An Analysis of the Effects of Frequency and Type of Physical Activity on Self-Esteem in Adolescent Males

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https://doi.org/10.48091/gsr.v2i2.42

Abstract

The goal of this study is to determine the effect of type and frequency of exercise on the self-esteem of college-aged males using a two-part online survey distributed amongst Georgetown students. Recent literature has investigated the implications of exercise on individuals' self-perception, in which partaking in frequent endurance exercise is associated with higher levels of self-esteem. Consequently, my research group postulated that if male college students perform endurance exercise, rather than strength exercise, then they will have a higher level of self-esteem. Additionally, it was hypothesized that if exercise is performed at a high frequency, versus a low frequency, then they would have a higher level of self-esteem. Frequency of exercise was operationalized through hours per week, in which each subject was then categorized into a type of exercise based on which they reported having the highest frequency. Self-esteem was calculated through responses to a modified version of the Rosenberg Self-Esteem Scale (Rosenberg, 1965). The results indicated that the high frequency endurance group had the highest mean self-esteem score, followed by the high frequency strength group, low frequency strength group, and low frequency endurance group. Through a 2x2 ANOVA test with a between-groups design, it was revealed that frequency of exercise, not type of exercise, had the most significant effect on self-esteem. Therefore, the relationship between frequency of exercise and self-esteem was found to be statistically significant, while that between type of exercise and self-esteem was not. These conclusions are relevant to building upon related academic literature concerning male self-esteem and the impacts of physical activity, as well as incorporation into university settings in order to improve students' self-esteem levels.

Keywords: self-esteem, exercise, endurance, strength, frequency

1. Introduction

The intention of this study was to investigate the effects of type and frequency of exercise on the self-esteem of male college students. To determine this relationship, a two-part online survey was distributed amongst the population of male undergraduate Georgetown University students, which consisted of questions regarding frequency of exercise and type of exercise, as well as scores resulting from participants' self-reported responses to a modified version of the Rosenberg Self-Esteem Scale.[1] The study was designed to ascertain whether performing endurance exercise at a high frequency contributes to a higher level of self-esteem in male college students than those who practice strength exercise at a low frequency. The hypothesis of the present study states that if male college students perform endurance exercise, rather than strength exercise, then they will have a higher level of self-esteem. Additionally, it was hypothesized that if exercise is performed at a high frequency, versus a low frequency, then they would have a higher level of self-esteem.

1.1 Self-Esteem and Physical Exercise

The effect of physical exercise on self-esteem, representing the bridge between physical and mental health, has become a prominent topic pervading modern society. Self-esteem embodies the evaluative portion of the self, representing cognitive, behavioral, and affective aspects. It also describes an individual's general subjective perception of personal worth and is used as a measure of how much one "values, approves of, appreciates, prizes, or likes him or herself."[2] This concept is worthy of study because of its influence on several elements of the individual, including motivation, decision-making processes, interpersonal relationships, emotional health, and overall well-being, as well as for its role in numerous psychological issues such as anxiety, depression, and eating disorders[3].

The connection between self-esteem and physical exercise is a highly relevant topic within modern-day psychology. The organized competitive sports and fitness industry in the United States has become a rapidly growing force to compensate for the increasingly sedentary habits that have become a staple of the American lifestyle, with physical activity being ingrained into academic curricula[4]. Recent literature has since investigated the implications of exercise on individuals' self-perception, in which partaking in frequent endurance exercise has been correlated with a higher level of self-esteem. Physical activity has been observed to directly affect self-esteem in adults[5], and increased frequency in the practice of it was found to be a significant variable in improving this aspect.[6] As suggested by an intervention of physical activity on Iranian medical students, aerobic exercise, which is interchangeable with the term endurance exercise, was observed to significantly increase self-esteem scores after an eight-week period.[7] To further detail, endurance is one of four categories of exercise (including strength, balance, and flexibility), and is characterized by activities that increase breathing and heart rate, such as walking, jogging, or swimming.[8] Additionally, it has been

suggested that increased levels of physical activity have a positive impact on self-perceptions on the social and athletic levels in the adolescent age group.[9] Specifically in the college-aged group, perceived body image of individuals who engaged in regular exercise through sports was positively affected by participating in this activity, along with psychological well-being, self-esteem, and exercise flow.[10] Exercise flow is the spiritual state that pushes a person to continue athletic activities. The implications of self-esteem are especially significant in regard to overall well-being, in which a study utilizing pertinent variables such as physical self-esteem, exercise self-efficacy, and affect found that regular physical activity increased physical self-esteem and improved quality of life for the young adults participating.[11] The effects of exercise participation on physical self-concept have also been found to positively influence mental well-being, and in turn, influence the changes in mental well-being via the improvement of self-esteem.[12] Furthermore, higher levels of physical exercise have been observed to prompt a higher score of subjective well-being over that of low-level exercise.[13]

Reasons as to why this may be stem from previously established theories, such as Maslow's Hierarchy of Needs, in which self-esteem plays a significant role as a basic human motivation, as individuals require both appreciation and inner self-respect to build self-esteem and fulfill the requirements to achieve self-actualization.[14] This could suggest that individuals who partake in frequent exercise may do so to gain respect amongst their peers, achieve a feeling of belonging, or seem more socially likeable, which contributes to their levels of self-esteem. Furthermore, engaging in regular exercise releases β-endorphins in the peripheral and central nervous system, which elevates an individual's mood and decreases anxiety levels. In consequence, these findings suggest a positive influence in self-esteem because of improvement in mood, thus implying a correlation between the factors of exercise and positive self-perception.[15] Bandura's self-efficacy theory is also relevant to this study, in that both

suggest a relationship between exercise and self-esteem. Self-efficacy, referring to one's belief in their own ability to succeed in a certain situation, is significant in this context due to its impact on self-esteem for its positive influence on individuals' resiliency to obstacles and stress, healthy lifestyle habits, improved professional performance, and academic achievement. In reference to the hypothesis of this study, Bandura's research positively supports the presented hypothesis, in that if an individual has a high level of self-confidence in their athletic abilities, there may also be a correlation associated with the frequency of exercise that they engage in.[16]

1.1.1 Motivation Behind Sample and Independent Variable of Type of Exercise

Researching adolescent men was of particular interest to this study due to findings in past literature which demonstrate that boys have a higher perceived athletic competence and are more physically active on average than girls,[17] yet the underrepresentation of boys' self-esteem in the media runs counter to conventional wisdom. Prompted by a 1995 study by the American Association of University Women[18] that incorrectly reported that educational bias results in girls' having a lower self-esteem than boys, a wave of corrective measures towards girls was issued, while current research suggests that the differences in self-esteem scores between genders is actually quite minimal[19]. In the same vein, there exists a social pressure on men to conform to a certain body type attained by frequent exercise, which may negatively impact self-esteem if not achieved, but also improve self-perception if this body type has been obtained. Thus, this study intends to fill the gap in academic literature based on the serial underrepresentation of male-centered self-esteem studies. Additionally, the comparison of exercise types is a variable not commonly studied when examining exercise and self-esteem and represents another gap in academic literature that this study intends to fill. The comparison between endurance and strength exercise is especially relevant to this study, in which endurance training has been

postulated to be effective in raising self-esteem,[20] and strength has been used in previous research as an appropriate comparison point.[21]

2. Methods

2.1 Participants

The sample was derived from Georgetown undergraduate male students at a minimum of 15 participants per independent variable, leading to a minimum of 60 total participants. Recruitment occurred through a voluntary basis based on responses to a widely distributed flyer exhibiting a QR code leading to the study's survey.

2.2 Apparatus

To conduct data collection, a two-part online survey was distributed amongst male undergraduates through the issuance of a flyer and location specific recruitment techniques. This survey featured questions regarding participants' demographic information, including ethnicity, class year, and international student status. It also inquired about participants' frequency of exercise in terms of how many hours performed per week. Additionally, participants were asked which category of exercise, strength, or endurance, they prefer based on how many hours per week they exercise each. Lastly, each subject self-reported responses to a modified version of the Rosenberg Self-Esteem Scale, which was used to calculate their total self-esteem score on a range from 0-40.[22] A consent form was presented at the premise of the survey to ensure consent and maintain participant confidentiality.

2.3 Design

The design of this research took on the form of a 2x2 factorial study, in which the independent variables of type of exercise and frequency of exercise were further divided into the categories of endurance and strength, and high or low level of frequency, respectively. Additionally, it assumed a between-subject design, in which participants identified with one level of each independent

variable, selecting strength- or endurance-based exercise and high or low frequency of exercise. The materials necessary for this study included a survey, consent form, and flyer with a QR code to access the web-based questionnaire.

2.3.1 Accounting for Extraneous Variables

Extraneous variables that may affect the results of this study generally cannot be controlled for but will be mentioned in order to account for possible interference. One factor that may influence the outcome of my statistical analysis is responses with extreme amounts of exercise hours logged, which could occur, for instance, if individuals on an organized sports team respond to the survey. To control for this phenomenon of regression to the mean, my research group manually eliminated these outliers. An additional factor that may affect the outcome of this study is the effect of external stress stemming from the academic environment that contributes towards a lower self-reported self-esteem score, such as collecting data during midterm season or a period with an especially heavy workload. Furthermore, the threat of self-reporting bias as a measurement error, which encompasses the deviation between the self-reported and true values of the same measure, is existent due to the method of volunteer sampling in the study's recruitment of participants.

2.3 Procedure

First, a survey was created, containing a consent form and questions regarding demographic information, type of exercise between endurance or strength, frequency of exercise on an hour per week basis, and a modified version of the Rosenberg Self-Esteem Scale.[22] Data was collected from October 15th to November 12th, by which the survey was then terminated and inaccessible online to limit the responses to a certain time period.

3. Results

This analysis revolved around data collected from the survey distributed amongst male undergraduate Georgetown students, focusing on the effects of frequency and type of exercise on self-esteem. The sample consisted of 67 male participants who self-reported hours of exercise according to type, as well as provided responses to a modified version of the Rosenberg Self-Esteem Scale. Participants' answers to the questions on the distributed survey were the source of these stated independent variables.

Demographic information was collected from each subject to supplement the data in this research study. Since the study specifically targeted Georgetown men, the frequency for gender was 100% male. For race, participants were able to select from a range of options, of which there were a reported 52 White/Caucasian (77.6%), 8 Asian American (11.9%), 5 African American (7.5%), 1 Alaska Native (1.5%), and 1 Other (1.5%). Class year was also recorded, with 7 being from the class of 2022 (10.5%), 27 being from the class of 2023 (40.3%), 26 being from the class of 2024 (38.8%), and 7 being from the class of 2025 (10.5%). Lastly, whether a participant was an international student was noted, with 9 subjects (13.4%) belonging to this category, and 58 (86.6%) not.

The nominal independent variable of frequency of exercise was split by the mean number of hours spent exercising per week, with this reported value being rounded to the nearest half hour. Splitting the total number of hours reported by the mean, which included hours related to endurance, strength, and general exercise, allowed me to divide responses into categories of "high" and "low" frequency, represented by the numbers one and zero when coding, respectively. To determine the subjects' preferred type of physical activity, a new variable was created that involved manually designating a type of exercise to a participant based on which category of exercise they reported a higher frequency for. The variable of endurance was then coded as the number 0, and the variable strength as 1, in order to further analyze the data. Out of the 67 male participants, the majority of the population, 74.6%, indicated preference towards endurance exercise, while

25.4% preferred strength. 55.2% of these subjects were classified as practicing low frequency of exercise, while 44.8% were identified as practicing high frequency.

Self-esteem, the dependent variable of this study, was measured using a modified version of the interval Rosenberg Self-Esteem Scale.[22] Participants were able to select from "strongly disagree", "disagree", "neither agree nor disagree", "agree", or "strongly agree" in indication of their level of agreement with each statement on the scale. Adding the neutral option of "neither agree nor disagree" allowed participants to choose from a broader range of choices to express their alignment with the original statements on the Rosenberg scale ("Pros and Cons"). Items featured on the scale featured phrases subjects could allocate their levels of agreement to.

Items	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I feel that I am a person of worth, at least on an equal plane with others.					
I feel that I have a number of good qualities.					
All in all, I am inclined to feel that I am a failure.					
I am able to do things as well as most other people.					
I feel I do not have much to be proud of.					
I take a positive attitude toward myself.					
On the whole, I am satisfied with myself.					
I wish I could have more respect for myself.					
I certainly feel useless at times.					
At times I think I am no good at all.					

Figure 1. Scale Used to Capture Participants' Self-Reported Self-Esteem Levels, Adapted from the Rosenberg Self-Esteem Scale (1965)

The adapted scale used for this study has ten items, of which items 1, 2, 4, 6, and 7 were calculated by associating the numbers 0, 1, 2, 3, and 4 to the statements "strongly disagree", "disagree", "neither agree nor disagree", "agree", and "strongly agree", respectively. Items 3, 5, 8, 9, and 10 were reverse scored, so that the scores ranged from 0 for strongly disagree to 4 for strongly agree[22]. The responses were summed to produce a total composite score ranging from 0-40. The addition of a neutral option to the Rosenberg Self-Esteem Scale required further calculations to determine the boundaries between normal, high, and low ranges, resulting in the normal range for the adapted scale being between 20 and 33, low self-esteem being indicated by scores below 20, and high self-esteem being indicated by scores above 33. This scoring helped lead the interpretation of the means, in which level of frequency by exercise category was compared to level of self-esteem. The mean for the high frequency endurance group (32.5 total score, SD = 5.09) was observed to be higher than the mean low frequency response for endurance exercise (23.3 total score, SD = 7.95). The mean for the high frequency strength group (24.8 total score, SD = 7.26) was noted to be higher than the mean low frequency response for the same category (27.8 total score, SD = 5.97) (see Table 1). Thus, it was observed that the high frequency endurance group had the highest mean self-esteem score, followed by the high frequency strength group, the low frequency strength group, and the low frequency endurance group.

Table 1. Frequency of Exercise by Type of Exercise: Mean and Standard Deviations for Hours of Exercise and the Number of Participants (*n*) Across Conditions. Note: Total Scores were calculated from a modified version of the Rosenberg Self-Esteem Scale with possible results ranging from 0-40.

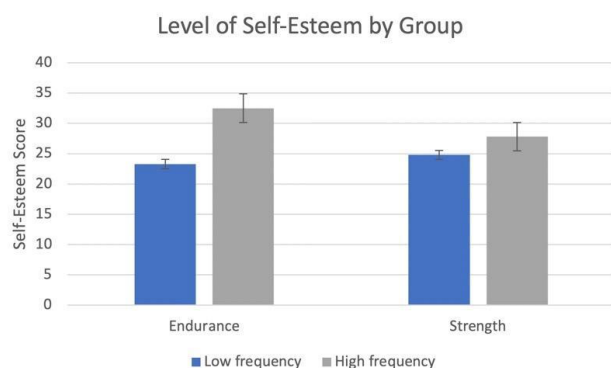|	Frequency of Exercise					
	Low Frequency of Exercise			High Frequency of Exercise		
Type of Exercise	*M*	*SD*	*n*	*M*	*SD*	*n*
Endurance	23.3	7.95	28.0	32.5	5.09	22.0
Strength	24.8	7.25	9.00	27.8	5.97	8.00

Figure 2. Mean Self-Esteem Total Score by Type of Exercise Group

A 2x2 ANOVA test with a between groups design was considered the best method to analyze the data given that two independent variables and several means were to be compared simultaneously. The p-value associated with the ANOVA output was used to determine whether the difference between the means of each comparison were statistically significant, and results were interpreted in accordance with the null hypothesis of there being no effect of frequency or type of exercise on self-esteem. At the alpha level of 0.05, a significant result is identified by a p-value of less than this standard, allowing me to reject the null and determine a relationship between the independent and dependent variables. In the ANOVA performed for this study, it was revealed that frequency of exercise, but not type of exercise, had a significant effect on self-esteem. This analysis indicated that there was a significant difference between groups of frequency of exercises, $F(1, 63) = 10.167$, $p = 0.002$, $\eta2 = 0.139$. This was determined by observing the p-values of the relationship between frequency of exercise and self-esteem, of which the p-value resulted in 0.002, which is less than the alpha level of 0.05, meaning I can reject the related null hypothesis. In contrast, the same test did not indicate a significant difference between groups of category of exercise $F(1,1) = 0.741$, $p = 0.392$, $\eta2 = 0.012$. The p-value for the interaction between type of exercise and self-esteem was 0.392, which is greater than the alpha level of 0.05 which fails to reject the null hypothesis. Therefore, the relationship between frequency of exercise and self-esteem was found to be statistically significant, while the relationship between type of exercise and self-esteem was not. Additionally, the associated Post Hoc Test revealed the negative mean difference between low and high frequency, presenting a value of -6.12, indicating once again that the high frequency exercise group had a significantly greater level of self-esteem than the low frequency group.

4. Discussion

The purpose of this experiment was to determine the relationship between type and frequency of exercise and level of self-esteem in the male undergraduate population. It was postulated that those who performed endurance exercise at a high frequency would have a higher level of self-esteem than those who performed strength exercise at a low frequency. My results found a statistical difference between groups of frequency, in which high frequency of exercise resulted in a higher level of self-esteem than that of low frequency of exercise, but not

between groups of categories of exercise, meaning category of exercise had no effect on resulting self-esteem scores.

On average, subjects pertaining to the high frequency group were associated with a higher total self-esteem score. At an alpha level of 0.05, this relationship was found to be significant, allowing us to reject the related null hypothesis. On the contrary, subjects pertaining to the endurance group only had the highest mean self-esteem score when associated with the high frequency exercise group. At the same standard of comparison, the relationship between category of exercise and self-esteem was found to be not statistically significant; thus, I failed to reject the null hypothesis. The resulting significance of the interaction effect, but not the main effect, was in alignment with the hypothesis regarding frequency, but not that regarding category.

These conclusions are significant to the field of psychology and the growing collection of academic literature on the relationship between physical and mental health. Additionally, these findings corroborate previous research that highlights the positive effects of exercise on self-esteem in the target population of adolescent males,[23] especially regarding frequency of this activity.[24] Moreover, the fact that no significant main effects between type of exercise and self-esteem was unprecedented, given that previous studies have supported endurance as the most effective form of exercise to improve this variable.[25] This inconsistency speaks to the replicability of these past studies and sheds light on the need for revision of previous research that supports this conclusion.

Though the results of this research indicate a significant effect of high frequency of exercise and self-esteem, this study still has its limitations. A limitation to my study's internal validity was the notable imbalance between subject groups, in which 50 endurance participants were analyzed in this study versus

17 strengths. This highlights an issue within the way I operationalized the independent variable of exercise, as categorizing each participant in an exercise group based on their frequency of exercise could have been compromised by the subjects who practiced both (n = 63). Moreover, having a small sample size of 17 for the strength category could have contributed towards a type II error. As a result, this inequality between samples may have inhibited the study's efforts to accurately reflect the population through statistical analysis, thus affecting the results of these tests. Additionally, the way in which the questions on the survey were formatted, in that it explicitly named the variables exercise and self-esteem, could have hinted at what the purpose of our study was and influenced participants' responses. More specifically, subjects may have misreported their number of hours exercised if they felt like their actual frequency of exercise was below average, leading to a misrepresentation of the reality of the population's true exercise habits. These limitations may be addressed in further replications of this study to improve the accuracy of my results.

This study illustrated that frequency of exercise significantly improves the self-esteem levels of undergraduate males, which is relevant to the understanding of how physical performance may affect mental health. By prioritizing external validity as part of this study through random sampling, these results may be generalized to the greater college-aged population of males. However, a limitation to this study includes the lack of determination of whether exercise itself drove the resulting self-esteem or inversely, if self-esteem motivated the individuals to partake in high frequency exercise. Only a longitudinal study could answer this question, and this limitation invites further replications to be performed to investigate this discrepancy as well as add to the growing collection of academic literature on self-esteem within this population to bring about better insight into this topic. Moving forward,

colleges and universities may use the conclusions articulated in this study to implement programs that encourage a high frequency of exercise amongst their undergraduate males in hopes of improving self-esteem in this population of their student body.

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