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Effects of Exercise on Anger and Aggressive Tendencies

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Effects of Exercise on Anger and Aggressive Tendencies

A senior thesis submitted to
The Department of Psychology
College of Arts & Sciences

In partial fulfillment of the requirements
for a Bachelor of Arts degree in Psychology

by

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Abstract

Evidence has been shown that anger can affect one's life in various ways that can cause distress for an individual. It is important for individuals who struggle with these issues to learn how to cope with them in a healthy and motivating way. Exercise has been shown to be an effective coping mechanism for many individuals struggling with mental and physical illnesses, and the use of exercise as a possible way to manage anger could be a positive intervention for those with anger and aggressive tendencies. The literature for exercise being actively used as an intervention for anger and aggression is minimal. In the study I conducted, participants completed a survey that was distributed through social media. The data from the survey separated the participants into three exercise groups (low, moderate, or high), and the average rating from the Buss Perry Questionnaire produced an anger score. The effect of the amount of hours of exercise per week on one's anger score was not significant $F(2, 79) = 0.34, p = 0.71$. Although the results did not show significant evidence that supported a correlation between exercise levels and anger levels, the results showed slight evidence between the groups that those who exercised more tended to have to be less prone to anger and aggressive tendencies.

Keywords: anger score, aggressive tendencies, Buss Perry Questionnaire

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The Effects of Exercise on Anger and Aggressive Tendencies

Anger is a common and natural human emotion, and it can impact people's lives in different ways (Baron, & Neuman 1996; Baumeister, Smart & Boden, 1996; Kweon, Ulrich, Walker, & Tassinari, 2008; Hawes et al., 2016). "One out of four American workers report themselves to be chronically angry, which has been linked to negative outcomes such as retaliatory behavior, revenge, interpersonal aggression, poor work performance, absenteeism, and increased turnover" (Kweon et al, 2008, p. 158). Anger acts as an instigator for aggressive tendencies and violent behavior, and this can cause individuals to lose jobs, lose friends and family, or have possible legal repercussions (Baron & Neuman, 1996; Cornell, Peterson, & Richards, 1999; Nichols, Mahadeo, Bryant, & Botvin, 2008; Hawes et al., 2016). Anger and aggressive tendencies may also cause individuals to engage in unhealthy coping mechanisms, such as abusing drugs or alcohol, which can further provoke this behavior (Bannon, Salis, & O'Leary, 2015). Aggressive tendencies and violent behavior are key elements to delinquency, abusive actions, and impulsivity (Bannon et al, 2015). It is important for individuals who struggle with these issues to learn how to cope with them in a healthy and motivating way (Baron & Neuman, 1996; Schlichter & Horan, 1981; Bruehl, Chung, & Burns, 2006).

Using exercise as a coping mechanism has been a healthy way for people to combat depression, anxiety, stress, and diseases such as Parkinson's (Gillison, Standage, & Skevington, 2006; Henchoz et al., 2014). "The health benefits of sport and exercise are well documented in children, adolescents and adults... sport and exercise plays a positive role in preventing substance use dependence, depression and abnormal weight, and in

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promoting quality of life” (Henchoz et al., 2014, p. 232). The benefits of proper exercise and nutrition are well-known and advised regularly by doctors and physicians, but many people fail to engage in a well-balanced diet or a regular exercise regimen (Gillison et al., 2006; Henchoz et al., 2014). Even though previous researchers have found that regular exercise or other physical activity may alleviate depressed mood in individuals experiencing depression or other depressive mental disorders, the impact that exercise may have on mood fluctuation and stressors associated with aggressive behavior and those with difficulty managing and coping with their anger has not been extensively investigated (Edenfield, 2007). The literature about a relationship between exercise and anger is minimal, and the research that does exist focuses more on either the elevated anger issues among prison inmates or the impact exercise has on those with bipolar disorder who may be combating fits of anger or depressive episodes (Cornell, Peterson, & Richards, 1999; Wagner, McBride, & Crouse, 1999; Edenfield, 2007). With the lack of relevant or recent research, it instigates filling this research gap and generating both an understanding of the positive impact of exercise and how that could relate to the many individuals who struggle with anger and aggression.

Evaluating and researching a possible connection between exercise and anger has the potential to benefit a population that struggles daily with combatting their anger and holding in their aggression. I predicted that an incorporation of exercise into one’s weekly schedule would decrease their aggressive tendencies and act as a healthy coping mechanism for excessive anger. Before I engaged in my research, I first considered what type of exercise the participants would be engaging in. Exercise could mean a variety of activities, one first has to consider whether the activity is aerobic or anaerobic, as well as

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the duration and vigorousness. There are many considerations and variables when it comes to exercises like yoga, Pilates, or weight lifting (such as amount of repetitions and the variety in difficulty levels). I focused on aerobic and utilized surveys that were distributed through social media. The survey addressed how much they exercise and their personal anger and aggression.

In order to examine the importance of coping skills in response to anger and aggressive tendencies, one must first understand the impact that is presented in one's life when they struggle with anger management. Psychologists have been researching how individuals control and learn to control their impulsive reactions (e.g., anger and fear). Freud, for example, identified the ego and the superego as regulators of the aggressive impulsivity of the id (Wilkowski, Robinson, & Troop-Gordon, 2010). Modern researchers, however, have a different understanding of this concept, and psychologists now understand that a cognitive control system is involved in regulating anger and aggressive tendencies (Eisenberg, Smith, Sadovsky, & Spinrad, 2004; Posner & Rothbart, 2000). This cognitive control system is located within the prefrontal cortex and is used to override inappropriate thoughts and impulsive urges or behaviors (Baumeister, Heatherton, & Tice, 1994; Rueda, Posner, & Rothbart, 2004; Wilkowski et al., 2010).

Depending on one's mental capacities, trauma history, and level of development, individuals demonstrate differing levels of cognitive control system functioning. For the population of individuals who have a lower level of cognitive control system functioning, they suffer from episodes of intense angry feelings that negatively impact their health, social, and occupational functioning (Tescher, Conger, Edmondson, & Conger, 1999).

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These individuals are prone to generalized anger as opposed to anger that is situation-based or anger in defensiveness. “Anger-prone individuals are thought to be easily provoked, to be chronically angry, and to respond to many situations with intense and prolonged anger” (Tescher et al., 1999, p. 118). Providing these individuals with healthy coping skills is essential to maintaining a life that involves less impulsivity and provides a way to decrease emotional, social, and occupational stress.

Anger and Aggression

Throughout this research, the terms *anger* and *aggression* were used often and may appear to be interchangeable, but it is important to define each term and understand them as separate definitions. Anger is used to describe an emotion and an emotional expression whereas aggression is used to describe an action that would most likely take place when one is experiencing anger (Burns, Quartana, & Bruehl, 2007). The definition of aggression from the dictionary is “the action of a state in violating by force the rights of another state, particularly its territorial rights; an unprovoked offensive, attack, invasion”, and it defines anger as “a strong feeling of displeasure and usually of antagonism” (*Merriam-Webster's collegiate dictionary*, 1999). Differentiating between these terms provides concrete ideas of what they are to avoid confusion and generate a clearer literature review and experiment as a whole.

Anger Suppression

A common response to repetitive feelings of anger may be for one to suppress it from others, and through suppressing these emotions the individual may be causing more internal stress (Burns, Quartana, & Bruehl, 2007). Suppression of emotion, anger in

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particular, has been linked to heightened pain intensity during a subsequent painful event (Burns et al, 2007). Those that choose not to express their anger in a verbal or physical way, and instead choose to hold those feelings inside themselves, have been shown to have lower pain thresholds and tolerances (Burns et al, 2007). This common response to suppress one's anger also has been shown to be accompanied by the use of alcohol and other substances, especially in the case of posttraumatic stress disorder (PTSD) and other trauma-related stress (Sakusic et al., 2010; Cassiello-Robbins, & Barlow, 2016).

Unhealthy Coping and the Physical Toll of Anger

Researchers have shown that alcoholism is characterized by a deficiency in the processing of emotional facial expressions, and this deficit shows a lower level of emotional intelligence, which also contributes to anger and aggressive tendencies (Sakusic et al., 2010). This introduction of alcoholism and substance abuse in the case of anger-prone individuals, shows another reason that would impact the day-to-day life and inspire the incorporation of healthy coping skills (Sakusic et al., 2010). The impact of anger not only effects the mental and emotional state of the individual, it also effects the physical health of the individual (Mushtaq & Najam, 2014).

It has been addressed that the stress involved has adverse effects on one's emotions, impulsivity, and pain tolerance, but the health concerns involved still need to be addressed. Most of the physical impacts are on the cardiovascular system and there have been impacts seen, especially in hypertension.

Hypertension affects the overall body functioning and human life in many ways.

Anger effects the possible onset of hypertension. Anger is explained as a psycho-

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physiological condition comprising of subjective feelings that is different in emotion from mild resentment to intense anger and is related to the activation of autonomic nervous system. (Mushtaq & Najam, 2014, p. 23).

Depending on the intensity of one's anger and the lack of healthy coping, one could experience health issues that could shorten their life.

Exercise as a Coping Skill

Individuals who participate in higher levels of physical activity have significantly better health (Olguin, 2005). In addition to the impact exercise had on one's physical health, researchers also found a significant correlation between positive mood and physical activity (Olguin, 2005). In a study conducted by Thirlaway and Benton (1991), the participants who were identified as physically fit reported higher levels of positive changes in mood states, including tension and stress relief, depression, anxiety, alertness, and increased coping abilities. In a similar study, Holmes and Roth (1987) divided their participants into a group that would engage in exercise as a coping strategy, and participants who would practice relaxation for the same time duration. The results indicated a significant improvement for those who were engaging in exercise and no difference was found for the group engaged in relaxation training (Holmes & Roth, 1987). These researchers concluded that exercise appeared to be a more effective intervention for reducing stress than relaxation training (Holmes & Roth, 1987).

Exercise and Depression

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Cross-sectional and prospective studies have consistently showed a relationship between the introduction of physical activity and reduced symptoms of depression, and this relationship has been reported in healthy and clinical populations (Chu, 2008). The most common research designs utilized to test this have been exercise intervention studies, and these studies have consistently indicated that exercise training is an effective measure to reduce depressive symptoms and cope with depression (Chu, 2008). Depressive disorders are one of the main contributors to suicidality and victims of suicide completion. “About two-thirds of individuals who died by suicide experienced depressive symptoms at the time of their deaths” (Chu, 2008, p. 95).

The association between hopelessness and suicidal behavior among young people is significant, and hopelessness is a common attribute of depressive disorders. Researchers (Chu, 2008; Taliaferro, Rienzo, Miller, & Dodd, 2009) have found a positive association between exercise and psychological health. Physical activity promotes positive emotional well-being, including improvements in depressed mood, anxiety, stress, and self-esteem. Research conducted by Taliaferro et al. (2009), provided evidence that exercise promotes a positive self-image, especially among young people with an initially low self-esteem. Utilizing these positive effects of physical activity may work to prevent suicidality through its effect on psychological well-being. These researchers also evaluated that adolescent’s demonstrated reduced suicide risk if the adolescents perceived physical activity as an important aspect of their health and as an established coping skill during times of distress (Taliaferro et al., 2009).

Exercise and Attention Deficit Hyperactivity Disorder

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Exercise and attention deficit hyperactivity disorder (ADHD) as a combined pair may seem counterintuitive to what should be beneficial for individuals suffering from symptoms of ADHD, since these symptoms include hyperactive behaviors. ADHD difficulties are particularly associated with the prefrontal cortex (Rhodes, 2017). The early childhood symptoms of ADHD are mostly behavioral hyperactivity, and this hyperactivity is especially noticeable in a structured environment such as school or any stationary activity (Dickstein et al., 2006). However, instead of trying to keep children with ADHD attentive, one should be encouraging them to exercise more (Rhodes, 2017). The incorporation of exercise has been found to increase cognitive functioning, and exercise should be seen as an intervention for children with ADHD and should be introduced at a young age.

When exercise is recommended in a treatment plan, there is a large possibility that the individual will also be on medication (medication is the most common method of treatment for individuals with ADHD). The introduction of exercise into a treatment that already has psychopharmacological intervention increases the individual's progress and they show a more prominent decrease in symptoms (Rhodes, 2017). The researchers concluded that exercise may provide therapeutic effects on symptoms of ADHD for adults similar to that of medication, and the combination of exercise and medication has proven to be the most beneficial for treatment (Abramovitch, Goldzweig & Schweiger, 2013). Furthermore, there is evidence to suggest that adults with ADHD can experience positive effects from exercising twice a week. The integration of exercise can be utilized as an effective intervention and a boost in treatment for ADHD symptoms (Abramovitch et al., 2013).

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Exercise and Anger

The downfalls of anger and aggressive tendencies and the distress that can be put on one's life have been discussed, as well as the use of exercise as a coping mechanism for physical and mental disorders. Exercise and the effects of anger have been addressed separately, and now it is important to discuss the research that has already been done for the effects of exercise on anger and aggressive tendencies together. A study done by Routledge, McFetridge-Durdle, Macdonald, Breau, and Campbell (2015), used blood-pressure to measure if exercise is an effective coping mechanism after an anger-provoking stimulus. These researchers used other variables along with exercise to see if one intervention was better than another for coping with anger, these other variables were reading a book, an interview to talk about the stressor, and quietly sitting (Routledge et al, 2015).

Throughout and following each of these activities one's blood-pressure was measured to see if any of the interventions was more proactive than another (Routledge et al, 2015). The researchers hypothesized that the exercise would be the most effective variable, but the results signified otherwise. "Overall, post-stressor exercise was not found to improve blood-pressure recovery while reading was effective at distracting individuals from angry thoughts (state rumination) but had no effect on blood-pressor compared to no-intervention" (Routledge et al, 2015, p. 45). The study showed that exercise did not improve the participant's rumination on the anger stimulus and was not significantly effective directly following an anger stimulus. This study does not directly correlate with what will be measured in my research because it focused more on the

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effects of exercise on blood-pressure and hypertension and how they correlate (Routledge et al, 2015). The inclusion of anger was exclusively used to invoke a rise in blood-pressure, but this study still shows a lack of effectiveness on exercise on one's rumination on angry feelings.

The past research contains inconsistencies about the effects of exercise on mood improvement and anger, showing differences depending on the kind of exercise done (aerobic or anaerobic), the duration of the exercise, and the intensity of the exercise. Researchers Washburn, Pritchard, Book, and Clark (2007) analyzed these inconsistencies:

Stephens and Cox (1988) found that women who exercised at a low-intensity reported positive mood change, whereas women who exercised at a high intensity reported an increase in tension and anxiety. McLafferty, Wetzstein, and Hunter (2004) found that resistance training decreased tension, anger, confusion, and overall mood of older adults. In addition, McGowan and Pierce (1991) observed that participating in a single bout of exercise decreased negative moods, depression, anger, tension, and confusion. In Berger and Owen's study (1998) college student joggers reported increased mood immediately after jogging, regardless of whether they jogged at a low or moderate intensity; however, Kennedy and Newton (1997) stated that as aerobic exercise intensity increased, rated anger, fatigue, depression, and tension decreased for male and female participants.

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The effects of exercise are overall viewed as a mood-enhancer but high-intensity exercise has been shown to create more tension and stress physically and mentally (Washburn, Pritchard, Book, & Clark, 2007). Washburn et al. (2007) supported that the increased duration and consistency of exercise was helpful to enhance mood and therefore decreased one's overall anger. However, high intensity exercise created more tension and that produces elevated anger responses (Washburn et al., 2007). The effects of exercise are dependent on gender and the type of exercise, those who exercised in a sport setting showed higher rates of tension especially female participants (Washburn et al., 2007).

Gender and Exercise

The term *athletic* is more often attributed to masculinity than it is to femininity, and as a whole those with more masculine traits and identify as males have a higher quantity of exercise in their lives than females (Bhattacharyya, & Dasgupta, 2015). The exercise habits of males and females are also different and are affected by an idea of what ideal bodily traits correspond with being male and female (Bhattacharyya, & Dasgupta, 2015). Males engage in more strength building exercises (weight-lifting or strength training) to encourage the growth of muscle and to generate a bigger physique (Bhattacharyya, & Dasgupta, 2015). Females are more inclined to engage in exercise that supports *feminine* traits, such as cardiovascular exercises and exercises that improve flexibility (Bhattacharyya, & Dasgupta, 2015). Females are also more likely to engage in yoga and other practices that encourage one to focus on mental and physical health (Bartholomew, & Linder, 1998). Although those who display more masculine traits

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statistically engage in more exercise than those who display more feminine ones, the exercise that is more performed by the female population might be more beneficial for enhancing mood and decreasing anger and aggression (Bhattacharyya, & Dasgupta, 2015).

Gender and Anger

Everyone experiences anger and may engage in verbal and/or physical aggression, but those who identify with more masculine or feminine gender traits experience, manage, and express their anger differently (Gianakos, 2002). The trait of aggression was similar to that of athleticism, in that it is more associated with masculinity and males (Gianakos, 2002). Researchers who examined anger in the workplace, found that females and males experience similar amounts of anger in the workplace setting but it was more socially acceptable for males to express that anger than females (Sanders, 2012). Females were shown to suppress their anger and had a reluctance of sharing those feelings to others because they feared it would make them appear “sensitive” or “weak” (Gianakos, 2002, 59). Males were more expressive about their anger in the workplace and aggression in this setting (in males) was perceived as something associated with a leader and leadership roles. Males tend to express their anger physically, whereas females were more likely to be verbally aggressive (Sanders, 2012). The workplace study also had evidence to suggest that another difference in gendered expressions of anger and aggression is the amount of time it takes for an individual to recover after anger is a present emotion (Gianakos, 2002). It is suggested that females may require more time to

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recover once they experience anger because they are more likely to ruminate on the angry feelings for a longer period than males (Gianakos, 2002).

Buss Perry Aggression Questionnaire

The Buss Perry Aggression Questionnaire was used as the measurement of aggression levels in the present study. This survey has been utilized to measure aggression since the survey's development in 1992, and the questionnaire is still a relevant instrument in measuring aggression (Buss & Perry, 1992). The questionnaire has shown consistency and stability throughout its experimental uses and replaced the Hostility Inventory Survey (Buss & Durkee, 1957) that was frequently used to measure aggression. However, the Buss Perry Aggression Questionnaire was a relevant addition to research because it focuses on aggression as a whole and not just a single element like the Hostility Inventory Survey (Buss & Perry, 1992). The Buss Perry Aggression Questionnaire evaluates four different aspects of aggression to establish a well-rounded evaluation of one's aggressive tendencies, these four aspects are physical aggression, verbal aggression, anger, and hostility (Buss & Perry, 1992).

Dividing the questionnaire into these four aspects is a key component to the questionnaire's effectiveness and each of the sections works to evaluate a separate part; therefore, together they may provide a more accurate representation of aggression. Buss and Perry (1992) defined the importance of understanding all four of these elements:

It is clear from the questionnaire data that the personality trait of aggression consists of four subtraits. Physical and verbal aggression, which involve hurting

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or harming others, represent the instrumental or motor component of behavior. Anger, which involves physiological arousal and preparation for aggression, represents the emotional or affective component of behavior. Hostility, which consists of feelings of ill will and injustice, represents the cognitive component of behavior. This division of behavior into instrumental, affective, and cognitive domains is nothing new, having been recognized in psychology for roughly a century. What is new are data demonstrating that this tripartite division extends to the personality trait of aggression (p. 452).

Researchers using this questionnaire have revealed information about the components of aggression, specifically, where the sex differences are and which components correspond with particular personality traits (Buss & Perry, 1992). The original hostility questionnaire (Buss & Durkee, 1957) was used for different kinds of experiments. For example, it was used to distinguish between violent and nonviolent men and between delinquent and nondelinquent adolescents. It was used to divide participants into high- and low-aggression groups in laboratory research (Buss & Perry, 1992). The Buss Perry Aggression Survey is capable of recording all of these same things but with more accuracy and with the additional information that the questions involving anger, physical, and verbal aggression provide (Buss & Perry, 1992).

In the literature, the Buss Perry Aggression Questionnaire has been used to measure aggression in domestic partnerships, prison inmates, and violence in schools. Felsten and Hill (1999) utilized the questionnaire in a college setting to evaluate how college students responded to maltreatment. This study involved individuals taking the

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questionnaire and following that taking a basic math multiple-choice exam on mathematics. The questionnaire separated the participants into either the low or the high hostility group, and they then took the aforementioned exam (Felsten & Hill, 1999). After taking the exam, the participants were told that they would all have to retake it due to cheating (Felsten & Hill, 1999). Those who were placed in the high hostility group expressed significantly more distress when they were informed of this than the low hostility group, and the Buss Perry Aggression Questionnaire was able to accurately evaluate who would express the most anger about the situation (Felsten & Hill, 1999).

This survey has been utilized to analyze aggression with the incorporation of exercise, such as with weight-lifting among violent males in prison and bodybuilders (Vaeroy, 2013). The experiment compared the questionnaire scores of violent prison inmates, male bodybuilders, and healthy non-violent males (Vaeroy, 2013). The research showed similar results for the inmates and the bodybuilders, especially in their scores for physical aggression and hostility. The influence of the bodybuilder's exercise appeared to increase their aggression and upon the blood test that was taken, the majority of the bodybuilder participants had been utilizing steroids (Vaeroy, 2013). The effects of the steroids were a contributing factor to their questionnaire scores being almost parallel to those of the prison inmates (Vaeroy, 2013). The steroids were a confounding variable to the experiment and made it difficult to tell if the bodybuilders rated high for aggression because of their chosen form of exercise or if it was exclusively their steroid use (Vaeroy, 2013). However, weightlifting and other bodybuilding exercises will not be used in the experiment that this study will be based on and it will be predominantly focused on the incorporation of cardiovascular and aerobic exercises.

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There has been research done with evidence that showed the positive effects of exercise on depression, ADD, and Parkinson's disease, but little research done involving anger and exercise. When one struggles with managing their anger, it may create problems in their social lives and can be difficult to combat in a work setting. There are unhealthy coping mechanisms that may be used to combat aggressive tendencies and anger management (e.g. suppression and alcoholism), and these unhealthy coping mechanisms create further stress for the individual. Finding an effective and accessible coping mechanism for individuals who have difficulty managing their anger would be beneficial for generating greater psychological wellbeing. Through my research of the current literature, I noticed a gap in the possible connection between anger management and exercise. Therefore, I hypothesized that the more one exercises, the less prone they will be to anger and aggressive tendencies.

Method

Participants

In this study, I surveyed individuals over the age of 18 that were accessed through social media. I posted the exercise and aggression survey on Facebook, requesting that people take the survey and share the post. The post was shared twice and this ensured that some of the participants were outside of people that I know. The demographics of those who took the survey were mostly unknown for anonymity, but based on the population that I am Facebook friends with, the majority are female and Caucasian. I had a sample size of approximately 80 participants.

Materials and Procedure

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The survey was distributed through social media and involved questions about exercise habits and questions about anger, jealousy, and aggression in order to generate an average anger score for each participant. Participants were informed about the purpose of the study, as well as their right to terminate participation at any time. They were asked to provide information that they felt comfortable sharing, and the participants were asked if they were above 18 years of age. If the participant answered *I agree* to both of these prompts, they were directed to the survey.

The surveys that were completed by the participants were in a Likert-scale format that involved questions about one's anger levels and aggressive tendencies. Some of the questions involved the participants to address their levels of anger and how the individual and others perceive that anger. I used the Buss Perry Aggression Survey, which was originally used to survey the aggression levels of prison inmates and it was effective in generating data about those aggression levels (Wagner et al., 1999). The statements that the participants rated from strongly agree to strongly disagree ranged from "when frustrated, I let my irritation show" to "I have become so mad that I have broken things" (Wagner et al., 1999). These surveys provided me with enough information to understand the participants' anger and calculate the mean value of their answers to receive an *anger score*. The participants also answered questions about exercise, the first being "I exercise regularly" and if one answered affirmatively they were asked, "how many hours do you exercise a week?". The information taken from these exercise questions provided the information necessary to categorize the participants into high, medium, and low exercise groups.

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Being friends with the majority of the participants on social media, as well as the researcher in this experiment, generated a conflict of interest. Having a dual-relationship with the participants could create an element of coercion that may have impacted my research. The participants, however, were aware that their participation was anonymous. I addressed the element of possible coercion in the consent form and reminded the participants that they could withdraw from the experiment at any time.

Data Analysis

Using the Buss Perry Aggression Survey to determine levels of aggression and generating an anger score (the mean rating of the anger questions answered) for each was an important step in quantifying one's anger and aggression levels. The anger scores were compared and analyzed within the exercise group that they were categorized in through a one-way ANOVA and determined if the participant's level of physical activity had an impact on their aggression levels.

Data protection and security plan

The data and the information from the surveys did not provide any identifying information and were anonymous, even to the researcher. The participants took the survey through Qualtrics to ensure their confidentiality, and to provide me with data that could be easily entered and analyzed. The data were stored in my computer which was locked and all surveys were stored in my private Qualtrics account that could only be seen by myself.

Risks and discomforts

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The risk of harm to participants was minimal, and the only risks that could be relevant in an exercise setting, such as injuries, were outside of the scope of this experiment. I do not believe there are many risk factors that need to be addressed, however one of the main elements of concern with my survey population was that their aggression levels were minimal. It is possible I would not have been able to find a significant or a large effect size between my two variables with the population I was using to conduct this study, and the initially low aggression levels would skew my results. I had no influence on this concern and I was unable to make any of the participants more prone to aggression or violent tendencies. The questionnaire potentially could have caused distress for the participants by generating thoughts about issues with anger. Because of this, I put a warning into my post on Facebook that the questions involved these elements and requested that one not take the survey if these topics could possibly upset them. There is also a concern, that some of the participants will be dishonest with the amount of time they spend exercising, but this possibility is decreased by the survey being anonymous. I also had no influence on this possibility but this could be a possible confounding variable that it is necessary to address.

Benefits

The benefits of this study were present for those who struggle with anger management and aggressive tendencies with a healthy and realistic way to cope with their issues and possibly create a better environment for those who struggle with anger and the people around them (Baron & Neuman 1996; Baumeister, Smart & Boden, 1996; Kweon, Ulrich, Walker, & Tassinary, 2008; Hawes et al., 2016). Individuals who struggle daily

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with anger can discover that it may be having a negative impact on their social and romantic life, as well as affecting their career or impacting their parenting style (Smart & Boden, 1996). Generating a better understanding of how people experience anger and providing those people with a healthy outlet would benefit a population that is underrepresented in research at this time. Participants were not compensated for their participation in the surveys conducted.

Results

My survey was completed by 82 participants. I separated the surveys into three exercise groups: low, moderate, and high. Upon separating the data, the majority of participants ($N = 48$) were in the low exercise group, 21 participants were in the moderate grouping, and 13 were in the high exercise grouping. I also created an anger score, by calculating the mean score of the anger questions that were answered on a 1 to 5 scale. A lower mean signified that the participants tended to be more angry and prone to aggressive tendencies.

I conducted a one-way ANOVA for independent groups. The effect of the amount of hours of exercise per week on one's anger score was not significant $F(2, 79) = 0.34, p = 0.71$. The data showed that participants who exercised the most ($M = 3.52, SD = .77$) had anger scores that signified that they were slightly more prone to anger than the moderate group ($M = 3.56, SD = 0.78$), and the high and the moderate exercise groups were both slightly more prone to anger than the low exercise group ($M = 3.70, SD = 0.99$). The total average of the anger scores ($M = 3.64, SD = 0.80$) showed that

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the majority of participants rated themselves as not prone to anger or aggressive tendencies.

Discussion

My original hypothesis was that there would be a significant relationship between the exercise groups and the participant's anger score. Although the results did not show significant evidence to support my original thesis, the results showed slight evidence between the groups that supported the intention of the study. The average anger score of the participants is in the middle of one and five (the low and high ends on the anger scale) and therefore suggest that the majority of participants are not prone to anger and aggressive tendencies. If I had the ability to attempt this study again, I would increase the number of participants and possibly change the survey. There is sufficient evidence to show the effectiveness of the Buss Perry questionnaire, but this survey is designed to test high levels of anger and aggressive tendencies, and is more effective when testing individuals who present with an aggressive history (Buss & Perry, 1992). In order to generate an accurate interpretation of an anger score in a population that does not originally present aggression, like friends and family on social media, the questions should consist of milder questions. For example, one of the questions presented was "once in a while, I can't control my urge to strike another person", and the majority of the participants answered this question with "strongly disagree". A few of the questions, like the example presented, could have skewed the data and severity of some of the questions could have attributed to the majority of the scores being in the middle of the scale.

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The majority of participants were in the low exercise group and this appeared to skew the data as well, because the majority of participants were in the low exercise group, the data were most likely more accurate for the low exercise group and the moderate and high groups had a higher possibility of being effected by outliers. Having a larger sample size of participants would ensure that there is a more equal amount of participants in each exercise group. My original hypothesis was that those who exercise more would have lower levels of anger and aggressive tendencies but the data from this study showed slight evidence that those who exercise more rated themselves as more aggressive. This evidence could also suggest that those who rate themselves as more angry and aggressive exercise more to combat that anger, or that those who tend to be angrier have more motivation to exercise to release some of that anger (Burns et al., 2007).

Anger is a common and natural human emotion, and it can impact people's lives in different ways (Baron, & Neuman 1996; Baumeister et al., 1996; Kweon et al., 2008; Hawes et al., 2016). "One out of four American workers report themselves to be chronically angry, which has been linked to negative outcomes such as retaliatory behavior, revenge, interpersonal aggression, poor work performance, absenteeism, and increased turnover" (Kweon et al, 2008, p. 158). Through the literature, evidence has been shown that anger can affect one's life in various ways that can cause distress for an individual (Baron & Neuman, 1996; Nichols et al., 2008; Hawes et al., 2016). Anger and aggressive tendencies may also be reason for individuals to engage in unhealthy coping mechanisms, such as abusing drugs or alcohol, which can further provoke this distress further (Bannon et al., 2015). Aggressive tendencies and violent behavior are key

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elements to delinquency, abusive actions, and impulsivity (Bannon et al, 2015). It is important for individuals who struggle with these issues to learn how to cope with them in a healthy and motivating way (Baron & Neuman, 1996; Schlichter & Horan, 1981; Bruehl et al., 2006). Exercise has been shown to be a healthy and effective coping mechanism for many individuals struggling with mental and physical illnesses or disorders, and the use of exercise as a possible way to manage anger could be a positive intervention for those with anger and aggressive tendencies (Chu, 2008; Taliaferro et al., 2009). Overall, I still believe that there is an effect that exercise has on anger and aggressive tendencies, and this study provided ideas of how to create a more conclusive study that would support my hypothesis and the literature provided.

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Appendix

Q1. I exercise regularly

Q1a. I exercise ___ hours a week

Q2. Some of my friends think I am a hothead

Q3. If I have to resort to violence to protect my rights, I will

Q4. When people are nice to me I wonder what they want

Q5. I tell my friends openly when I disagree with them

Q6. I have become so mad that I have broken things

Q7. I can't help getting into arguments when people disagree with me

Q8. I wonder why sometimes I feel so bitter about things

Q9. Once in a while, I can't control the urge to strike another person

Q10. I am an even-tempered person

Q11. I am suspicious of overly friendly strangers

Q12. I have threatened people I know

Q13. I flare up quickly but get over it quickly

Q14. Given enough provocation, I may hit another person

Q15. When people annoy me, I may tell them what I think of them

Q16. I am sometimes eaten up with jealousy

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Q17. I can think of no good reason for ever hitting a person

Q18. At times I feel I have gotten a raw deal out of life

Q19. I have trouble controlling my temper

Q20. When frustrated, I let my irritation show

Q21. I sometimes feel that people are laughing at me behind my back

Q22. I often find myself disagreeing with people

Q23. If somebody hits me, I hit back

Q24. I sometimes feel like I am ready to explode

Q25. There are people who pushed me so far that we have fought

Q26. I know that "friends" talk about me behind my back

Q27. My friends say that I'm somewhat argumentative