

THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF KINESIOLOGY

An Examination of the Relationship Between Adverse Childhood Experiences, Physical
Activity, and Mental Health of College Students

LUCY RACE
SPRING 2022

A thesis
submitted in partial fulfillment
of the requirements
for a baccalaureate degree
in Kinesiology
with honors in Kinesiology

Reviewed and approved* by the following:

Melissa Bopp
Professor in Charge, Undergraduate Program in Kinesiology
Thesis Supervisor

Jonas Rubenson
Associate Professor in Kinesiology
Honors Adviser

* Electronic approvals are on file.

ABSTRACT

Physical activity has been associated with several health benefits. In addition to the impact on physical health status and chronic disease, exercise has been shown to decrease risks of mental illness such as anxiety and depression. Despite this knowledge, the prevalence of mental illness in the population remains high, with college students being affected at a disproportionate rate. One factor related to mental illness that may contribute is adverse childhood experiences (ACEs). The purpose of this study was to examine the relationship between adverse childhood experiences, physical activity, and mental health in college students. Participants were asked to participate in a survey examining self-reported PA, mental health outcomes, and ACE exposure. Data was analyzed by SPSS software, where t-tests and correlations were set at $p < 0.05$. Female students with ACEs reported higher levels of stress and depression and lower levels of MPA, VPA, and MET-mins. Male students with ACEs reported higher levels of depression and alcoholic drinks per week. This experiment served as an exploratory study to determine if relationships existed between ACEs and physical activity and mental health variables. Future studies could benefit from examining the presence of a graded relationship between ACEs and from using more objective measurements of PA.

TABLE OF CONTENTS

LIST OF TABLES iii

ACKNOWLEDGEMENTS iv

Chapter 1 Literature Review 1

Chapter 2 Methods 6

Chapter 3 Results 10

Chapter 4 Discussion 12

Appendix A 18

BIBLIOGRAPHY 22

LIST OF TABLES

Table 1. Demographic Characteristics of the Total Sample and Divided by Gender	18
Table 2. Behaviors and Psychological Outcomes of the Sample.....	19
Table 3. Relationship Between Main Outcome Variables and ACE Status for Males	20
Table 4. Relationship Between Main Outcome Variables and ACE Status for Females.....	21

ACKNOWLEDGEMENTS

First, I would like to thank Dr. Melissa Bopp for her patience and encouragement. In addition to being a wonderful mentor throughout every step of the thesis process, she helped foster my passion in the classroom for learning and advocating for those with health disparities. I would also like to thank Lucas Elliot for his extensive assistance. I am very grateful for his help with data cleaning, teaching me statistical analysis, and answering my sometimes-never-ending questions in lab for this project. Lastly, I would like to thank my family and friends for their unwavering love throughout my entire career at Penn State. Through all the ups and downs of college, my family has always trusted my decisions and been my biggest fans as I worked towards my goals. Without their support, I would have never reached where I am today. To my friends, thank you being a continual source of joy and laughter. Despite all our busy schedules, we still find time to get together, and often, it is exactly what I need. A special shoutout goes to my boyfriend who listened to all my worries throughout the thesis process and constantly reassured me that I will succeed—I couldn't have done this without you.

Chapter 1

Literature Review

There is a wide range of evidence noting the numerous benefits physical activity has for all aspects of health. Adults that consistently meet the recommended physical activity guidelines are rewarded with improved physical and mental health. Physical benefits are seen through increased muscular strength, cardiorespiratory fitness, and bone health (2018 Physical Activity Guidelines Advisory Committee, 2018). Additionally, physical activity increases life expectancy and delays the progression of chronic diseases such as hypertension, type 2 diabetes, obesity, cardiovascular disease, and certain cancers. Compared with adults who are not active, adults that regularly participate in physical activity have a lower risk of all-cause mortality by 33%.

Physical activity is also one of the most effective mental health interventions. Once a regular physical activity routine is established, there will be decreased risks of anxiety and depression as well as enhanced cognitive abilities, better sleep outcomes, and overall improved quality of life (2018 Physical Activity Guidelines Advisory Committee, 2018).

The benefits of physical activity are separated by age in the Physical Activity Guidelines, with each group experiencing distinct health advantages. In the college age population, the impact of physical activity on mental health is significant. This relationship was demonstrated in a systematic-review and meta-analysis of 331 randomized controlled trials focused on mental health interventions. In these trials, exercise was among the few interventions that had the highest positive effect on both depression and generalized anxiety disorder in the college age population (Huang et al., 2018). The effect of physical activity on reducing college student stress is also apparent. A study by Largo-Wight et al. (2005) surveyed 232 undergraduate students in a

health class with the goal of determining if there was a relationship between stress, problem-solving, and physical health. It was found that consistent physical activity was linked with lower levels of stress and better mental health coping skills (Largo-Wight, Peterson, and Chen, 2005). Despite the considerable evidence that physical activity is an effective mental health intervention, the prevalence of college students with mental illness remains high.

Due to the increased stress of the transitional period (Cuijpers, 2015) and the unfamiliar adult responsibilities that college students face (Pedrelli et al., 2015), this population is at a higher risk of developing mental health problems. According to findings from the Substance Abuse and Mental Health Services Administration (2020), the age group of 18-25 years old has consistently reported the greatest prevalence of depression since 2005 on their National Survey on Drug Use and Health. In 2020, the percentage of individuals aged 18-25 with depression was the highest it has ever been at 17%, compared with only 7.2% of individuals aged 26 and older. Additionally, the National Institute of Mental Health (2022) reported in 2003 that the age group of 18-29 years old had the second highest prevalence of anxiety symptoms at 22.3%, compared with other age groups. In the Fall 2020 version of The Healthy Minds Study, Eisenberg et al. (2020) specifically examined the mental health patterns of students currently enrolled in universities. Of the 32,754 participants, 39% reported experiencing a major depressive episode in the past two weeks while 34% of participants reported symptoms associated with generalized anxiety disorder. Stress is certainly a role player in this alarming prevalence, but it is important to consider what other factors might be causing such excessive amounts of mental illness in college students. One possibility is the presence of adverse childhood experiences.

Adverse childhood experiences (ACEs) are potentially traumatic events that happen between ages 0 to 17. These experiences include physical, emotional, or sexual abuse; physical

or emotional neglect; mental illness or substance abuse in the household; having an incarcerated relative, a mother that is treated violently, or divorced parents (National Conference of State Legislatures, 2022). In the United States, 61% of adults reported having at least one ACE, and 16% reported having more than four. Females and racial and ethnic minority groups have a disproportionately high reporting of ACEs (Centers for Disease Control and Prevention, 2019). There is evidence that having at least one ACE during childhood is associated with an increased risk of chronic diseases, mental illness, and substance abuse in adulthood due to how the associated stress can affect brain development and change the body's coping mechanisms (Centers for Disease Control and Prevention, 2021). The most common mental illnesses that ACEs are linked to are depression and suicidality (Centers for Disease Control and Prevention, 2021). Preventing ACEs is shown to reduce the prevalence of depression in adults by 44%, but unfortunately, prevention is not always a possibility (Centers for Disease Control and Prevention, 2019).

The impact of ACEs on college student mental health has been examined in several existing research studies. Karatekin (2017) collected data via a survey on 239 college students at a large public mid-Western university at the beginning and end of a semester and discovered that the students with any ACEs had worsened mental health over the period than the students without ACEs and the students with two or more ACEs were twice as likely to meet depression, anxiety, and/or suicidality criteria. Additionally, students with ACEs reported higher levels of stress and there was a direct relationship between stress and negative mental health outcomes (Karatekin, 2017). In another study, a health questionnaire was completed by 12,039 undergraduate students enrolled at universities in California, Minnesota, and Texas during the 2017-18 academic year. Results showed a graded relationship between ACEs and lifetime

depression, suicidal ideation, and lack of restful sleep. Female participants with ACEs reported worse mental health outcomes than their counterparts without ACEs, while males with ACEs reported more substance abuse (Grigsby, Rogers, and Albers, 2020).

While there is an adequate amount of data on ACEs and mental health in college students, there is little known about the role physical activity plays in this relationship. The study by Grigsby, Rogers, and Albers (2020) explores the connection between self-reported moderate to vigorous physical activity and ACE status in college students and found no significant relationship. However, the rest of the existing research only examines the effect among other populations. For example, in a study by Boisgontier et al. (2020), it was determined that individuals aged 62 and older engaging in physical activity more than once a week protected their ability to function independently from the negative effects of adverse childhood experiences and depression (Boisgontier et al., 2020). In another study, Harada et al. (2021) explored this relationship in children aged 13 to 17 through the 2016 National Survey of Children's Health and found that those without ACEs had better odds of meeting physical activity recommendations. As the number of ACEs increased, the likelihood of a child engaging in any type of healthy behavior decreased (Harada et al., 2021). There is some existing research on the relationship between ACEs, mental health, and physical activity, but the research done in the college student population is underdeveloped.

It is important to explore this relationship in college students due to the considerable amount of mental health triggers and the already high prevalence of mental illness in this population. It is currently undetermined how meeting physical activity recommendations could moderate the relationship between ACEs and mental health or how this could influence the

likelihood that college students will meet those recommendations. Further investigation is necessary to find appropriate interventions for ACE associated mental illness.

Aims

1. To examine the prevalence of adverse childhood experiences in the college student population.
2. To evaluate relationships between adverse childhood experiences, physical activity behaviors, and mental health outcomes to help further the advancement of college student health interventions.
3. To assess the presence of demographic differences in adverse childhood experience status and identify any significant relationships with physical activity or mental health variables.

Hypotheses

1. Students with adverse childhood experiences will have higher rates of mental illness symptoms such as stress, depression, and anxiety.
2. Students with adverse childhood experiences will engage in lower rates of physical activity.

Chapter 2

Methods

Participants and Procedures

This was a cross-sectional analysis that took place at Penn State University. Undergraduate students are required to take at least one general education health and wellness class to graduate, and physical activity classes fulfill this requirement. The participants included students taking a for-credit physical activity class during the Fall 2021 semester. These students were recruited in August via email with a link to an online survey. Participation was encouraged by instructors, but it was emphasized that it was not required as part of their grade in the course. Students were presented with an informed consent statement upon opening the survey. Students had to be at least 18 years of age to participate. The study was approved by the Pennsylvania State University Institutional Review Board. The students who completed the study had the option of entering a drawing for a \$50 weekly prize.

Survey Design

Participants were asked to complete the online survey via the Qualtrics platform. The survey took approximately 10-15 minutes to complete. Participants were asked a series of 55 questions on the topics of physical activity, psychological variables, general health, mental health, and demographics.

Measures

Demographics – Participants self-reported their age, current semester standing, gender identity, sexual identity, race, height, weight, credit load, GPA, and parent/guardian highest level of education.

Physical Activity – The Global Activity Questionnaire measures physical activity behaviors. Participants self-reported vigorous and moderate physical activity, strength training, and active transport time throughout a typical week. Weekly moderate (MPA) and vigorous physical activity (VPA) were determined based on physical activity frequency and duration. Using this, participants were grouped based on whether they met the national recommendations for physical activity and strength training guidelines (≥ 150 min/week of moderate PA; ≥ 75 min/week of vigorous PA; ≥ 2 sessions of muscle strengthening activity/week). Weekly metabolic equivalent minutes (weekly MET minutes), an indication of expenditure based on a combination of the volume and intensity of PA, were calculated based on the World Health Organization guidelines (Armstrong and Bull, 2006).

Depression – The Center for Epidemiological Studies-Depression Scale 7 (CESD-7) was used to measure participants' levels of depression. This scale is a shortened version of the 20-item measure which measures depressive symptoms. Participants ranked a series of habits and feelings for their likelihood to experience them on a scale of 1 to 4, with 1 being "Rarely or none of the time" (less than 1 time a week) and 4 being "Most or all of the time" (5-7 days a week). These values were then summed to calculate participants' total depressive symptom score. Questions were related to poor appetite, trouble keeping mind on tasks, feelings of depression,

feeling that everything was an effort, restless sleep, feeling sad, and inability to “get going” (Radloff, 1977).

Stress – The Perceived Stress Scale (PSS10) was used to measure participants’ levels of stress. Participants rated how often they experienced a set of feelings in the past month on a scale ranging from never (1) to very often (5). These values were then summed to calculate participants’ total stress score. Questions included how often participants felt: “upset because of something that happened unexpectedly; unable to control the important things in their life; nervous and stressed; confident about their ability to handle their personal problems; that things were going their way; that they could not cope with all the things they had to do; that they were able to control irritations in their life; that they were on top of things; angered because of things that were outside of their control; and, that difficulties were piling up so high that they could not overcome them” (Cohen et al., 1983).

ACEs – Adverse childhood experiences (ACEs) were measured using the Behavioral Risk Factor Surveillance System (BRFSS) designed by the Centers for Disease Control and Prevention (2021). Participants were asked whether any of the ACEs happened to them before the age of 18. Participants were provided a list of the ACEs and then gave a “Yes” or “No” response. ACEs include whether: “you lived with anyone who was: depressed/mentally ill/suicidal, a problem drinker or alcoholic, a user of illegal street drugs or who abused prescription medications, served time or was sentenced to serve time in prison/jail/or other correctional facility; your parents were separated or divorced; your parents slapped, hit, kicked, punched, or beat each other or you frequently; your parents frequently swore at you or put you down; and if an adult touched you, forced you to touch them, or forced you to have sex with them” (Centers for Disease Control and Prevention, 2021). Following this question, the

information to contact Penn State's Counseling and Psychological Services, Mount Nittany Medical Center, and the Penn State Police was provided. The information for the Penn State Crisis Line, along with an explanation of its services was also listed.

Alcohol consumption – Participants were asked to fill out the amount of alcohol they consumed each day during a typical week in the last 3 months. Participants were provided a chart that explained what one standard drink is equal to in terms of beer, wine and wine coolers, and hard liquor (Collins, Parks, and Marlatt, 1985).

Sleep – Sleep was assessed using an item from the National College Health Assessment. Participants reported the number of days (0-7) in the last week that they got enough sleep to feel well rested in the morning (American College Health Association, 2006).

Statistical Analysis

Basic descriptive statistics were used to describe this sample. Independent t-tests were used to compare the differences between physical, mental, and behavioral outcomes to determine if significance existed between participants with and without ACEs. Significance levels were at $p < .05$ and all analyses were run using SPSS 22.0 (IBM, Armonk, NY).

Chapter 3

Results

The demographics of the participants (n=1207) are shown in Table 1. The sample was divided by gender, with males comprising 44.0% (n=532) of the participants and females comprising 49.9% (n=602). The mean age of the total sample was 19.92 ± 2.4 , with the majority identifying as white or Caucasian (71.4%, n=835) and straight or heterosexual (85.7%, n=1004). Table 2 depicts behaviors and psychological variables for the sample. The sample had a mean MPA of 210.27 ± 234.15 minutes/week; a mean VPA of 220.4 ± 271.15 minutes/week; a mean total physical activity of 2627.8 ± 2620.1 MET-minutes/week; and a mean strength-training (ST) of 2.1 ± 2.03 days/week. The mean number of days participants woke up feeling rested was 3.76 ± 1.73 days/week and the mean alcoholic drinks per week was 4.72 ± 7.36 drinks. The sample had a mean GPA of 3.43 ± 0.5 and a mean BMI of 22.5 ± 5.98 kg / m². For the psychological variables, the mean perceived stress score was 19.85 ± 6.68 and the mean depression score was 6.57 ± 4.48 . There was 28.8% (n=313) of the sample that reported having an ACE.

Examining Differences by Gender

Both the male and female samples were majority white or Caucasian (73.3% of the males, 69.8% of the females) and straight or heterosexual (95.3% of the males, 82.1% of the females). As seen in Table 2, males reported a higher amount of VPA (p=0.01) and ST (p=0.02) than females. Males also had a higher number of alcoholic drinks per week (p<.001). Females, however, scored higher than males on the perceived stress scale (p=.02). There was also a

significant difference between men and women for ACEs, with a higher percentage of women having them than men ($\chi^2= 23.86$, $p<.001$).

The t-tests between those who reported ACEs and those who did not for behavioral and psychological variables are noted in Table 3 for males and in Table 4 for females. As seen in Table 3, having one or more ACEs for males was correlated with a higher number of alcoholic drinks per week ($p=.006$) and a higher depression score ($p<.001$). In Table 4, it shows that when females did not have an ACE, it correlated with higher amounts of MPA minutes/week ($p=.02$), VPA minutes/week ($p<.001$), and MET-mins/week ($p<.001$). On the other hand, when females did report an ACE, it was correlated with a higher perceived stress ($p<.001$) and depression score ($p<.001$).

Chapter 4

Discussion

This study assessed the relationships between physical activity behaviors, mental health outcomes, and adverse childhood experiences (ACE) in college students. Few studies to date have focused on the relationship between ACE status and both physical activity and mental health. Research is particularly lacking in the college aged population. Based on existing research, it was hypothesized that students with ACEs would have worse mental health outcomes and less physical activity than students without ACEs. The results from the current study supported this hypothesis in several behavioral areas. Notably, there were significant gender differences discovered in how ACE status was related to various outcomes. The implications of this study are relevant for university counseling centers, campus fitness personnel, college student and pediatric healthcare providers, and college administrators responsible for providing preventative interventions focused on improving physical and mental health of students.

The current study noted a significant relationship between ACE exposure and depression. Both male and females that had an ACE reported higher levels of depression. Our findings were in line with several other studies that saw this relationship in college students by using self-report surveys (Grisby, Rogers, and Albers, 2020; Karatekin, 2017; Watt et al., 2020). Data from the Centers for Disease Control and Prevention (2021) identified this correlation in the general population, but this literature and the current study support the association between ACE status and depression during college aged years where the risk of developing mental illness is at its peak (Pedrelli et al., 2015). While other studies that separated these findings by gender only saw significance in the female population (Grisby, Rogers, and Albers, 2020; Whitaker et al., 2021),

the current study revealed significant relationships for both males and females. These findings suggest that ACEs do not only relate to the internalizing behaviors of female college students, but among males as well.

Further analysis compared physical activity behaviors with ACE status. Female college students that did not have ACEs reported significantly higher values of MPA, VPA, and MET-mins than those who had ACEs. This contradicts a study done by Grisby, Rogers, and Albers (2020) with similar methods where there was no significant relationship between ACEs and any physical activity variable. This finding from the current study may be associated with the idea that psychosocial factors affect the chances of females being physically active more than they do with males (Edwards and Sackett, 2016). Moreover, well-being makes an impact on whether women are physically active. This was determined by Bondarev et al. (2021) who examined measures of physical performance, self-reported physical activity, mental health, and affect in 6878 middle-aged women. Since the current study noted that ACE presence in females was associated with depression, a form of negative well-being, this literature suggests that this connection also decreases physical activity. Although, as previously discussed, ACEs influence the mental health outcomes of men, findings suggest that the mental effects of ACEs do not impact physical activity behaviors as much as they do in women. Rather than exploring the effect of ACE status on physical activity as the current study did, a few studies (Boisgontier et al., 2020; Moon and Han, 2022) analyzed the impact of physical activity on people with ACEs, discovering that it improved quality of life. Given the lower amount of physical activity those with ACEs partake in and the immense benefits they can reap from being active, it is essential that more physical activity interventions be tailored to this population.

The analyses examining the relationship between ACE status and perceived stress revealed that females with ACEs are more likely to report feelings of stress. These findings are comparable to a study performed by Manyema, Norris, and Richter (2018) that determined that ACEs contribute to psychological distress in young adults aged 22 to 23 years, regardless of gender. The methods of this study differed from the current study as Manyema, Norris, and Richter (2018) obtained ACE data from a longitudinal study and measured current stress in the participants using a questionnaire. Although there were gender differences in the current study and previous literature, the findings still solidify the correlation between ACE exposure and increased stress in college aged students. A significant relationship being found in the current study for females and not males could be contributed to the fact that females are more likely than males to report their stress (American Psychological Association, 2010). Further assessing the associated stress relief techniques of men and women would better determine if men do utilize internalizing behaviors or if this finding was unique to the depressive symptoms. In a different study, depression, anxiety, and suicidality were measured in college students towards the beginning and end of the semester and it was found that these mental health symptoms worsened more for the students with ACEs (Karatekin, 2017). When connecting this finding to the current study's findings, it might suggest that increased stress- in this case from the students enduring the semester- causes ACEs to have a larger impact on mental health outcomes.

The relationship between male ACE exposure and alcohol consumption revealed significant differences. These findings align with previous literature explaining that although ACEs impact women more in terms of stressors, men are more likely to partake in heavy or binge drinking due to their ACE traumas, with those exposed to four or more ACEs drinking significantly more than their counterparts (Crouch, Radcliff, Strompolis, and Wilson, 2018). The

current study confirms the relationship in the college male population. Several existing research studies delineate the use of alcohol as a common coping mechanism for depressive symptoms while at four-year universities (Bravo, Pearson, Stevens, and Henson, 2016; Vernig and Orsillo, 2015; Kenney, Jones, and Barnett, 2015). It is undetermined whether men with depressive symptoms due to the ACEs use alcohol to cope at a greater rate than men without ACEs. Aside from the association with ACEs, heavy drinking is linked with further mental and physical health damage in and of itself. The current study findings encourage additional interventions for college males with ACEs to reduce alcohol consumption and the associated negative effects.

Implications

The findings from this study can be used in several ways to benefit college students. Campus health promotion and wellness should consider these mental and physical health outcomes associated with ACEs and introduce trauma informed intervention programs to mitigate the effects. Beginning at a younger age, before mental health issues peak in college, pediatricians should include ACE screenings in their patient evaluation. Higher quality medical care will be provided if healthcare providers understand the entire patient situation. ACE screenings would also be useful while in college for all students utilizing university counseling centers. If therapists have an accurate ACE history for their patients, they will better understand where behaviors are stemming from and will be able to accommodate mental health needs more appropriately. Additionally, university counseling centers should consider the benefits of prescribing physical activity to students with ACEs, particularly for females. It may be beneficial for college students to be educated on what ACEs are and the role physical activity can play

through Exercise is Medicine on Campus initiatives. Given the high prevalence of ACEs in the college student population, campuses should continue to advance Exercise is Medicine initiatives for all students.

Limitations

There were a few limitations associated with the design of the present study, with the primary one related to external validity. It is unclear whether the volunteer sample of Penn State students in general health and wellness classes is representative of all Penn State students or the entire population of college students. Additionally, the proportion of minority students by race/ethnicity and sexual orientation in this sample was limited, making it difficult to examine whether ACEs affected certain demographics more than others. It would be beneficial in future studies to obtain a spread more indicative of the general population. Another limitation was the reliance on self-report measures to determine physical activity and ACE variables without other sources of objective measure. Future research should also explore whether a graded relationship is present between ACEs and the behaviors analyzed in this study. This study did not determine whether more ACEs worsened the effects on health or if certain ACEs have more of an effect than others. In previous studies, ACEs have been related to chronic physical health issues. Additional research should be done to assess whether prescribing appropriate interventions during college, before mental health effects occur, could decrease the prevalence of these long-term health problems. It would be beneficial to determine if physical activity as an intervention is the answer.

Conclusion

The aims of this study were met by furthering the discussion on how ACEs relate to college student physical activity and mental health. Furthermore, clear gender differences were seen. The data supported the hypothesis that students with ACEs will have higher rates of stress (seen in females) and depression (seen in both males and females) but did not support the claim that they would have higher rates of anxiety. Since the data showed that female students with ACEs have lower rates of MPA, VPA, and MET-mins, the second hypothesis was also supported. Colleges should consider ways they can utilize these findings to improve the physical and mental health of their students. A significant number of opportunities remain to analyze the relationship between adverse childhood experiences, physical activity behaviors, and mental health outcomes in college students.

Appendix A

Results Tables

Table 1. Demographic Characteristics of the Total Sample and Divided by Gender

	Total Sample (n= 1207)				Males (n= 532)				Females (n= 602)			
	n	%	Mean	SD	n	%	Mean	SD	n	%	Mean	SD
Age (years)			19.92	2.42			19.95	2.28			19.9	2.6
Race												
White or Caucasian	835	71.4			388	73.3			418	69.8		
Black or African American	52	4.4			19	3.6			32	5.3		
Hispanic or Latino	47	4			14	2.6			33	5.5		
Asian American	81	6.7			39	7.4			37	6.2		
Pacific Islander	1	0.1			0	0			1	0.2		
Native American	2	0.2			0	0			2	0.3		
Other	59	4.9			34	6.4			21	3.5		
Multiracial	93	7.7			35	6.6			55	9.2		
Sexual Orientation												
Straight/Heterosexual	1004	85.7			503	95.3			494	82.1		
Gay/Lesbian	22	1.7			2	0.4			12	2		
Bisexual	82	7			13	2.5			58	9.6		
Other Sexual Orientation	64	5.8			10	1.8			38	6.3		

Table 2. Behaviors and Psychological Outcomes of the Sample

	Total Sample (n= 1207)				Males (n= 532)				Females (n= 602)				t or χ^2
	n	%	Mean	SD	n	%	Mean	SD	n	%	Mean	SD	
Behavior													
Moderate Physical Activity (min/week)			210.27	234.15			207.02	239.23			218.08	232.13	0.78
Vigorous Physical Activity (min/week)			220.4	271.15			265.85	282.19			192.04	262.44	4.56*
Metabolic Equivalents (MET- min/week)			2627.84	2620.11			2965.32	2640.73			2432.81	2625.09	3.37
Strength Training (days/week)			2.06	2.03			2.63	2.07			1.62	1.87	8.6*
Sleep (days/week)			3.76	1.73			3.98	1.77			3.56	1.68	4.12
Alcohol (drinks/week)			4.72	7.36			5.34	8.51			4.31	6.12	2.37***
Grade Point Average			3.43	0.5			3.37	0.5			3.49	0.47	3.8*
Body Mass Index (kg / m2)			22.45	5.98			23.29	6.07			21.7	5.76	4.46
Psychological													
Stress			19.85	6.88			18.39	7.04			20.92	6.42	6.31*
Depression			6.57	4.48			5.57	4.2			7.23	4.41	6.39
Adverse Childhood Experiences													
Yes	313	28.8			104	21.2			193	34.8			23.68*
No	773	71.2			387	78.8			361	65.2			

Table Key: * = Correlation is significant at the .05 level (2-tailed).

** = Correlation is significant at the .01 level (2-tailed).

*** = Correlation is significant at the .001 level (2-tailed).

Table 3. Relationship Between Main Outcome Variables and ACE Status for Males

	Had ACEs n= 104	Did not have ACEs n= 387	
	Mean (SD)	Mean	t
Moderate Physical Activity (min/week)	231.54	195.54	0.84
Vigorous Physical Activity (min/week)	248.93	272.11	-1.06
Metabolic Equivalents (MET- min/week)	2917.62	2973.88	-0.6
Strength Training (days/week)	2.59	2.63	-0.75
Sleep (days/week)	3.81	4.02	-0.62
Alcohol (drinks/week)	7.35	4.8	-1.21**
Grade Point Average	3.32	3.38	-1.48
Body Mass Index (kg / m ²)	24.02	23.08	1.72
Stress	18.84	18.16	1.55
Depression	6.79	5.21	2.40***

Table Key: * = Correlation is significant at the .05 level (2-tailed).

** = Correlation is significant at the .01 level (2-tailed).

*** = Correlation is significant at the .001 level (2- tailed).

Table 4. Relationship Between Main Outcome Variables and ACE Status for Females

	Had ACEs n= 193	Did not have ACEs n= 361	t
Moderate Physical Activity (min/week)	190.74	238.71*	-2.3
Vigorous Physical Activity (min/week)	145.02	226.59***	-3.43
Metabolic Equivalent (MET- min/week)	1942.82	2792.43***	-3.55
Strength Training (days/week)	1.42	1.75	-1.95
Sleep (days/week)	3.35	3.62	-1.81
Alcohol (drinks/week)	4.55	4.31	0.44
Grade Point Average	3.46	3.49	-0.77
Body Mass Index (kg / m2)	21.85	21.6	0.46
Stress	22.66	20.15***	4.47
Depression	9.03	6.49***	6.63

Table Key: * = Correlation is significant at the .05 level (2-tailed).

** = Correlation is significant at the .01 level (2-tailed).

*** = Correlation is significant at the .001 level (2- tailed).

BIBLIOGRAPHY

- American College Health Association (2006). American College Health Association National College Health Assessment (ACHA-NCHA) Spring 2005 reference group data report (Abridged) *Journal of American College Health*, 55(1): 5-16. DOI: [10.3200/JACH.55.1.5-16](https://doi.org/10.3200/JACH.55.1.5-16)
- American Psychological Association. (2012). 2010 Stress in America: Gender and Stress. *American Psychological Association*. Retrieved from: [2010 Gender and Stress \(apa.org\)](https://www.apa.org/pubs/journals/abp/2010-gender-and-stress)
- Armstrong, T., & Bull, F. (2006). Development of the World Health Organization Global Physical Activity Questionnaire. (GPAQ). *J Public Health*, 14(12), 66-70.
- Boisgontier, M.P., Orsholits, D., von Arx, M., Sieber, S. (2020). Adverse childhood experiences, depressive symptoms, functional dependence, and physical activity: A moderated mediation model. *Journal of Physical Activity and Health*, 17(8), 790-799. <https://doi.org/10.1123/jpah.2019-0133>
- Bondarev, D., Sipilä, S., Finni, T., Kujala, U.M., Aukee, P., Kovanen, V., Laakkonen, E.K., Kokko, K. (2021). Associations of physical performance and physical activity with mental well-being in middle-aged women. *BMC Public Health*, 21, 1448. <https://doi.org/10.1186/s12889-021-11485-2>
- Bravo, A. J., Pearson, M. R., Stevens, L. E., & Henson, J. M. (2016). Depressive symptoms and alcohol-related problems among college students: A moderated-mediated model of mindfulness and drinking to cope. *Journal of Studies on Alcohol and Drugs*, 77(4), 661–666. <https://doi.org/10.15288/jsad.2016.77.661>

Centers for Disease Control and Prevention (2021). Behavioral Risk Factor Surveillance System Survey Questionnaire, 2020. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention (2021). We Can Prevent Childhood Adversity.

Centers for Disease Control and Prevention. Retrieved from:

<https://vetoviolenecdc.gov/apps/aces-infographic/home>

Centers for Disease Control and Prevention. (2019). Adverse Childhood Experiences (ACEs), Preventing early trauma to improve adult health. *Centers for Disease Control and Prevention*. Retrieved from: <https://www.cdc.gov/vitalsigns/aces/pdf/vs-1105-aces-H.pdf>

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24, 386-396.

Collins R.L., Parks G.A., Marlatt G.A (1985). Social determinants of alcohol consumption: the effects of social interaction and model status on the self-administration of alcohol. *Journal of Consulting and Clinical Psychology*, 53(2):189-200. DOI: [10.1037//0022-006x.53.2.189](https://doi.org/10.1037//0022-006x.53.2.189)

Crouch, E., Radcliff, E., Strompolis, M., & Wilson, A. (2018). Adverse Childhood Experiences (ACEs) and Alcohol Abuse among South Carolina Adults. *Substance use & misuse*, 53(7), 1212–1220. <https://doi.org/10.1080/10826084.2017.1400568>

Cuijpers, P. Cristea, I.A., Ebert, D.D., Koot, H.M., Auerbach, R.P., Bruffaerts, R., Kessler, R.C. (2015). Psychological treatment of depression in college students: A metaanalysis. *Depression and Anxiety*, 33(5), 400-414. <https://doi.org/10.1002/da.22461>

- Edwards, E. S., & Sackett, S. C. (2016). Psychosocial Variables Related to Why Women are Less Active than Men and Related Health Implications. *Clinical Medicine Insights: Women's Health*, 9(1), 47–56. <https://doi.org/10.4137/CMWH.S34668>
- Eisenberg, D., Ketchen Lipson, S. Zhou, S. (2020). The Healthy Minds Study, Fall 2020 Data Report. *The Healthy Minds Network*. Retrieved from: <https://healthymindsnetwork.org/wp-content/uploads/2021/02/HMS-Fall-2020-National-Data-Report.pdf>
- Grigsby, T.J., Rogers, C.J., Albers, L.D. (2020) Adverse childhood experiences and health indicators in a young adult, college student sample: differences by gender. *International Journal of Behavioral Medicine*, 27, 660–667. <https://doi.org/10.1007/s12529-020-09913-5>
- Harada, M., Guerrero, A., Iyer, S., Slusser, W., Szilagyi, M., Koolwijk, I. (2021). The relationship between adverse childhood experiences and weight-related health behaviors in a national sample of children. *Academic Pediatrics*, 21(8), 1372-1379. <https://doi.org/10.1016/j.acap.2021.05.024>
- Huang, J., Nigatu, Y.T., Smail-Crevier, R., Zhang, X., Wang, J. (2018). Interventions for common mental health problems among university and college students: A systematic review and meta-analysis of randomized controlled trials. *Journal of Psychiatric Research*, 107, 1-10. <https://doi.org/10.1016/j.jpsychires.2018.09.018>
- Karatekin, C. (2017). Adverse childhood experiences (ACEs), stress and mental health in college students. *Stress and Health*, 34(1), 36-45. <https://doi.org/10.1002/smi.2761>
- Kenney, S., Jones, R. N., & Barnett, N. P. (2015). Gender differences in the effect of depressive symptoms on prospective alcohol expectancies, coping motives, and alcohol outcomes in

- the first year of college. *Journal of Youth and Adolescence*, 44(10), 1884–1897.
<https://doi.org/10.1007/s10964-015-0311-3>
- Largo-Wight, E., Peterson, P. M., & Chen, W. W. (2005). Perceived problem solving, stress, and health among college students. *American Journal of Health Behavior*, 29(4), 360-70.
<https://doi.org/10.5993/AJHB.29.4.8>
- Manyema, M., Norris, S. A., & Richter, L. M. (2018). Stress begets stress: the association of adverse childhood experiences with psychological distress in the presence of adult life stress. *BMC Public Health*, 18(1), 835. <https://doi.org/10.1186/s12889-018-5767-0>
- Moon, I. Han, J. (2022). Moderating effects of physical activity on the relationship between adverse childhood experiences and health-related quality of life. *International Journal of Environmental Research and Public Health*, 19, 668.
<https://doi.org/10.3390/ijerph19020668>
- National Conference of State Legislatures. (2022). Adverse Childhood Experiences. *National Conference of State Legislatures*. Retrieved from:
<https://www.ncsl.org/research/health/adverse-childhood-experiences-aces.aspx>
- National Institute of Mental Health. (2022). Prevalence of any anxiety disorder among adults. *National Institutes of Health*. Retrieved from:
<https://www.nimh.nih.gov/health/statistics/any-anxiety-disorder>
- Pedrelli, P., Nyer, M., Yeung, A., Zulauf, C., & Wilens, T. (2015). College students: mental health problems and treatment considerations. *Academic Psychiatry: The Journal of the American Association of Directors of Psychiatric Residency Training and the Association for Academic Psychiatry*, 39(5), 503–511. <https://doi.org/10.1007/s40596-014-0205-9>

Physical Activity Guidelines Advisory Committee. (2018). Physical Activity Guidelines Advisory Committee Report, 2018.

Radloff, L.S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurements, 1*, 385-401.

Substance Abuse and Mental Health Services Administration. (2020). 2020 National Survey of Drug Use and Health (NSDUH) Releases. *Substance Abuse and Mental Health Services Administration*. Retrieved from: <https://www.samhsa.gov/data/release/2020-national-survey-drug-use-and-health-nsduh-releases>

Vernig, P.M., Orsillo, S.M. (2014). Drinking motives and college alcohol problems: a prospective study. *Journal of Substance Use, 20*(5), 340-246.
<https://doi.org/10.3109/14659891.2014.923053>

Watt, T., Kim, S., Ceballos, N., & Norton, C. (2020). People who need people: the relationship between adverse childhood experiences and mental health among college students. *Journal of American college health : J of ACH*, 1–9. <https://doi.org/10.1080/07448481.2020.1791882>

Whitaker, R.C., Dearth-Wesley, T., Herman, A.N., Block, A.E., Holderness, M.H., Waring, N.A., Oakes, J.M. (2021). The interaction of adverse childhood experiences and gender as risk factors for depression and anxiety disorders in US adults: a cross-sectional study. *BMC Public Health 21*, 2078. <https://doi.org/10.1186/s12889-021-12058-z>

ACADEMIC VITA

Lucy Race

lucyrace33@gmail.com

lfr5169@psu.edu

EDUCATION **Bachelor of Science in Kinesiology**
Schreyer Honors College
The Pennsylvania State University, University Park, PA
Anticipated Graduation: May 2022

PROFESSIONAL EXPERIENCE **Emergency Medical Technician** August 2020 – Present
University Ambulance Services, University Park, PA

- Took primary on treating patients on calls in a fast-paced environment
- Utilized skills such as patient assessment, monitoring of vital signs, oxygen therapy, and patient stabilization to effectively mitigate patient symptoms
- Practiced skills of communication, compassion, and empathy to comfort patients in their time of need
- Trained volunteers in learning the skills necessary to become a competent EMT

Resident Assistant August 2020 – Present
Schreyer Honors College, University Park, PA

- Ensured the hall was a safe, inclusive, and comfortable living space for 30 residents
- Collaborated with a team of 14 RAs to enforce all residence hall policies
- Held the role of Accountability Liaison in where I ensured all other RAs, and my Residence Life Coordinator completed their assigned duties in a timely manner
- Served as Mental Health Advocate for Simmons Hall where I planned programs to improve the mental well-being of the residents

Kinesiology Undergraduate Researcher May 2021 – Present
Physical Activity and Public Health Laboratory, University Park, PA

- Research assistant under Dr. Melissa Bopp for undergraduate thesis research in the Schreyer Honors College
- Studied the relationship between adverse childhood experiences, mental health outcomes, and physical activity in college students

Camp Aide at Watson Inclusive Summer Program June – July 2019
Chatham University, Pittsburgh, PA

- Worked with an autistic child to develop her social skills in a typical summer camp setting by encouraging appropriate interactions with other campers
- Planned camper's weekly goals and monitored her progress each day, introducing new strategies to calm her behaviors when necessary

INVOLVEMENTS Member, Changing Health, Attitudes, and Actions to Recreate Girls 2018 – 2021
Member, Penn State Navigators 2019 – 2021
Learning Edge Academic Program Mentor 2019 – 2020
Community Chair, Empower Orphans 2019 – 2020

ACHIEVEMENTS Dean's List: Fall 2018 – Fall 2021
Recipient, The Pennsylvania State University Academic Excellence Scholarship