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Physiological responses between collegiate female athletes versus collegiate female non-athletes to body image, nutrition, and mental health inquiries.

Molly McChesney
mam571@uakron.edu

Jenna Holloway
jeh161@uakron.edu

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Molly McChesney and Jenna Holloway

School of Exercise and Nutrition Sciences

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Approved:

Date: 4-10-2023
Honors Project Sponsor (signed)

Stephanie Davis-Dieringer
Honors Project Sponsor (printed)

Stephanie Davis-Dieringer
Date: 4-20-2023
Reader (signed)

Reader (printed)

Kaitlyn Coerse
Date: 5/1/23
Reader (signed)

Melissa G. Smith
Reader (printed)

Melissa G. Smith

Accepted:

Date:
Honors Department Advisor (signed)

Honors Department Advisor (printed)

Jenna Hollowell
Date: 5-3-2023
School Director (signed)

Judith A. Juvancic-Heltzel
School Director (printed)

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A Research Project

Presented to

The Williams Honors College at The University of Akron

Molly McChesney and Jenna Holloway

Abstract

Participation in college athletics poses numerous demands on young adults. Not only are there academic demands to remain eligible for competition, but there are physical and mental demands that often go unnoticed. With all these demands, it is understandable how one's nutrition, body image, and mental health may go on the back burner, resulting in insufficiencies in all three categories. The results from this study suggest that athletes displayed stronger physiological responses with respect to heart rate and blood pressure when responding to the surveys surrounding the topics of mental health, body image, and nutrition as compared to non-athletes. The presence of elevated physiological responses to these topics can assist in suggesting that these topics have a higher stress inducing effect on athletes as compared to non-athletes. We hope to inspire additional research on this important topic and continue to prove its relevance in college athletics, specifically for female athletes.

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Introduction

Participation in college athletics poses numerous demands on young adults. These demands include, but are not limited to, academic pressure to remain eligible and on track to graduate, athletic pressure to perform and compete for positions, potentially living far from home, time management between athletic commitments, academic deadlines, and maintaining social connections, all while maintaining sufficient nutritional quantities and getting enough sleep. Not only are there academic demands to remain eligible for competition, but there are physical and mental demands that often go unnoticed. At the Division 1 collegiate level, teams are allowed a certain amount of contact hours depending on whether you are in-season or out of season. Contact hours are any hours that players are being coached, which may include mandatory practices and conditioning. At the highest, teams are allowed 20 hours per week for practices and conditioning. Any additional volunteering or other team or athletic commitments such as optional training sessions, team meetings, or team study sessions are not included in the 20-hour limit. One should also remember that athletes at the Division 1 level must be actively enrolled in at least 12 credit hours academically while maintaining a GPA of 2.3 to be eligible for competition. With all these demands, it is understandable how one's nutrition, body image, and mental health may go on the back burner, resulting in insufficiencies in all three categories. There is also the likelihood of increased stress leading to the physiological responses of increased heart rate and blood pressure when these topics arise for these individuals. When undergoing a stress-inducing experience, the hypothalamus sets off a combination of nerve and hormonal signals, prompting the adrenal glands to secrete adrenaline and cortisol. Adrenaline increases heart rate and elevates blood pressure while cortisol increases glucose concentration in the bloodstream (Pruthi, 2021). Discussions about nutrition, mental health, or body image may

trigger responses such as an elevated heart rate and blood pressure. The stigma surrounding these topics makes it difficult for athletes to feel comfortable addressing their own stories, especially for the fear of it being viewed as a weakness.

As the authors of this paper, we can contribute our personal experiences which led us to pursue this research topic with one of us being in our fourth year of collegiate athletics at The University of Akron and the other being in our fourth year enrolled as a traditional student. The narrative that we can provide from the student-athlete perspective is important in understanding the relevance we have to this topic. The ultimate goal of this research is to determine if there is a difference in physiological responses between female collegiate athletes and female collegiate non-athletes at The University of Akron when responding to various questionnaires addressing body image, mental health, and nutrition. More specifically, the Multidimensional Body Self-Relations Questionnaire (Cash, 2015), Objectified Body Consciousness Scale (McKinley & Hyde, 1996), Fear of Negative Appearance Evaluation (Lundgren et al., 2004), Eating Disorders Inventory (Clausen et al., 2010), and the Rosenberg Self-Esteem Scale (Sinclair et al., 2010). Each of these questionnaires are found in Appendix A. The current research on this topic is sufficient to clearly identify the issue at hand. There is clear data that there is a prevalence of eating disorders and body image disturbances within the collegiate athlete population. It is our hope that our data not only aids in confirming these findings as also being present at The University of Akron, but also to determine if there are differences in physiological responses to these difficult topics between female athletes versus non-athletes. A secondary goal is to determine if there is a difference in physiological responses between those females on different athletic teams as well as participants of different ages. Assuming there are differences, we aim to draw attention toward the prevalence of the nutritional insufficiency, inadequate self-image, and

poor mental health of female collegiate athletes at The University of Akron. The presence of physiological responses to these topics can assist in suggesting that these topics have resulted in stressors and different anxieties these females, whether athlete or non-athlete, must tackle daily. We also hope to inspire additional research on this important topic and continue to prove its relevance in college athletics, specifically for female athletes.

By presenting this research, we hope that it will educate professionals regarding the physiological responses of athletes to questions about mental health, body image, and nutrition. Assuming an increase in physiological responses, we can assume correlation to the increase in stress or anxiety caused by these types of questions based on personal experiences with nutrition, mental health, and body image dysfunction. The audience will be able to view our results, become further educated regarding these subjects, and investigate what they can do as coaches, supervisors, and trainers. Understanding clients have specific needs that may surround difficult topics elevates the health profession by including an emotional aspect. Changing approaches to certain clientele may be necessary to help them best achieve their goals without triggering a sensitive topic in the process. Not only does this make health professionals more well-rounded, but it will allow them to have more honest, emotional, and sincere conversations and professional relationships with their clients and patients which in turn will better their experience and make them feel more comfortable, heard, and seen.

Literature Review

Mental Health

Mental health is defined as one's emotional, psychological, and social well-being. It affects how individuals think, feel, and act. It also helps determine how one may handle stress, relate to others, and make healthy choices. Mental health is important at every stage of life, from childhood and adolescence through adulthood (Centers for Disease Control and Prevention, 2021). The athletic population is vulnerable to a range of mental health problems to which traditional students cannot relate. Elite athletes appear to experience a broadly comparable risk of high-prevalence mental disorders relative to the general population (Rice et al., 2016). Collegiate student athletes are faced with the same developmental challenges and stressors as their non-athlete peers, but they are also expected to deal with the challenges of athletic involvement (e.g., time demands, physical demands, travel schedules). Such additional demands may put athletes at greater risk for experiencing physical and psychological health problems. Intercollegiate athletes are often perceived by the public to be an exceptionally healthy group of people who are not normally in need of help. In truth, collegiate athletes are usually physically healthy. However, this is not true of all athletes, nor is it always true about their mental health (Etzel et al., 2006). Elite athletes face a unique array of stressors, including the pressures of increased public scrutiny through mainstream and social media, limited support networks due to relocation, group dynamics in team sports and the potential for injuries to end careers prematurely. A greater risk of disorder may be experienced by elite athletes who are injured, approaching/in retirement or experiencing performance difficulty. Athletes tend not to seek support for mental health problems for reasons such as stigma, lack of understanding about mental health and its potential influence on performance, and the perception of help seeking as a sign of weakness. While both female collegiate athletes and non-athlete female students have similar access to the mental health services at their schools, they are not utilized as much by the

athletes. Collegiate athletes have been found to underutilize campus health services even more so than their nonathletic peers. The stigma of "being depressed" or "seeing a counselor" is often considered a "weakness" by the athletic subculture. According to a study conducted by Charles Cox (2015), when asking if female athletes knew how to receive the mental health support that they need, around 25% of the athletes did not know how to access it. Additionally, it was found that over 44% of athletes had not received any mental health education through their athletic department (Cox, 2015). While it is well established that physical activity has a positive effect on mental health, a review has found that intense physical activity performed at the elite athlete level might instead compromise mental wellbeing, increasing symptoms of anxiety and depression through overtraining, injury and burnout (Rice et al., 2016). Athletes are trained to be both physically and mentally tough; therefore, feelings of hopelessness, loneliness, and lack of self-worth are viewed as personal flaws, but, are symptoms of mental illness which can effectively be treated. This unequal level of pressure could put athletes at increased risk for depressive symptomatology (Armstrong et al., 2015). Statistics indicate that in any given year, tens of thousands of college athletes struggle with psychological issues. "Mental illness is probably one of the greatest silent epidemics in our country. It's a public health issue and now we're seeing it more and more in our student-athletes," said Timothy Neal, assistant athletic director for sports medicine at Syracuse University (Noren, 2014). "One in every four to five young adults has mental health issues, but what is unique about the student-athlete is they have stressors and expectations of them unlike the other students that could either trigger a psychological concern or exacerbate an existing mental health issue" (Noren, 2014). Athletic departments handle psychological concerns in very different ways, and at many schools, mental health resources are downright sparse when compared to those dedicated to the physical health of

the athletes. Many athletic programs have medical staff of more than a dozen people, yet fewer than 25 Division I athletic departments have a full-time licensed mental health practitioner on staff (Noren, 2014). Ultimately, sport performance should not come at the expense of an athlete's health and well-being (Etzel et al., 2006). An unrealistic expectation is put in place regarding the ability of these athletes to remain not only physically strong, but mentally strong as well to battle through injuries, road trips, altered eating schedules, academics, and long seasons. It is understandable how mental health can be given inadequate attention. The busy schedule of a student athlete leaves very little time for anything other than sleep, practice/games, classes, and homework/studying. During the travel season, academic responsibilities on top of frequent competition may lead to further reduced sleep. A study has shown that the quality of sleep or duration can affect student athletes' mental health. It was found that shorter sleep duration is associated with higher levels of stress, depression, anxiety, more poor mental health days, and decreased social support from family (Grandner et al., 2020). Athletes should be able to receive support from everyone in their life, especially those in the athletic department and their own coaching staff. If an athlete feels that they do not have a good support system or have bad relationships with their coaches, that could be detrimental to their mental health and overall well-being. All the stressors discussed in this section can potentiate diminished mental health which in turn may lead to different athletic-related anxieties and an increase in physiological responses when performing or even just simply thinking about their athletics. This relates to the data of short-term psychological stress causing a significant increase in heart rate (Delaney & Brodie, 2000) and systolic blood pressure being significantly associated with anxieties (Mucci et al., 2016).

Body Image and Nutrition

Body image is a combination of the thoughts and feelings one has about one's body (National Eating Disorders Association, 2022). Body dissatisfaction occurs when a person has persistent negative thoughts and feelings about their body (National Eating Disorders Association, 2022). This emotional and cognitive process may be influenced by external factors such as pressures to meet a certain appearance ideal. Body dissatisfaction can drive people to engage in unhealthy weight-control behaviors, particularly disordered eating (National Eating Disorders Association, 2022). Stressful life events have also been found to be positively associated with extreme weight control behaviors. These events are associated with higher levels of depression and anxiety. It is possible that disordered eating behaviors may serve to regulate the negative effect that accompanies stressful life events (Loth et al., 2008). Because college student athlete's lives are remarkably regimented and often closely monitored by coaches, sports medicine professionals, nutritionists, and others, some may assume that this unique group is somehow at lower risk for engaging in unhealthy, dysfunctional eating (e.g., skipping meals, eating on the run, eating cheap unhealthy foods) and less vulnerable to developing eating disorders. In fact, it is quite the contrary; student athletes appear to be at greater risk than their non athlete peers for various eating disorders (Etzel et al., 2006). Eating disorders are particularly common in female adolescents and young adults (90% of cases occur in people under the age of 25) and seem to be more prevalent among athletes than in the general population (Petisco-Rodríguez et al., 2020). Female collegiate athletes often experience the same societal pressures to be thin, lose weight, and be more aesthetically appealing as their nonathletic peers. A pivotal difference, though, is that athletes are often either internally or externally pressured to maintain a certain weight, muscle mass, and appearance for peak performance.

Disordered eating can negatively affect every aspect of a collegiate athlete's life, often leading to a lack of concentration in academics, athletic underachievement, social withdrawal, and feelings of sadness, irritability, and hopelessness (Torres-McGehee et al., 2011). Another report provided similar data while stating that female athletes encounter the same sociocultural pressures as that of non-athletes, however the increased demand of sport related pressures may independently or dependently increase their risk of eating disordered attitudes and behaviors (Kato et al., 2011). The Multidimensional Body-Self Relations Questionnaire (Cash, 2015) was used in a study conducted on female athletes of Division I and Division III. The study showed that 24.2% of Division I female athletes and 30.7% of Division III female athletes were either very dissatisfied or mostly dissatisfied with their overall appearance" (Kato et al., 2011). While there is sufficient literature supporting the prevalence of disordered eating within the college athlete population as compared to non-athletes, there is also opposing evidence. For example, a study reported that female athletes are more satisfied with the overall shape of their body than non-athletes and that collegiate female athletes also feel more positively about the functions and abilities of their body than non-athletes (Varnes et al., 2013). Another study reported that athletes have a better perceived body image as compared to non-athletes (Blum et al., 2010). It is important to analyze a topic in its entirety, especially when there is conflicting information regarding the results of similar studies. Both sets of results are to be considered and appreciated given this present study. An additional aspect of college athletics that requires significant attention is the number of stresses and pressures placed on an athlete at any given time. Due to the pressures within the sports environment, female athletes may develop unhealthy eating practices to lose weight or change their body size or shape to become more competitive and meet societal and sport-related physique ideals. These pressures may come from coaches, teammates, the wearing of certain

uniforms, or even athletic event judges (Reel et al., 2013). In a study performed at Davidson College with female Division 1 athletes from a range of sports, it was found that weight pressures from parents, peers, and the media were directly associated with body dissatisfaction. Moreover, these pressures were indirectly associated with disordered eating via their associations with thin- and muscular-ideal internalization (Pallotto et al., 2022). Efforts to achieve perfectionism may be a common outcome resulting from these pressures. Perfectionism is a personality characteristic that entails a combination of exceedingly high standards and a preoccupation with extreme self-critical evaluation (Frost et al., 1990). Research has demonstrated a positive relationship between perfectionism and many different forms of anxiety. Anxiety is one of the most common emotional responses in athletes, which has evident consequences on performance. Increases in anxiety, lowered self-esteem, and high aims of perfectionism appear to be important risk factors for body image dissatisfaction and eating disturbance (Petisco-Rodríguez et al., 2020). Another notable point is the masculinity standards that come with athletics. Female athletes often participate in sports using standards of traditional male athleticism, yet at the same time, attempt to manage societal expectations of conforming to traditional femininity. Female athletes have reported that they perceive themselves as being different from their non-athlete female peers and they view themselves to have characteristics that are more like men (Steinfeldt, 2011). To counter the masculinity of athletics, female athletes also are subject to sexualization. A study describes a theory termed the "Objectification Theory" which explains the common sexualization of women's bodies today. This makes it difficult for female athletes to not only feel confident in their appearance sexually, but also in their body, to be able to achieve their optimal sports performance and meet the athletic demands of their sport (Escalante, 2016). A common misconception with female athletes is that they will perform better

at their respective sport if they achieve the lowest possible body fat and weight (Coelho et al., 2014). The root of many body image issues within the female athlete population may stem from the locker room. This setting serves as an environment in which athletes may be most vulnerable. Exposing one's body to change in and out of uniform or practice apparel can be daunting for those who are self conscious or uncomfortable in those settings. One's teammates are supposed to be built-in best friends but at times they may fail to act as such. Among female athletes, perceived weight pressure from teammates is associated with greater drive for thinness and body dissatisfaction. Negative comments about weight or appearance from teammates may influence unhealthy eating-related attitudes and behaviors. A study found that athletes receiving a critical comment from a teammate resulted in significantly higher eating/exercise psychopathology, anxiety, and lower self-esteem compared to those who had not. It was also found that reported weight/shape comments were more severe among female over male athletes (Scott et al., 2022). Athletes may also compare their own weight or shape and eating behaviors to their teammates which can lead to competitive weight-control behaviors (Pallotto et al., 2022). All topics discussed in this section warrant themselves as being stress or anxiety inducing. Pressures to maintain a certain body image for athletic performance while attempting to maintain femininity, encountering unhealthy body image comparisons among teammates, and a constant aim for perfectionism on all fronts contribute to the increases in stress and anxiety that athletes endure daily. Based on the information addressed previously of increases in physiological values of heart rate and blood pressure when encountering stress or anxiety inducing situations, the connection can be made regarding the topics discussed here as being stress or anxiety inducing, ultimately leading to increases in heart rate and blood pressure.

Physiological Responses

A stressful situation sets off a chain of events. Your body releases adrenaline, a hormone that temporarily causes your breathing and heart rate to speed up and your blood pressure to rise. These reactions prepare you to deal with the situation — the "fight or flight" response (American Heart Association, 2021). When someone experiences a stressful event, the amygdala, an area of the brain that contributes to emotional processing, sends a distress signal to the hypothalamus. After the amygdala sends a distress signal, the hypothalamus activates the sympathetic nervous system by sending signals through the autonomic nerves to the adrenal glands. These glands respond by pumping the hormone epinephrine into the bloodstream. As epinephrine circulates through the body, it brings on many physiological changes. The heart beats faster than normal, pushing blood to the muscles, heart, and other vital organs. Pulse rate and blood pressure go up. The person undergoing these changes also starts to breathe more rapidly. This combination of reactions to stress is also known as the "fight-or-flight" response because it evolved as a survival mechanism, enabling people and other mammals to react quickly to life-threatening situations. The carefully orchestrated yet near-instantaneous sequence of hormonal changes and physiological responses helps someone to fight the threat off or flee to safety. Unfortunately, the body can also have this response to stressors that are not life-threatening. (Harvard Medical School, 2020). After your stress subsides, your blood pressure and heart rate should return to normal (Wojcik & Kang, n.d). Correlating behavioral observations with simultaneous measures of heart rate provides an important validation for using behavioral indicators of individual arousal and stress (Wascher, 2021). In studies of post-traumatic stress disorder (PTSD), heart rate has been used as an objective measure of reactions to trauma-related stimuli. Results showed a positive association between PTSD severity and heart rate increases when trauma memories were

involuntarily triggered by reminders. A high heart rate correlated with increased fear and anxiety, whereas a low heart rate correlated with a relatively calmer state (Chou et al., 2014). This reported increase in heart rate following the introduction of trauma provoking memories provides analysis regarding how individuals respond physiologically to content that may be triggering. In another study, it was reported that heart rate increased significantly from baseline to stress task thus suggesting a successful stress induction (Schneider et al., 2021). Another study found that there was a significant increase in heart rate when subjects were acutely stressed, suggesting a rise in somatic nervous system (SNS) activity (Schubert et al., 2009). All these studies support the idea that increases in stressors result in increases in the physiological measurement of heart rate. In the populations studied, heart rate was found to increase following the addition of the stressor into the study. Whether it be reminders of traumatic memories or the induction of a stressful task, the consistent response between the studies was an increase in heart rate. The same can also be discussed regarding blood pressure. Exaggerated cardiovascular response to acute and chronic stressors has been found to increase the risk for hypertension (Ayada et al., 2015). An article in the Journal of Hypertension states that repetitive (stress-induced) sympathetic stimulation can induce transient rises in blood pressure (Unger & Parati, 2005). In one study, an increase in blood pressure levels was reported in situations of high global subjective stress, negative social interactions, and when acute stressors in general and within life domains occurred (Weber et al., 2022). A different study measured workplace induced stress, finding blood pressure increases ranging from 1.5 to 11 mmHg among exposed workers in prospective studies (Trudel et al., 2018). A study consisting of majority undergraduate female subjects measured physiological responses while being asked to write on paper about different traumatic events they have experienced in their lives. It was found that in doing so, there was a short-term

physiological arousal that took place. More specifically, they determined an increase in blood pressure while responding to the stressing content (Pennebaker & Beall, 1986). While the previous studies mentioned consist of subjects who are non-athletes, they still provide important data regarding trends in physiological responses to different stressors. Understanding how the general public respond to different stimuli allows for comparisons and assumptions to be made when considering the athletic population. Now, in view of the blood pressure response of athletes, a study reported that athletes who experience sport related anxiety may present with a wide spectrum of physiological symptoms and signs ranging from mild to debilitating. Somatic signs and symptoms may include increased blood pressure (Patel et al., 2010). These studies all align with the results of the previous studies of heart rate, however, involve measurement of blood pressure. Like heart rate, following the involvement of subjective stress, blood pressure increased. All the data provided supports the belief that heart rate and blood pressure increase when responding to stress. Stress in this case can be defined as a state of worry or mental tension caused by a difficult situation. Stress is a natural human response that prompts us to address challenges and threats in our lives (World Health Organization, 2023). Inductions of stressors related to mental health, body image, or nutritional habits may be triggering for some individuals, especially those who are at greater risk of experiencing trauma. Due to the repetitive stressors they encounter, athletes are a population who would fall into this category of being more susceptible to stressors, especially compared to the non-athlete population. As mentioned previously, the induction of stressors leads to elevations of heart rate and blood pressure.

Methodology

The procedures outlined in this section have been granted approval by the IRB at The University of Akron. The cohort for this study consisted of 30 females at The University of Akron. This cohort consisted of 15 athletes and 15 traditional students between the ages of 18-24. Traditional students are students who were enrolled at The University of Akron as of the 2022-2023 academic year and are not involved in collegiate athletics. The athletes were from different sports teams, including softball, lacrosse, soccer, dance, and track and field. Informed consent (Appendix B) was obtained from all participants prior to the beginning of their study. They were informed about the contents of the questionnaire, more specifically how the questions surround the topics of nutrition, mental health, and body image. They were also informed about the measurements of heart rate and blood pressure. Heart rate and blood pressure were measured before, during, and after completing the questionnaire. Initial heart rate and blood pressure was taken after the participant had been seated for five minutes. The second set of measurements took place after the participant completed their third questionnaire. Final measurements were taken immediately after the conclusion of the last questionnaire and again 5 minutes after the prior measurement. There were a total of 4 measurements. Heart rate was measured by assessing the participants pulse using a Pulse Oximeter (AccuMed, Houston, Texas) placed on the finger of the middle finger of the non-dominant hand. This measurement was taken by the same person for all participants to ensure standardization. Once resting heart rate was obtained, resting blood pressure was taken manually using a standard adult blood pressure cuff (Labtron, Graham-Field Health Products, Inc., Atlanta, Georgia) following American College of Sports Medicine (ACSM) guidelines (Riebe, 2018). Using the participants' right arm, the blood pressure cuff was placed around their brachial artery, just superior to their antecubital space. A Littmann stethoscope (Littmann Classic III, 3M Company, Saint Paul, Minnesota) was placed over the

brachial artery, inferior to their antecubital space and held there throughout the duration of the measurement. Participants were in a seated position with their legs uncrossed, resting on the floor. Their right arm was resting on the table in front of them. The blood pressure cuff was inflated to 20 mm Hg above the first Korotkoff sound, and then was released at 2-5 mm Hg per second. At this time, the measurer was listening for the first and last Korotkoff sounds, signifying the systolic and diastolic blood pressure values. Measurements for resting heart rate and resting blood pressure were recorded. This test was administered in a lab setting, with exercise equipment and comfortable tables to sit on. All participants were asked for their age and sports team for those applicable. All participants were given the same questionnaires, consisting of questions relating to self-image, nutrition, and mental health. The questionnaires that were used include the: Multidimensional Body Self-Relations Questionnaire (Cash, 2015), Objectified Body Consciousness Scale (McKinley & Hyde, 1996), Fear of Negative Appearance Evaluation (Lundgren et al., 2004), Eating Disorders Inventory (Clausen et al., 2010), and the Rosenberg Self-Esteem Scale (Sinclair et al., 2010). Only one questionnaire was completed at a time and it was administered using paper and pencil. All participants completed the questionnaires in the same order. This is the order in which they are listed above. After the first three questionnaires were complete, heart rate and blood pressure measurements were taken. Then, the final three questionnaires were given. Participant time to completion was not taken and is discussed in the limitations. During the rest period post survey completion, the participants were asked to remain seated and be conscious of their breathing. We asked that they refrain from drinking water or any other beverage to avoid any interference with physiological responses that may be taking place. This allowed for further standardization of the testing procedure and the potential of physiological response onset. Questionnaires were collected post-testing and participants were

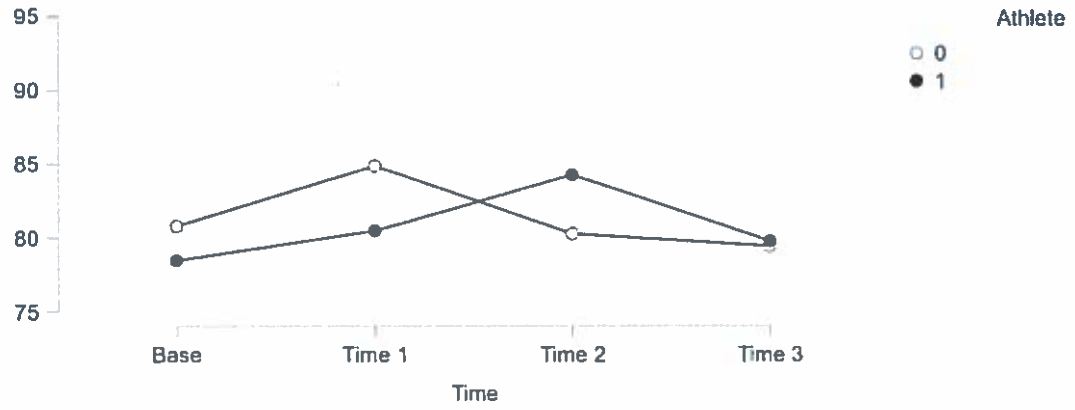
asked not to discuss the contents of the questionnaires at any time to avoid bias among other participants. Blood pressure and heart rate results were analyzed using Pearson product correlation and independent samples t-tests to evaluate relationship between heart rate, blood pressure, timeframe, and questions to determine any consistencies between testing groups, specific athletic teams, and ages of participants. More specifically, we analyzed the results to determine if there are any changes in heart rate or blood pressure when comparing initial measurements with subsequent time points. An increase in heart rate and/or blood pressure indicated an increase in physiological responses due to stressors or anxiety related to the contents of the questionnaire. At post survey completion, we verbally explained that the survey content data will not be used and is collected and destroyed at the end of the evaluation. The survey content is not what we evaluated, rather the physiological responses while taking the survey. We did not disclose this prior to them beginning the surveys because we wanted them to take the surveys seriously, so it did not skew the physiological responses while completing survey instruments. Participants were told that their ability to complete the survey was preferred, but they may seek to terminate the study at any point if they so choose. Their results were shared with them once they finished the questionnaires, and all measurements were completed. This included any changes in heart rate or blood pressure.

Results

Heart Rate

Figure 1

Comparison of heart rate in athletes versus non-athletes during questionnaires

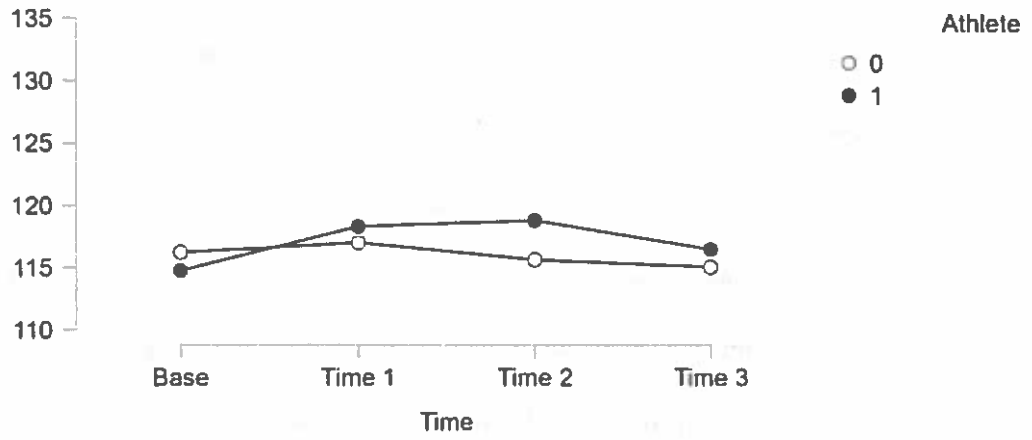


In comparing heart rates of athletes versus non-athletes, as seen in Figure 1, an elevation from resting values occurred in both populations following the measurement taken after the first set of surveys. This graph depicts non-athletes as "0" and athletes as "1". A decrease in heart rate then was shown following the measurement taken after the second set of surveys in the non-athletes whereas athletes showed a continued increase. The measurement taken after the five-minute recovery period showed decreases in heart rate to almost resting values among both groups.

Systolic Blood Pressure

Figure 2

Comparison of blood pressure in athletes versus non-athletes during questionnaires



In comparing systolic blood pressure of athletes versus non-athletes, as seen in Figure 2, both populations showed an increase from resting values following the measurement taken after the first set of surveys, with athletes demonstrating a greater increase than non-athletes. This graph depicts non-athletes as "0" and athletes as "1". The measurement taken following completion of the second set of surveys showed a slight decrease in blood pressure among non-athletes whereas the athletes showed a slight increase in blood pressure. The measurement taken after the five minute recovery period showed decreases in blood pressure to almost resting values among both groups.

Discussion

The results of this study support the current literature positing that heart rate increases from baseline to stress task following stress induction (Schneider et al., 2021), an increase in blood pressure while responding to the stressing content (Pennebaker & Beall, 1986), and after stress subsides, blood pressure and heart rate returning to normal (Wojcik & Kang, n.d). The results of heart rate show that both athletes and non-athletes initially had increases of heart rate

from their resting values following the first set of surveys. What is interesting is what occurs after the second set of surveys. With the second set containing questions more sensitive to how other people view you, questions about specific parts of one's body, and self-esteem, one may expect there to be an overall continued increase in heart rate among both groups, but the data suggests otherwise. Athletes were shown to have a continued increase in heart rate following the measurement taken after the second set of surveys whereas non-athletes showed a decrease compared to their measurement taken after the first set. This data suggests that athletes had stronger physiological responses with respect to heart rate when responding to the contents of the surveys as compared to non-athletes. Given that both athletes and non-athletes displayed decreases in heart rate back down to almost resting values following the five-minute recovery period suggests that the increase in heart rate is associated with the taking of the surveys.

Similar results are revealed when considering blood pressure. Increases in both groups were observed from resting values following the measurement taken after the first set of surveys. While athletes demonstrated a continued increase in blood pressure following the measurement taken after the second set of surveys, non-athletes showed a decrease. Then, once again, like heart rate responses, following the five-minute recovery period, both groups showed a decrease to almost resting values as the final measurement was taken. Based on these results, it can be stated that the contents of the surveys elicited greater elevations in heart rate and blood pressure in athletes at The University of Akron as compared to non-athletes.

While there were initial increases among non-athletes in both physiological measurements, there was ultimately a decrease in both heart rate and blood pressure following the second set of surveys. It is important to consider the information presented in the literature review regarding responses to anxiety and stress inducing topics. The introduction of a stressful

task results in an increase in heart rate (Schneider et al., 2021) as well as blood pressure (Pennebaker & Beall, 1986) due to the rise in SNS activity (Schubert et al., 2009). If the contents of the surveys were anxiety or stress inducing among the non-athlete group, a continued increase in heart rate and blood pressure is expected to have been observed. Results of the current study suggest that athletes were more influenced by the contents of the surveys, leading to greater increases in heart rate and blood pressure as compared to non-athletes.

In looking at subjective measurements from the surveys, a wide variety of information can be inferred. While participants engaged in the study by completing the surveys, observations were noted by researchers regarding facial expressions, changes in shifting body weight, and different non-verbal signs of the participants. Serious and stern demeanors were commonly reported as subjective observations among both groups. Another theme among both groups was an increase in subjective observations during the second set of surveys. More specifically, this includes an increase in concentration, seriousness, tapping of feet, shifts in body weight, blinking, clenching of jaw, pursing of lips, and deep breathing. This observation is consistent with the fact that the second set of surveys contained what could be perceived as more sensitive content. It is important to understand that signs and symptoms associated with anxiety include biting fingernails, defensive mannerisms, inhibited posture, repetitive movements, withdrawal, aggressive outbursts, fidgeting, avoiding eye contact, and covering face with hands (Patel et al., 2010). In general, the athlete group engaged in more fidgeting behaviors whether it be tapping of the pen, picking at fingers, touching face, tapping of feet, and shifting of body weight as compared to the non-athlete group. In a few participants, laughing, flushing of the face, and significant heart rate fluctuation occurred. These observations suggest that athletes exhibited greater anxiety related mannerisms than non-athletes during completion of the surveys.

There are several limitations that should be given consideration for this research study. Only so much information can be obtained from a small sample size. Despite the trends that were present in the data, a sample size of 30 is relatively small and should be taken into consideration when analyzing the results. Additionally, due to the limited sample size, conclusions regarding participants of the same age or athletic team are unable to be made. Increasing sample size and conducting additional research may demonstrate differences in different demographics. It should be noted that obtaining student athletes for testing is difficult given inconsistencies in practice schedules, travel in and out of season, and class times between sports. Continuing this study with additional participants is at the forefront of current priorities. The handedness of participants is another limitation that was encountered. Based on the hand that participants used to write for the surveys, blood pressure cuffs were adjusted for individual comfort. Because this was not standardized, it should be considered as a possible limitation. Analyzing heart rate and blood pressure comes with two limitations. These include the possibility of equipment malfunction and the possibility of technician error. While it is assumed that the pulse oximeters and sphygmomanometers functioned properly through the duration of all testing, it should be noted that the same equipment was not used for each participant. Technician error is another limiting factor that should be considered. In addition to having multiple technicians, incorrectly reading the pulse oximeter and mistaking the oxygen saturation reading for the heart rate reading or inaccurately listening to Korotkoff sounds are common sources of error and should be considered for this study. Another limiting factor may be the amount of time that took place between the completion of surveys and the beginning of blood pressure and heart rate measurements. This was not standardized and may serve as a source of error if participants were given more or less time to have their physiological values change as compared to what they were while working on

the surveys. If we were to complete this study again, it is suggested that these pivotal moments during testing be standardized. It is also suggested that if a repeated study were completed, additional attention would be given toward the subjective observations made and analyzing more in depth the psychology behind certain mannerisms and behaviors observed throughout the taking of the surveys. It would also be interesting to see how long it takes to complete individual surveys. This will add another layer of analysis in determining if athletes have to think for longer periods of time to answer the difficult questions that the surveys entail. Finally, taking into consideration the status of the menstrual cycle and sexual activity of the females being tested may yield valuable information regarding their resting physiological responses and is something to keep in mind with future studies.

This study may serve as the foundation for pivotal research on this important topic. Including only females at The University of Akron allowed for precise data to be collected regarding the well-being of female athletes and non-athletes. While females are commonly thought of when considering the topics of nutrition, body image, and mental health, especially in the age range of 18-24 years of age, the male population should not be dismissed. It is suggested that this study opens the door for subsequent research to be conducted including the male student body and student-athletes at The University of Akron. In doing so, not only can the same data be collected and analyzed as seen here with females, but there can be comparisons made between males and females that may be groundbreaking.

This project has allowed us the opportunity to educate ourselves about important, underrepresented topics that are not talked about enough in our major, or in society in general. This project serves as a foundation for future research and has provided undergraduate research opportunities that would not have been possible if we were not a part of the Honors College. An

important aspect of the exercise science curriculum is learning about physiological responses to various stressors, exercise being the main factor. Additionally, nutrition, body composition, and mental health are briefly touched upon in several program courses. By choosing this topic as our focus for this project, we not only have been able to increase our knowledge on these topics but have applied practical skills of measuring blood pressure and heart rate. We have been able to better understand the significance of female collegiate athletes and their struggles with nutrition, body image, and mental health, and demonstrate its presence here at The University of Akron, not only with athletes, but the non-athletic population as well, given that our results showcase data from both testing groups. It is important to be educated about these subjects in the field of exercise science because of the high prevalence of athletes we encounter, but regardless of being an athlete or not, any patient or client could be going through struggles with body image, nutrition, and mental health. The additional physiological stress that may accompany these topics during sessions or appointments is something that all professionals in this field should be aware of. Being able to have awareness of these stressors and understand how to better the experiences of potential clients or patients is pertinent in our ability to enter our careers as informed, educated health professionals.

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Appendix A

Multidimensional Body-Self Relations Questionnaire – Appearance Orientation Subscale

Using the scale below, please circle the number that best matches your agreement with the following statements.

Definitely Disagree	1
Mostly Disagree	2
Neither Agree Nor Disagree	3
Mostly Agree	4
Definitely Agree	5

1. Before going out in public, I always notice how I look.	1 2 3 4 5
2. I am careful to buy clothes that will make me look my best.	1 2 3 4 5
3. I check my appearance in a mirror whenever I can.	1 2 3 4 5
4. Before going out, I usually spend a lot of time getting ready.	1 2 3 4 5
5. It is important that I always look good.	1 2 3 4 5
6. I use very few grooming products.	1 2 3 4 5
7. I am self-conscious if my grooming isn't right.	1 2 3 4 5
8. I usually wear whatever is handy without caring how it looks.	1 2 3 4 5
9. I don't care what people think about my appearance.	1 2 3 4 5
10. I take special care with my hair grooming.	1 2 3 4 5
11. I never think about my appearance.	1 2 3 4 5
12. I am always trying to improve my physical appearance.	1 2 3 4 5

Objectified Body Consciousness Scale – Body Shame Subscale

Using the scale below, please circle the number that best matches your agreement with the following statements.

Strongly Agree	1
Agree	2
Slightly Agree	3
Neither Agree nor Disagree	4
Slightly Disagree	5
Disagree	6
Strongly Disagree	7
Not Applicable	8

1. When I can't control my weight, I feel like something must be wrong with me.

1 2 3 4 5 6 7 8

2. I feel ashamed of myself when I haven't made the effort to look my best.

1 2 3 4 5 6 7 8

3. I feel like I must be a bad person when I don't look as good as I could.

1 2 3 4 5 6 7 8

4. I would be ashamed for people to know what I really weigh.

1 2 3 4 5 6 7 8

5. I never worry that something is wrong with me when I am not exercising as much as I should.

1 2 3 4 5 6 7 8

6. When I'm not exercising enough, I question whether I am a good enough person.

1 2 3 4 5 6 7 8

7. Even when I can't control my weight, I think I'm an okay person.

1 2 3 4 5 6 7 8

8. When I'm not the size I think I should be, I feel ashamed.

1 2 3 4 5 6 7 8

Multidimensional Body-Self Relations Questionnaire – Appearance Evaluation Subscale

Using the scale below, please circle the number that best matches your agreement with the following statements.

Definitely Disagree	1
Mostly Disagree	2
Neither Agree nor Disagree	3
Mostly Agree	4
Definitely Agree	5

1. My body is sexually appealing.	1 2 3 4 5
2. I like my looks just the way they are.	1 2 3 4 5
3. Most people would consider me good-looking.	1 2 3 4 5
4. I like the way I look without my clothes on.	1 2 3 4 5
5. I like the way my clothes fit me.	1 2 3 4 5
6. I dislike my physique.	1 2 3 4 5
7. I am physically unattractive.	1 2 3 4 5

Fear of Negative Appearance Evaluation

Using the scale below, please circle the number that best matches your agreement with the following statements.

Never True	1
Rarely True	2
Sometimes True	3
Frequently True	4
Almost Always True	5

1. I am concerned about what other people think of my appearance.	1 2 3 4 5
2. It bothers me if I know someone is judging my physical shape.	1 2 3 4 5
3. I don't care about other people's opinion of my appearance.	1 2 3 4 5
4. I worry that people will find fault with the way I look.	1 2 3 4 5
5. When I meet new people, I wonder what they think about my appearance.	1 2 3 4 5
6. I am afraid other people will notice my physical flaws.	1 2 3 4 5
7. I am unconcerned even when I know that my appearance is being evaluated.	1 2 3 4 5
8. I think that other people's opinion of my appearance is too important to me.	1 2 3 4 5

Eating Disorders Inventory - Body Dissatisfaction Subscale

These questions measure a variety of attitudes, feelings, and behaviors. There are no right or wrong answers so please try to be completely honest in your answers. Read each question and circle the number of the word that best describes how YOU usually are.

Always	1
Usually	2
Often	3
Sometimes	4
Rarely	5
Never	6

1. I think that my stomach is too big.	1 2 3 4 5 6
2. I think that my thighs are too large.	1 2 3 4 5 6
3. I think that my stomach is just the right size.	1 2 3 4 5 6
4. I feel satisfied with the shape of my body.	1 2 3 4 5 6
5. I like the shape of my buttocks.	1 2 3 4 5 6
6. I think my hips are too big.	1 2 3 4 5 6
7. I think that my thighs are just the right size.	1 2 3 4 5 6
8. I think that my buttocks are too large.	1 2 3 4 5 6
9. I think that my hips are just the right size.	1 2 3 4 5 6

Rosenberg Self-Esteem Scale

Using the scale below, please circle the number that best matches your agreement with the following statements.

Strongly Agree	1
Agree	2
Disagree	3
Strongly Disagree	4

1. I feel that I'm a person of worth, at least on an equal basis with others.	1 2 3 4
2. I feel that I have a number of good qualities.	1 2 3 4
3. All in all, I am inclined to feel that I am a failure.	1 2 3 4
4. I am able to do things as well as most other people.	1 2 3 4
5. I feel I do not have much to be proud of.	1 2 3 4
6. I take a positive attitude toward myself.	1 2 3 4
7. On the whole, I am satisfied with myself.	1 2 3 4
8. I wish I could have more respect for myself.	1 2 3 4
9. I certainly feel useless at times.	1 2 3 4
10. At times I think I am no good at all.	1 2 3 4

Appendix B

PROTOCOL TITLE: Physiological responses between collegiate female athletes versus collegiate female non-athletes to body image, nutrition, and mental health inquiries.

Informed Consent Form
For Prospective Collection of Data/Information

DESCRIPTION: You are invited to participate in a research study that will compare the physiological responses of heart rate and blood pressure between those of female athletes compared to those of non-athletes at the University of Akron while responding to questionnaires relating to body image, nutrition, and mental health. This research will be conducted by undergraduate students Molly McChesney and Jenna Holloway under the supervision of Stephanie Davis-Dieringer, M.S. Ed. in the School of Exercise and Nutritional Sciences at the University of Akron. The purpose of this research is to determine if female athletes have an elevated physiological response when answering questions relating to body image, nutrition, and mental health as compared to female non-athletes.

PROCEDURES: After signing the informed consent form, you will be measured for your resting heart rate and blood pressure. It is important that you keep your legs uncrossed while sitting at the table. Blood pressure will be taken from your right arm while heart rate will be taken from your radial pulse on your left wrist. Once obtained, you will be given a series of questionnaires in which you will be asked to complete each fully. You will be given one questionnaire at a time, with 60-seconds in between the completion of one, and the initiation of another. Please follow the directions on each questionnaire and respond to the questions honestly. After the third questionnaire is complete, you will be measured for heart rate and blood pressure again. Once complete, you will be given the fourth questionnaire, and then the fifth upon completion. Once complete with all five questionnaires, you will immediately be measured for heart rate and blood pressure again. Then, after 5-minutes post completion, one final measurement of heart rate and blood pressure will be taken.

It is important that the contents of the questionnaire are not discussed following the completion of the study. All questionnaires will be shredded following each participant's completion. Any significant results, such as an elevation in heart rate or blood pressure will be shared with participants at the conclusion of their study. If at any point you should choose to discontinue the study, you may.

INCLUSION CRITERIA: All participants must be between the ages of 18 and 24 and must be currently enrolled at the University of Akron as of the fall 2022 semester. 15 participants must be on the active 2022-2023 rosters of their respective sport. 15 different participants must not be on any athletic roster.

EXCLUSIONS: Any participants under the age of 18 or over the age of 24 are not eligible to be a part of this study.

RISKS: This research contains information and questions that may be sensitive to some participants. Participants have the right to withdraw from the study at any time.

BENEFITS: You may benefit from this study by better understanding the prevalence of poor body image, inadequate nutrition, and diminished mental health within the female population at the University of Akron, especially in student athletes. In doing so, you are providing current data that can be used to better the lives of those affected by these conditions. It will also help you understand your physiological responses to difficult subjects and possible trauma.

Office of Research Administration
Akron, OH 44325-2102

NOTICE OF APPROVAL

Date: 3/21/2023

To: Molly McChesney and Jenna Holloway

From: Kathryn A Watkins Office of Research Administration, Special Assistant and IRB Administrator

IRB Number: 20230212

Title: Comparison of Physiological responses between female athletes versus female non-athletes to body image, nutrition, and mental health surveys.

Thank you for submitting your Application for Research Involving Human Subjects to the IRB for review. Your protocol represents minimal risk to subjects and has been approved.

Approval Category: Expedited 7

Approval Date: 3/10/2023

In addition, the following is/are approved:

- ☐ Research involving children
- ☐ Research involving prisoners
- ☐ Waiver of documentation of consent
- ☐ Waiver or alteration of consent

- Annual review of Expedited protocols is no longer required under the regulations; therefore, there is no expiration date on this approval.
- If changes are made to the protocol you must submit a Request for Change form for review and approval before the change is implemented.
- When the project is completed you must submit a Final Report to close the IRB file.
- If this research is being conducted for a master's thesis or doctoral dissertation, you must file a copy of this letter with the thesis or dissertation.
- All forms are available on the ORA website at http://www.uakron.edu/research/ora/compliance/irb/irbforms.dot
- CITI Certification is valid for three years. It is your responsibility to update your certification as needed. The link to the CITI home log-in screen is: https://www.citiprogram.org/

☑ Approved consent form(s) attached

The University of Akron

School of Exercise & Nutrition Sciences
Akron, OH 44325-5103
(330) 972-7473 Office
(330) 972-5293 Fax

20230212

APPROVED
IRB
Date 3-10-2023
The University of Akron
Expedited 7

The University of Akron
Institutional Review Board

Physiological responses between collegiate female athletes versus collegiate female non-athletes to body image, nutrition, and mental health inquiries.

Introduction: You are invited to participate in a research study that will compare the physiological responses of heart rate and blood pressure between those of female athletes compared to those of non-athletes at the University of Akron while responding to questionnaires relating to body image, nutrition, and mental health. This research will be conducted by undergraduate students Molly McChesney and Jenna Holloway under the supervision of Stephanie Davis-Dieringer, M.S. Ed. in the School of Exercise and Nutritional Sciences at the University of Akron.

Purpose: The purpose of this research is to determine if female athletes have an elevated physiological response when answering questions relating to body image, nutrition, and mental health as compared to female non-athletes.

Procedures: After signing the informed consent form, you will be measured for your resting heart rate and blood pressure. It is important that you keep your legs uncrossed while sitting at the table. Blood pressure will be taken from your right arm while heart rate will be taken from your radial pulse on your left wrist. Once obtained, you will be given a series of questionnaires in which you will be asked to complete each fully. You will be given one questionnaire at a time, with 60-seconds in between the completion of one, and the initiation of another. Please follow the directions on each questionnaire and respond to the questions honestly. After the third questionnaire is complete, you will be measured for heart rate and blood pressure again. Once complete, you will be given the fourth questionnaire, and then the fifth upon completion. Once complete with all five questionnaires, you will immediately be measured for heart rate and blood pressure again. Then, after 5-minutes post completion, one final measurement of heart rate and blood pressure will be taken. At post survey completion, we will verbally explain that the survey content data is not going to be used and is collected and destroyed at the end of the evaluation. (We will destroy the survey) The survey content is not what we are evaluating, we are evaluating the physiological response while taking the survey. We do not want to disclose this prior to them beginning the surveys because we want them to take the surveys seriously, so it does not skew the physiological response they have while taking the survey.

Risks and Discomforts: This research contains information and questions that may be sensitive to some participants. Participants have the right to withdraw from the study at any time.

The University of Akron
School of Exercise & Nutrition Sciences
Akron, OH 44325-5103
(330) 972-7473 Office
(330) 972-5293 Fax

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APPROVED
IRB
Date 3-10-2023
The University of Akron
Expedited 7

Benefits: You may benefit from this study by better understanding the prevalence of poor body image, inadequate nutrition, and diminished mental health within the female population at the University of Akron, especially in student athletes. In doing so, you are providing current data that can be used to better the lives of those affected by these conditions. It will also help you understand your physiological responses to difficult subjects and possible trauma.

Exclusions: Any participants under the age of 18 or over the age of 24 are not eligible to be a part of this study.

Right to refuse or withdraw: Taking part of this project is entirely up to you, and no one will hold it against you if you decide not to do it. If you do take part, you may stop at any time.

Anonymous and Confidential Data Collection: Any identifying information collected will be kept in a secure location and only the researchers will have access to the data. You will not be individually identified in any publications or presentations of the research results. Only aggregate data will be used. Your signed consent form will be kept separate from your data and nobody will be able to link your responses to you.

Confidentiality of records: You will be assigned numbers to maintain anonymity. Only the PIs on the project will have access to the original data. Any paperwork will be stored in the PIs office for 3 years.

Who to contact with questions: Stephanie Davis-Dieringer: ***(330) 608-5899*** This project has been reviewed and approved by the University of Akron Institutional Review Board. If you have any questions about your rights as a research participant, you may call the IRB at (330) 972-7666

Acceptance & Signature: I have read the information provided above and all of my questions have been answered. I agree to participate in this study. I will receive a copy of this consent form for my information.

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Participant Signature **Date**