due to the shortness of the intervention or the intervention itself not being vigorous enough to increase sexual self-concept.

Even so, these findings provide insight into how physical activity may be useful in improving an individual's sexual self-concepts. From this study, we can infer that physical activity has a somewhat positive effect on sexual self-concept from the slight median increase in scores of sexual self-perception. This is probably due to increases in positive perception of body image and self-esteem from working out. Prior research has linked physical activity to increased body image due to weight loss and physical toning (Davison & McCabe, 2005; Yamamiya et al., 2006). Physical activity often causes people to view their bodies in more positive ways. This

information can be useful when looking into ways to improve an individual's perception of themselves, and their sexual behaviors. It could also be useful when assessing how the physical activity levels of college students could affect their risky sexual behaviors and provide insight for college health offices to provide new initiatives to reduce these risk behaviors through exercise.

Though insignificant, sexual self-esteem was found to not significantly decrease in participants from pre- to post-intervention. Participants had a slight decrease in positive feelings towards themselves with regard to their sexual behaviors after completing the 3-week exercise intervention. These findings are insignificant and cannot be discussed as a significant result, but this pattern of means shows insight into a possible relationship between these variables. The slight difference in mean response of sexual self-esteem findings for this study could be explained by the small sample size in the experimental group. The study also required a very large time commitment for participants, which could have contributed to participants not being fully engaged, or honestly answering, the survey questions.

As sexual self-perception increased, sexual self-esteem was found to decrease. These two scales measure similar concepts for sexual self-concept, and should have had similar outcomes, but since both analyses were insignificant these results cannot be discussed as significant. The difference in scores could also be due to the nature of the questions, with the Sexual Self-Perception and Adjustment Scale asking individuals to answer questions about their own sexual needs while the self-esteem measurement asked participants to answer questions about themselves as a sexual partner. Again, this difference could be attributed to the small sample size, or bias of the participant group.

Study 2: Correlational Group Responses

Correlations between Sexual Self-Efficacy Scales and Sexual Risk

Initial analysis using intercorrelations of the outcome measures revealed significant correlations between the Sexual Self-Perception and Adjustment Scale and Sexual Risk Behavior Scale. Sexual risk behavior was positively correlated with sexual self-perception, meaning more positive reports of sexual self-perception were correlated with higher self-reported sexual risk behavior. This positive relationship was also seen for the Sexual Self-Perception and Adjustment subscales (sexual self-efficacy and sexual satisfaction) with the Sexual Self-Esteem Scale as well, which means increased levels of sexual self-perception, sexual self-efficacy, and sexual satisfaction were related to increased levels of sexual self-esteem.

Sexual self-esteem and sexual self-efficacy are two major components of sexual self-concept. When an individual has an increased, or more positive, sexual self-perception, it means they have a solid understanding of their wants and needs as a sexual being. Physical activity has been found to increase sexual self-concept, which affects an individual's sexual behaviors, as they have a stronger view of their sexual wants and needs. The findings from this study are partially supported by prior literature which has found that increased physical activity has been related to more positive levels of sexual self-esteem and sexual self-efficacy, especially since most of the sample in Study 2 participated in regular physical activity (Merianos et al., 2013; Mor et al., 2014). That being said, there is also prior literature that has also linked increased sexual self-concept to decreased risk behaviors (Pai et al., 2011). An individual with a more positive sexual self-concept could be more willing to try newer, or riskier, sexual activities, leading to increased sexual risk behaviors.

The differences in previous findings, as well as the current studies' results, on the relationship between sexual self-concept and sexual risk behavior could be from the impact of exercise. In this study, individuals who were a part of regular physical activity (member of a

sports team, member of a club sport, or regularly exercised) had higher levels of sexual self-esteem and sexual risk behaviors than individuals who did not regularly exercise. Prior literature has also pointed to involvement in athletic teams to be correlated with increased self-reported sexually risky behavior as well as increased sexual self-concept (Bogel, 2007; Faurie et al., 2004; Wetherill & Fromme, 2007).

A significant correlation was also found between the Sexual Self-Efficacy Scale and Sexual Risk Behavior Scale. This further supports the prior literature that has related positive sexual self-concept to increased reported sexually risky behavior, with increased sexual self-concept being related to increased sexually risky behavior and sexually risky cognitions (Hsu et al., 2014; Lou et al., 2010). The current findings suggest a relationship exists between an individual's sexual self-concept and their sexual behavior, with positive sexual self-concept being correlated with increased sexual risk behaviors. This relationship should be further analyzed, as it could be useful in creating interventions utilizing self-efficacy to promote safe sex on college campuses. Further research is also needed in this area as there are still inconsistencies between this research and prior literature as well.

No significant relationships were found between any of the other variables. Perceived stress was not found to be statistically significant with sexual risk behavior or sexual self-concept. This is inconsistent with prior literature, which has found evidence of a relationship between stress levels and sexual risk behaviors, as well as stress levels and sexual self-efficacy (Hsu et al., 2014; Lou et al., 2010; van der Straten et al., 1998). This difference with prior literature could be related to issues with self-reporting. Participants can be self-conscious while answering survey questions about their personal information, such as stress and sexual behaviors, and could also want to provide socially desirable answers as well (Althubaiti, 2016). Self-bias

and social desirability could have played a possible role in the difference between current findings and prior literature. Also, although this sample was large enough to detect strong relationships, the sample size of 34 participants could have left the study underpowered to detect small to modest relationships.

Differences by Physical Activity Level

Group comparisons revealed significant differences in outcome variables between the various activity levels (Member of a Varsity Sports, Member of Club Sports, Regularly Exercise, Does not Regularly Exercise). It was found that perceived stress scores were statistically significant between participants who exercised regularly versus those who did not, with participants who regularly exercised reporting lower levels of stress than individuals who did not regularly exercise. Perceived stress was also found to be significantly different for individuals who participated in a club sport when compared to reported perceived stress scores of individuals who did not regularly exercise. There were no significant differences found between any of the other activity levels. These results partially support the hypothesis that individuals involved in regular physical activity would have lower stress scores than individuals who did not participate in regular physical activity. The results are also consistent with prior literature that has related increased activity level to lower levels of stress (Eather et al., 2016; Krucoff & Krucoff, 2000; Mikkelsen et al., 2017; Sharma et al., 2006).

What is interesting about these findings is that participants involved in varsity sports were not found to significantly differ in their mean perceived stress levels than the other activity levels. Based on prior research that has found a negative correlation between participation in collegiate sports and stress, these varsity athletes should have had lower levels of perceived stress. Participants who were involved in varsity sports did have a lower mean perceived stress

score than the inactive group, but it was not a significant difference ($p = .286$). These different results could be explained by the number of individuals in each athletic group and poor sampling of varsity athletes. Participants who identified themselves as participating in collegiate athletics were the smallest activity group, with only 3 participants (8.8%), as compared to participants who did not regularly exercise (26.5%). The difference in sample size of each activity group could have skewed results, as the study was largely underpowered in this aspect.

Sexual risk behavior was also found to be marginally but not significantly different between participants with different activity levels. Specifically, those who do not exercise regularly had slightly lower mean scores than members of a club sport. Individuals involved in a club sport had a higher mean average of reported sexual risk behaviors than did individuals who did not regularly exercise. Though this relationship was only marginally significant, $p = 0.083$, it is interesting to touch upon as it shows insight into a possible relationship between physical activity and sexual behavior that could possibly emerge given a larger sample size. This agrees with prior literature which has found individuals who are a part of a formal club organization to have higher levels of sexually risky behavior (Aurelia et al., 1997; Faurie et al., 2004; Wetherill & Fromme, 2007). This also agrees with prior literature that found increases in physical activity to be associated with increased levels of sexual risk behavior as well (Faurie et al., 2004; Wetherill & Fromme, 2007). Though individuals who reported themselves as exercising regularly had a higher reported mean level of sexual risk behavior, this statistic did not reach significance. This could be due to the small sample size as well.

Interestingly, participants who reported being a part of a varsity sports team had the lowest recorded mean score on the Sexual Risk Behavior Scale. Prior literature has found that being a part of a varsity sports team correlated with higher levels of sexual risk behavior (Aurelia

et al., 1997). The current study found the opposite of prior findings. This difference could be due to the amount of time varsity athletes have to spend training and participating in their sports at different points in the season and when current participants responded. There was also an exceedingly small number of varsity athletes ($N = 3$) involved in Study 2, which could contribute to the difference in findings. When looking at the demographics of the participants involved with varsity sports in the current study, most of the sports participants reported being members of were either in season or completing pre-season training at the time that this survey was completed. The Cronbach alpha for the Sexual Risk Behaviors Scale was also found to be .62, which is low. This could also explain the difference in results between the various activity groups and with prior literature as well. Participants may not have been responding consistently or accurately to this survey.

No statistically significant differences were found between the various groups with different activity levels and mean sexual self-perception or sexual self-esteem scores. Mean scores for both sexual self-perception and sexual self-esteem were reported higher for participants involved in varsity sports or club sports rather than individuals who did not regularly exercise. This is consistent with prior literature that found increased athletic participation is correlated with increased sexual self-concept (Bogel, 2007). Again, the small sample size for each group could explain why the results were not statistically significant. Also in support of prior literature, individuals who were involved in varsity or club sports were found to have slightly higher mean scores of sexual self-perception and sexual self-esteem than individuals who reported regularly exercising. Past research has revealed that participation in sports teams, both varsity and club, has been correlated with increased sexual self-efficacy that can be related to the culture of being a part of a team and concepts of popularity (Bogel, 2007; Grossbard et al.,

2007; Moore et al., 2011). This could explain why individuals who regularly exercise scored lower self-efficacy scores than individuals who participated in club and varsity sports, and higher than individuals who did not regularly exercise.

Summary of Main Findings

Overall, the only significant relationships were found in the correlational study (Study 2), not in the intervention study (Study 1). Bivariate analyses revealed significant relationships between both sexual self-perception and sexual self-esteem, and sexual risk behavior and sexual self-perception for all participants in Study 2. Higher sexual self-perceptions were found to be related to higher sexual self-esteem and higher reported sexual risk behaviors as well. Stress levels were unrelated to sexual health variables in this sample.

Physical activity level was significantly related to perceived stress and sexual risk behaviors. Perceived stress scores were found to be statistically different across groups, with individuals in club sports and individuals who regularly exercise reporting lower stress scores than individuals who did not regularly exercise. Sexual risk behavior scores were found to be statistically significantly different between members of club sports and those who do not regularly exercise, with higher reported sexually risky behavior in members of club sports than individuals who did not regularly exercise. The significant results found in Study 2 reveal a relationship between amount of physical activity, sexual self-concept, and sexually risky behavior. These relationships point to the need for sexual health campaigns to educate undergraduates on the role of physical activity with stress and sexual behaviors to help increase sexual health knowledge of physically active students.

Limitations

This study had several limitations. The largest limitations are related back to the methodology and recruitment. The study was extremely limited in the number of participants in both Study 1 and Study 2. This study was limited to the Connecticut College campus, and already started with a smaller participant pool due to the small size of the student population. Connecticut College has a very active student body, making the recruitment of usually sedentary students a difficult task. The 3-week time required for the intervention study, as well as the health requirements to qualify to be a part of the exercise intervention, which included 10 questions asking about participants' medical history, were extensive. These requirements created a large barrier to participant recruitment. The 3-week time requirement, including exercising 3 times a week for 20 minutes for this intervention made it hard to keep participants as well. These factors led to a small participant pool, which caused largely underpowered analysis. The data analysis and results would have fared better with a larger sample size and participant group.

In the future, this study should take place with a larger sample size through the recruitment of participants from an array of colleges across the country. If this study was going to be conducted again on a small campus, it would be useful to redesign the study to have individuals fill out the pre-test and then do an intensive one time exercise intervention, then fill out the post surveys when they are done as a simpler and more time-effective way to assess this relationship and recruit more participants. It would also be beneficial to open the experimental portion of the study to all individuals, instead of targeting individuals who do not usually exercise as well, as this factor greatly reduced the participant pool for the current study.

Regarding the correlational group, it would have been useful to advertise the survey for a longer period of time. Given time constraints with the thesis deadline and spring break, the

survey was only open for about 3 weeks, which was not a lot of time to gain a wide pool of participants. To increase participation in the future, it would be worth considering contacting the heads of club sports on campus as well as the coaches of the varsity athletic teams to get more sports participants. The heads of most academic departments on campus were contacted as well to try to gain more non-regularly active participants, but in the future, the increased use of social media advertisements may be a better attempt to reach this population.

There were other limitations surrounding participant recruitment and attrition as well. The 3-week intervention period took place during the winter in February. Physical activity levels have been found to decrease in the winter and in colder weather (Buchowski et al., 2009; Uitenbroek, 1993). Along with weather affecting participant recruitment and retention, anxieties around working out could have also led to decreased participation. Social anxiety and fear of negative scrutiny have been correlated to decreased levels of physical activity and gym avoidance (Levinson et al., 2013). As this exercise intervention was aiming to recruit traditionally inactive participants, fears of working out in the Connecticut College Fitness Center and possible social scrutiny from their peers could have caused a decrease in participation as well.

The intervention itself was also possibly too short to have noticeable and significant results. Given the timing of the experiment with breaks and finals, it was only possible to have a 3-week intervention. In the future, the intervention should be extended to a 6-to-9-month intervention time period, as prior research utilizing exercise interventions utilized this longer the same time frame (Cormie et al., 2013; White et al., 1990). A longer intervention period would provide more time for exercise to possibly affect an individual's lifestyle and produce significant changes in their stress, sexual behaviors, and sexual self-concept.

Another limitation is also based on the demographics of both participant groups. The samples were not equally representative of gender, race, or ethnicity. A majority of participants were white females in both studies, which could have possibly biased the results towards this specific population. Since these results were so biased in demographics it is important to note that these results are not representative of the college's undergraduate population. In the future, it would be useful to recruit a wider participant pool from multiple colleges to be able to increase both demographics and the actual size of the participant pool.

It is also important to note that there was no control group for the exercise intervention. Individuals were randomly assigned to the exercise or control group, and due to both participant attrition and issues with recruitment, all participants whose data were analyzed were in the experimental group. The lack of a control group meant that no comparisons could be made between the actual intervention group and a non-active control group. Due to this, no causal conclusions could be drawn about the actual interaction between the walking intervention on stress, sexual behavior, and sexual self-concept.

Future Directions

Additional research is needed to assess the extent of the relationship between physical activity, stress, and sexual risk-taking behavior. Prior research in this field has been solely on stress and athletics, stress and sexual risk behavior, or exercise and sexual health. Most of the prior research is correlational, with only a handful of these studies utilizing exercise as a form of intervention (Ehlen et al., 2011; More et al., 2012).

No prior research has attempted to analyze the relationship between these three variables, or any mediating factors that could affect this relationship. This study attempted to analyze the relationship of these three variables, but the extremely low sample size leaves many unanswered

questions. A larger participant pool is needed to further evaluate the actual relationship between these variables. It would also be useful to look into the effect of different types and intensities of exercise on typically inactive individuals when assessing the relationship between activity, stress, and sexual behavior as the quasi-experimental analyses in Study 2 revealed possible differences in these dependent variables related to physical activity level. Finally, future research on this topic should investigate how this information could be useful with promoting sexual health initiatives and safe sex programming on campus. This type of educational programming would be especially useful for members of both varsity and club sports, as well as individuals who regularly exercise, to understand how their increased physical activity can possibly put them at risk for increased sexually risky behaviors and negative sexual health outcomes.

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Appendix A

Flyer

PARTICIPANTS NEEDED!

BUSY AND STRESSED OUT? WANT TO BE MORE ACTIVE?

Participants will be entered into a raffle for Amazon giftcards !!

SCAN HERE:

In order to participate you must be:

- At least 18 years old
- Not regularly exercise

PARTICIPATE IN A RESEARCH STUDY TO LEARN MORE ABOUT EXERCISE, DEVELOP REGULAR EXERCISE HABITS, & DESTRESS

TO LEARN MORE ABOUT THIS STUDY, CHECK OUT THE QR CODE ABOVE

For more information, contact eberkeley@conncoll.edu

Appendix B

Study #2 Flyer

INTERESTED IN THE RELATIONSHIP BETWEEN STRESS AND SEX?



MUST BE:

- 18 years old or older
- A Connecticut College Student



**Participants will be
entered into a raffle
for Amazon Gift
Cards**

**LOOKING FOR PARTICIPANTS TO TAKE PART
IN A RESEARCH STUDY ABOUT STRESS, SEX,
AND PHYSICAL ACTIVITY.**

**TO LEARN MORE ABOUT THIS STUDY, SCAN THE QR
CODE ABOVE.**

For more information, contact eberkeley@conncoll.edu

Appendix C

Pre-Screening Questionnaire

Thank you for your interest in participating in our research study. In order to be apart of this study, you must be: 18 years of age or older, not regularly exercise, and in good health.

Please answer the questions below as part of the preliminary screening process to see if you are able to be a part of this study.

Instructions: Choose only one answer for each question. Please answer all questions honestly.

Are you at least 18 years or older?

Yes

No

Do you participate in organized sports team practices? (Ex: Collegiate sports or club sports)

Yes

No

Do you regularly exercise? (Ex: Running or weightlifting 3x a week)

Yes

No

Appendix D

Disqualification Message

We are sorry to inform you that based on your answers to the screening questions, you are unable to participate in this study. Thank you for your interest in our study. If you would like to learn more about this study once it is complete, please feel free to email the primary investigator (eberkeley@conncoll.edu).



Appendix E

Information Session Sign-Up

Thank you for your interest in this study! Based on your previous answers, you are qualified to participate in this research project.

Please choose only **one** of the three sessions below to join for an intake session, and learn more about participating in this study!

All intake sessions will take place in the PC Classroom on the lower floor of Shain Library.

A reminder email detailing the location and time you selected will be sent a few days prior to the intake session.

Monday January 30th at 5pm (in Shain's PC Classroom)

Tuesday January 31st at 4:30pm (in Shain's PC Classroom)

Wednesday February 1st at 12pm (in Shain's PC Classroom)

Please provide your e-mail address below:

Are you receiving course credit for participation in this study?

Yes

No

Appendix F

Additional Intake Appointment Information

Thank you for your interest in this study! Based on your previous answers, you are qualified to participate in this research project.

Please choose only **one** of the three sessions below to join for an intake session, and learn more about participating in this study!

All intake sessions will take place in the PC Classroom on the lower floor of Shain Library.

A reminder email detailing the location and time you selected will be sent a few days prior to the intake session.

Tuesday, February 7th 4:30-5:30pm (in Shain's PC Classroom)

Wednesday, February 8th 12-1pm (in Shain's PC Classroom)

Thursday, February 9th 5-6pm (in Shain's Davis Classroom- first floor)

Tuesday, February 14th 4:30-5:30pm (in Shain's PC Classroom)

Wednesday, February 15th 12-1pm (in Shain's PC Classroom)

Thursday, February 16th 5-6pm (in Shain's Davis Classroom- first floor)

Please provide your e-mail address below:

Appendix G

Reminder Email

Recipients

Research In-Take Appointment Reminder

Dear Participant,

Thank you for signing-up to be a part of this honors study on stress and exercise. This is a reminder email for your participation in an in-take appointment. The information about the time and location of your selected in-take appointment is below.

Reminder: "Participant Selected Time & Date"

Any questions or concerns, please reach out to eberkeley@conncoll.edu. See you then!

Best,
Emily Berkeley
eberkeley@conncoll.edu

Appendix H

Informed Consent

Title of the Project: Physical Activity, Stress, & Health

Student Principal Investigator: Emily Berkeley, Connecticut College Psychology Department

Faculty Advisor: Joshua Uhalt, Professor, Connecticut College Psychology Department

Invitation to be Part of a Research Study

You are invited to participate in a research study. In order to participate, you must be an undergraduate student, who does not regularly exercise and wants to be more active. Taking part in this research project is voluntary.

Important Information about the Research Study

Things you should know:

- The purpose of the study is to better understand the role of stress and exercise on risk-taking behaviors and sexual health in undergraduate college students. This will take approximately 8 hours over the course of 3 weeks.
- Risks of discomforts from this research as expected to be minimal and no greater than the risks/discomforts encountered in day-to-day life. However, we will be asking questions pertaining to your sexual health and sexual behaviors. You will be asked to participate in an activity which may be physical, so please let the researcher know if you have any physical or health constraints.
- The study will help create new educational health incentives, specifically for undergraduate campuses.
- Taking part in this research project is voluntary. You don't have to participate and you can stop at any time.

Please take time to read this entire form and ask questions before deciding whether to take part in this research project.

What is the study about and why are we doing it?

The purpose of the study is to investigate the effects of stress and physical activity on health decisions. You will be asked to walk on a treadmill at a 3 mile per hour pace for 20 minutes, 3 days a week for 3 weeks. You will be asked to perform this activity in the supervised areas of the Connecticut College Fitness Center. You will be asked to document this activity, and times completed, in a journal. This activity might be physical, so please let the researcher know if you have any physical or health constraints. You will also be asked to complete a survey before and after the 3 weeks is over. In these surveys, you will answer questions about your stress level and sexual experiences (i.e., coping with stressors, degree of participation in sexual acts, etc.).

What will happen if you take part in this study?

If you agree to take part in this study, you will be asked to attend an informational intake session to determine eligibility for the present study. If eligible, the PI will distribute the link to a survey to take. We expect this session to take about 1 hour. Participants will then be asked to walk on a treadmill for 20 minutes, at least 3 days of the week, for 3 weeks. You will be asked to record this data through a personalized Google Form daily. The identity of all participants is protected (here the data are anonymous, that is, no identifying information is collected. A randomized Participant Identification Number will be used to ensure anonymity. After 3 weeks, participants will be asked to come back to take an in-person survey. This is expected to take 30 minutes.

How could you benefit from this study?

There is a chance you may physically benefit from being in the study, through the increase in weekly physical activity. Others might benefit because it will aid in the creation of new and beneficial health educational programming for university students. It will also enhance current knowledge of the sexual psychophysiology of undergraduate Students health behaviors.

What risks might result from being in this study?

There are some risks you might experience from being in this study. You may be asked to participate in physical activity. It is possible that you may injure or hurt yourself. Please tell the researchers if you have any injuries or other problems related to your participation in the study.

The College may be able to assist you with obtaining emergency treatment, if appropriate, but you or your insurance company will be responsible for the cost. By signing this form, you do not give up your right to seek payment if you are harmed as a result of being in this study.

The type of activity you are being asked to do is walking on a treadmill for 20 minutes.

If you need any help regarding an injury or health concern, please contact Student Health Services at SCS@conncoll.edu or ext. 2275

We are also asking questions about the extent of your risk-taking behaviors, such as sexual health behaviors and perceived stress, it is possible that you might find answering these questions upsetting. For that reason, we are including contact information to Student Counseling Services or other service providers on the Debriefing.

Some of the questions in this survey cover sexual history and behavior, which you may find a sensitive topic. Example questions are, “How often have you had sex while under the influence of alcohol (i.e. drunk)?” and “How often have you had sex without a condom with someone you have just met?”.

If you wish to speak to someone about any concerns you have concerning your sexual history or any psychological issue, please contact Student Counseling Services at

SCS@conncoll.edu or ext. 4587.

How will we protect your information?

We plan to publish the results of this study. To protect your privacy, we will not include any information that could directly identify you.

We will protect the confidentiality of your research records by using deidentified data by using randomized Participant Identification Numbers. Your name and any other information that can directly identify you will be stored separately from the data collected as part of the project.

It is possible that other people may need to see the information we collect about you. These people work for Connecticut, and government offices that are responsible for making sure the research is done safely and properly. Any identifying information (e.g. email address, name) will not be recorded.

What will happen to the information we collect about you after the study is over?

We will keep your research data to use for future research. Your name and other information that can directly identify you will be deleted from the research data collected as part of the project.

We may share your research data with other investigators without asking for your consent again, but it will not contain information that could directly identify you. Data collected as part of this research will be provided to the Open Science Framework repository for future use by other researchers. This data will not contain information that could directly identify you.

How will we compensate you for being part of the study?

If you are receiving course credit from the Psychology Department, you will receive 2 course credits and entry into the raffle. All other participants will be entered into a raffle for the chance to win one of 12 Amazon gift cards valued at \$25 for your participation in this study once you have shown up and signed into the initial intake session. You will not lose entry into the raffle, or course credit, from withdrawing from the study at any point. After the study has ended, a raffle will be held, and 12 participants will randomly be chosen. All participants who complete the initial intake survey forms will be eligible to be a part of the raffle drawing by physically writing their email address and name on a physical document that will be kept in a secured, locked office. This document will be presented during the initial intake session.

What are the costs to you to be part of the study?

There are no costs to you for participating in this study.

Your Participation in this Study is Voluntary

It is totally up to you to decide to be in this research study. Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time. You do not have to answer any questions you do not want to answer. If you decide to withdraw before this study is completed, your data will not be used. The PI may decide to terminate a subject's participation without consent of the subject if the subject is not tracking the expected three times a week activity.

Contact Information for the Study Team and Questions about the Research

If you have questions about this research, you may contact Emily Berkeley at **eberkeley@conncoll.edu** or Joshua Uhalt at **juhalt@conncoll.edu**.

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the following:

Kira Phillips, IRB Administrator

Jason Nier, IRB Chairperson

Connecticut College Institutional Review Board

270 Mohegan Avenue

New London, Ct 06320

Phone: (860) 439-2330

Email: irb@conncoll.edu

Your Consent

By signing this document, you are agreeing to be in this study. You are also certifying that you are 18 years of age or older. Make sure you understand what the study is about before you sign. I/We will give you a copy of this document for your records. I/We will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I understand what the study is about and my questions so far have been answered. I agree to take part in this study. I certify that I am 18 years of age or older as well.

Printed Subject Name

Signature

Date

Appendix I

Control Group (Group #1) Google Form Daily Questionnaire & QR Code to Google Form

Daily Update Form

If you have any questions, please contact: eberkeley@conncoll.edu

eberkeley@conncoll.edu (not shared) [Switch account](#)

Please write down your Participant Number (ex: 1-007)

Your answer _____

Did you engage in exercise today? (For this question, exercise is walking significantly more than you usually do):

Yes

No

How long did you exercise for? (Ex: did you walk for more than 20 minutes on the treadmill):

Your answer _____

Rate your mood today on a scale of 1 (Very Poor) to 5 (Very Good):

1 (Very Poor)

2 (Poor)

3 (Neither Good or Bad)

4 (Good)

5 (Very Good)

[Submit](#) [Clear form](#)





Appendix J

Experimental Group (Group #2) Google Form Daily Questionnaire & QR Code to Google Form

Daily Update Form

If you have any questions, please contact: eberkeley@conncoll.edu

 [eberkeley@conncoll.edu](#) (not shared) [Switch account](#) 

Please write down your Participant Number (ex: 1-007)

Your answer _____

Did you engage in exercise today? (For this question, exercise is walking significantly more than you usually do):

Yes

No

How long did you exercise for? (For this question, exercise is walking significantly more than you usually do):

Your answer _____

Rate your mood today on a scale of 1 (Very Poor) to 5 (Very Good):

1 (Very Poor)

2 (Poor)

3 (Neither Good or Bad)

4 (Good)

5 (Very Good)

[Submit](#) [Clear form](#)



Appendix K

Fitness Center Acknowledgement Letter

November 29, 2022

To whom it may concern,

My name is Analisse Rios and I am the Director of Sports Performance at Connecticut College. I approve of the project that will be carried out in the Ann & Lee Higdon Fitness Center under the guidance of Senior Honors Thesis Student, Emily Berkley. According to Emily Berkley, students participating in the study will be asked to complete 20 minutes of walking, 3x a week over the course of 3 weeks. Students involved in the study will be using the treadmills located in the Fitness Center to complete their walking.

Please don't hesitate to reach out with any questions.

Sincerely,

Analisse Rios

Director of Sports ~~Performance~~
Connecticut College
abrio@conncoll.edu
(860)912-2853

Appendix L

Exercise Protocol Consent Agreement

Dear Participant,

Thank you for agreeing to participate in this study. It is totally up to you to decide to be in this research study. Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time.

To participate in this study, you will be asked to walk 20 minutes a day 3 times a week for the duration of 3 weeks. We ask that you read and agree to follow the below instructions for the walking exercise to avoid risk and ensure your safety. Also included below are some tips to reduce risk of injury while walking.

Protocol for Walking:

- Walking will take place at the Connecticut College Fitness Center using the treadmills
- Start for the *first 5 minutes* of the walk at a slow pace of **2.5 MPH**
- *After 5 minutes*, place the treadmill at a **1 incline** and increase the speed to **3 MPH**
- *After walking for 10 minutes* at an incline, begin a 5 minute cool down: **decrease the incline to 0** and decrease the speed to **2.5 MPH**
- Stop after *20 minutes*

Tips on how to use the Connecticut College Fitness Center Treadmills:

- The speed knob is located on the right center of the machine
- The incline knob is located on the left center of the machine
- To increase the speed or incline, turn the knob up slowly
- To decrease the speed or incline, turn the knob down slowly
- There is a button in the middle of the machine that says “Quick Start”
 - Push this button to begin your work out, then slowly adjust the speed and incline as stated above
- There is a timer located on the top right hand corner of the treadmill’s screen which tracks your time spent on the machine
 - You can use this to keep track of your progress

Suggested safety tips for walking (Victoria Government Department of Health & Human Services, 2016):

- Choose walks that suit your age and fitness level. Warm up and cool down with a slow, gentle walk to ease in and out of your exercise session.

- Slow down or decrease speed/incline if you start to feel fatigued or discomfort.
- Wear loose, comfortable clothing, and appropriate footwear to avoid blisters and shin splints.
- Drink plenty of fluids before and after your walk. If you are taking a long walk, take water with you.

By signing below, I acknowledge that I have read, understand, and will follow the above information on the exercise protocol.

I also acknowledge that participation in this study is completely voluntary and the Primary Investigator (Emily Berkeley) and Conn College are not responsible for any injuries sustained during participation in this study.

Signature

Date

Appendix M

Inclusion Criteria

Thank you for partaking in the initial surveys for this research. Below is a set of screening questions to see if you qualify to participate in this study.

INSTRUCTIONS: Circle one answer for each question. Please answer all questions honestly.

Are you at least 18 years or older?

Yes

No

Have you had a physical examination within the last year?

Yes

No

Is there anything in your medical history that would prevent you from engaging in exercise safely? (Ex: asthma, recent surgery, or high blood pressure)

Yes

No

Have you ever experienced unexplained pains or discomfort in your chest at rest or during any type of exercise/physical activity?

Yes

No

Have you ever felt faint or dizzy during exercise or physical activity?

Yes

No

Do you participate in organized sports team practices? (Ex: Collegiate sports or club sports)

Yes

No

Do you regularly exercise? (Ex: Running or weightlifting 3x a week)

Yes

No

Appendix N

In-Take Session Disqualification Message

We are sorry to inform you that based on your answers to the screening questions, you are unable to participate in this study. Thank you for your interest in our study and your time. If you would like to learn more about this study once it is complete, please feel free to email the primary investigator (eberkeley@conncoll.edu).



Appendix O

Participant Identification Number Question

Please enter your Participant ID Number below:

This is the number on the paper you were given during the in-take session.



Appendix P

Study #2 Inclusion Criteria Questions

Thank you for your interest in being a part of this study. The purpose of the study is to investigate the effects of stress and physical activity on health decisions. You will also be asked to complete a survey on your physical activity levels, stress, and sexual behavior. In these surveys, you will answer questions about your stress level and sexual experiences as well (i.e., coping with stressors, degree of participation in sexual acts, etc.).

Please answer the below questions to make sure you qualify for this study.

Are you currently a student at Connecticut College?

Yes

No

Are you 18 years or older?

Yes

No

Are you receiving course credit for participation in this study?

Yes

No

If so, please enter your Connecticut College email:



Appendix Q

Study #2 Disqualification Message

We are sorry to inform you that based on your answers to the screening questions, you are unable to participate in this study. Thank you for your interest in our study and your time. If you would like to learn more about this study once it is complete, please feel free to email the primary investigator (eberkeley@conncoll.edu).



Appendix R

Study #2 Qualification Message

You have qualified to be a part of this study. The next few pages will ask you a series of questions. Please answer to the best of your ability.



Appendix S

Study #2 Physical Activity Level Questions

Please choose the option below that best describes your activity level:

Member of a sports team

Member of a club sport

Exercise regularly (3 times or more per week)

Do not exercise regularly (Less than 2 times per week)

If you are apart of a sports team or club sport, please specify what team/sport below:

If you exercise regularly, please specify what type of exercise below (ex: weight-lifting; running; etc.):



Appendix T

Attention Check

Directions: Below is a list of words. Please select the fruit:

Shoes

Eight

Dogs

Apple

Fork



Appendix U

Perceived Stress Scale

Directions: For each of the questions choose from the following alternatives: 0-Never 1-Almost Never 2-Sometimes 3-Fairly Often 4-Very Often

	0- Never	1- Almost Never	2- Sometimes	3- Fairly Often	4- Very Often
In the last month, how often have you been upset because of something that happened unexpectedly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt that you were unable to control the important things in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt nervous and stressed?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt confident about your ability to handle your personal problems?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt that things were going your way?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you found that you could not cope with all the things that you had to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In the last month, how often have you been able to control irritations in your life?

In the last month, how often have you felt that you were on top of things?

In the last month, how often have you been angered because of things that happened that were outside of your control?

In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?



Appendix V

Sexual Self Perception and Adjustment Questionnaire

Directions: Please answer the questions based on how you feel currently about your sexual life. Remember that your answers are completely anonymous and will not be traceable to you in any way.

	0- Not at all a characteristic of me	1- Somewhat not a characteristic of me	2- Possibly a characteristic of me	3- Somewhat a characteristic of me	4- Very much a characteristic of me
I have the ability to take care of any sexual needs that I may have.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am able to make sure my sexual needs are fulfilled.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have the ability to ensure rewarding sexual behaviors for myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am able to handle my own sexual needs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have the capability to take care of my own sexual needs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident in my ability to respond sexually.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel comfortable in initiating sexual activities with my partner.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I am satisfied with the way my sexual needs are currently being met.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am satisfied with the status of my own sexual fulfillment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The sexual parts of my life are personally gratifying to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The sexual parts of my life are satisfactory compared to most peoples'.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am satisfied with the sexual parts of my life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My partner satisfies me sexually.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel my sex life has good quality.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Note: The response set for the items on the Sexual Self Perception and Adjustment Questionnaire range from 0 (not at all a characteristic of me) to 4 (very characteristic of me).

Appendix W

Sexuality Scale- Short Form

Directions: Please answer the questions based on how you feel currently about your sexual life.

	Disagree (-2)	Somewhat Disagree (-1)	Neutral (0)	Somewhat Agree (1)	Agree (2)
I am a good sexual partner.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would rate my sexual skill quite highly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think of myself as a very good sexual partner.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would rate myself low as a sexual partner.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident about myself as a sexual partner.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Note: All items were scaled on a 5-point Likert type scale where “agree” equals +2 and “disagree” equals -2. (R) indicates reverse keyed items.

Appendix X

Sexual Risk Behaviors Scale (SRBS)

Directions: The following questions are about the nature and frequency of your sexual behaviors in the past month. Please read the questions carefully and tick only one box for each question.

	Never	Rarely	Sometimes	Often	Very Often
How often have you had anal sex without a condom?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you performed oral sex without protection (condom or dental dam)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you had sex while under the influence of alcohol (i.e. drunk)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you had sex while under the influence of drugs or substances?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you had sex without a condom with someone you have just met?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

←

→

Scoring Instructions: SRBS total scores can be computed by averaging individual items’ scores (where 0 = “Never”; 1 = “Rarely”; 2 = “Sometimes”; 3 = “Often”; 4 = “Very often”), with higher total scores indicating higher risk to engage in sexual risk behaviors.

Appendix Y

Demographics

Directions: Please provide your answers to the following questions below. All questions are optional. You may skip any questions you do not feel comfortable answering

Age:

Gender:

Sexual Orientation

Ethnicity:

Are you currently in a committed relationship?



Appendix Z

Post-Experimental Survey Reminder

Post-Experimental Survey Reminder

Dear Participant,

Thank you for being a part of this Honors Study, "Physical Activity", for the past 3 weeks. This is a reminder email to please complete the post-experimental survey below to complete your participation in this study.

Link to Post-Experimental Survey: "Link"

If you forgot your participant identification number, or have any questions or concerns, please reach out to eberkeley@conncoll.edu. See you then!

Best,
Emily Berkeley
eberkeley@conncoll.edu

Appendix AA

Debriefing Statement

First of all, thank you for participating in this research dealing with exercise, stress, and risky behavior. In this research, I am comparing the relationship of stress and physical activity to risk-taking behaviors. In addition to Introductory Psychology students at Connecticut College, other undergraduate students recruited through flyer advertisements have been asked to complete this survey as well. One of the issues in the literature on sexual risk behaviors in undergraduate students is that there is little information pertaining to non-organized athletic participation on sexual health and well-being. Typically researchers have focused on the impact of stress, or social norms, in sexual risk taking behaviors. To my knowledge, no research has examined the specific relationship between stress, physical activity, and risky behavior, and that is the purpose of this research.

If answering any of these questions was upsetting to you, please contact Student Counseling Services. To schedule an appointment, please email SCS@conncoll.edu or call us at (860) 439-4587.

For Connecticut College *students studying remotely outside the State of Connecticut (both domestic and abroad)*, we have partnered with Morneau Shepell My Student Support Program (My SSP) to provide free 24/7 mental health care—even when the Health Center is closed. You can download the free My SSP App on the [App Store](#) or [Google Play](#)

- Through the app, you can call or chat with a Student Support Counselor 24/7 in real-time or schedule a telephone or video session that fits your schedule. My SSP provides support in the event of a personal crisis and also connects students with providers, offering both short- and long-term counseling.
- You can browse a digital library of helpful articles and videos.
- Or, you can call them directly at (866) 743-7732 (If calling from outside North America, dial 001-416-380-6578).

- The services offered through this app are paid for by Connecticut College.

If you are not enrolled at Connecticut College and answering any of these questions was upsetting to you, please consider contacting your healthcare professional, your local counseling center, or reaching out to the Crisis Text line (<https://www.crisistextline.org/>)

If participating in this study caused any physical injury or ailment, please contact Student Health Services. To schedule an appointment, please email SCS@conncoll.edu or call us at (860) 439-2275.

If you have any questions or concerns about the manner in which this study was conducted, please contact the IRB Chairperson [Professor Neir at irb@conncoll.edu].

If you are interested in this topic and want to read the literature in this area, you might enjoy the following article:

Frauman, D.C. (1982). The relationship between physical exercise, sexual activity, and desire for sexual activity. *The Journal of Sex Research*, 18, 41-46.

Lindeman, H. C., King, K. A., & Wilson, B. R. (2007). Effect of exercise on reported physical sexual satisfaction of university students. *Californian Journal of Health Promotion*, 5(4), 40-51. <https://doi.org/10.32398/cjhp.v5i4.1267>

You may also contact me (Emily Berkeley) at eberkeley@conncoll.edu for additional resources.