

The Effects of Resistance Training on the Physical Self-Perceptions of Adolescent Girls

By Sean Donmoyer

Submitted in Partial Fulfillment of the Requirements for the
Degree of Master of Education

May 2014

Graduate Programs in Education
Goucher College

Table of Contents

List of Tables	iii
Abstract	iv
I. Introduction	1
Overview	1
Statement of Problem	2
Hypotheses	2
Operational Definitions	2
II. Review of the Literature	4
The Importance of Physical Activity and Resistance Training	4
Self Esteem: Components and Factors Associated with Physical Activity	5
Physical Activity and Skills, Body Image and Self-Esteem	6
Sports Participation and Self-Esteem	7
Physical Activity and Adolescent Females	8
Resistance Training and Adolescent Girls	9
Resistance Training Program Models for Adolescents	11
III. Methods	13
Design	13
Participants	13
Instruments	14
Procedure	15
IV. Results	17
Comparison of Physical Self Perceptions of Girls Participating and Not	17

Participating in Resistance Training	
Comparison of Gains in Physical Strength by Group	20
V. Discussion	22
Implications for Resistance training on strength and physical self-perceptions	22
Limitations of the study	23
Connections to Prior Research	24
Recommendations for Future Studies	25
Conclusions	25
References	27
Appendix A	31

List of Tables

1. Descriptive Statistics for Pre-and Post-intervention MODIFIED PSDQ SURVEY by Group	18
2. t-Test for Independent Samples Comparing Post-intervention Modified PSDQ SURVEY scores Across Groups	19
3. Descriptive Statistics Regarding Upper and Lower Body Strength Measures and Gain Scores by Group	20
4. t-Test for Independent Samples Comparing Mean Gains in Upper and Lower Body Strength for the RT and Control Groups	21

Abstract

The purpose of this study was to investigate the effects that resistance training had on the physical self-perceptions of adolescent girls. This study utilized a quasi-experimental design with a pre-measure, treatment, and post-measure and included 13 students enrolled in a private all-girls school. The participants in this study ranged in age from 14-18 years old and incorporated students from ninth through twelfth grades. The study hypothesized that participation in a resistance training program would have no influence on the physical self-perception or muscular strength of adolescent girls. The results indicated that participation in the resistance training program had no influence on the physical self-perceptions of adolescent girls. The results further indicated that participation in a resistance training program did have a positive effect on the upper body strength of adolescent girls but not on lower body strength. Implications of the findings for implementing effective resistance training programs with greater benefits for adolescent girls are discussed.

CHAPTER I

INTRODUCTION

Overview

Resistance training is becoming an increasingly popular method of physical activity and often is prescribed as part of a well-rounded exercise program (Faigenbaum, Zaichkowsky, Westcott, Lonh, LaRosa-Loud, Micheli & Outerbridge, 1997). While the physical benefits of resistance training are evident in popular media, less is known about the benefits that resistance training can provide to young women's psychological well-being. With societal influences heavily impacting the way girls may feel about their bodies, the need for developing an appreciation for the body's functionality over appearance becomes more important. Through physical activity, specifically those activities in which feelings of physical competence can be developed, it could be possible to help young women develop a healthy appreciation of their bodies' functionality. Recognizing the changes in one's physical competency could benefit the teenage girl by allowing her to see what her body is able to do rather than just focusing on how her body looks.

This researcher became interested in learning more about the effects of resistance training on adolescent girls' physical self-perceptions in his role as a strength and conditioning coach. Through his work he noticed changes in the way his athletes' thought of their physical capabilities after participation in a resistance training program and wished to examine this interaction for the purpose of helping to better educate physical educators and coaches about the benefits of resistance training.

Statement of Problem

The purpose of this research was to determine the effects of resistance training on adolescent girls' physical self-perceptions and strength.

Hypotheses

Physical Competence

There will be no difference in physical self-perception between adolescent girls who participated in a resistance training program and a similar group of adolescent girls who did not participate in a resistance training program.

Muscular Strength

There will be no difference in muscular strength between adolescent girls who participated in a resistance training program and a similar group of adolescent girls who did not participate in a resistance training program.

Operational Definitions

Muscular Strength: a measure of how much force a muscle can exert. In this study, muscular strength is measured for both upper body and lower body strength using a three repetition maximum test.

- The **upper body strength** test used a seated chest press machine to determine the maximum amount of weight an exerciser can use for three repetitions.
- The **lower body strength** test used a leg press machine to determine the maximum amount of weight an exerciser can use for a three repetition maximum.

Physical competence: an individual's self-confidence about his or her ability to successfully perform a physical skill (Poole, Mathias, & Stratton, 1996). In this study, physical competence

was assessed using a rating scale assessing participants' views about their physical strength, coordination, sports competence, strength, flexibility, endurance, flexibility, and resistance training competence.

Resistance training: a type of physical exercise that uses various forms of resistance to induce muscular contraction to build muscular strength, size, and/or endurance. In this study, resistance training utilized selectorized strength-training machines.

- **Selectorized strength-training machines:** a type of resistance training equipment in which the user selects the level of resistance by moving a pin

CHAPTER II

REVIEW OF THE LITERATURE

This literature review explores the relationship among self-esteem, physical activity, and sports participation with a focus on how these factors relate to adolescent females. The review begins with an overview of the importance of physical activity and resistance training. The second section discusses components and factors associated with physical activity as they relate to self-esteem. The third section examines relationships among physical activity and skills, body image, and self-esteem. In the fourth section, the review extends this discussion to the relationship between sports participation and self-esteem. The fifth section focuses on physical activity and adolescent females, while the subsequent section specifically considers resistance training and adolescent females. The review concludes with a discussion of the health benefits of resistance and offers recommendations for children and adolescents.

The Importance of Physical Activity and Resistance Training

The Center for Disease Control and Prevention recommends that children and adolescents participate in 60 minutes or more of moderate to vigorous physical activity each day. As part of their 60 minutes, it is recommended that children and adolescents include muscle-strengthening physical activity for at least three days of the week (“Physical Activity Guidelines for Everyone,” 2011). While activities that enhance cardiorespiratory fitness generally are recommended, research such as that reported by Faigenbaum, (2007) increasingly suggests that resistance training can offer benefits for children and adolescents when it is prescribed and supervised correctly. Resistance training, as defined by Faigenbaum in his 2007 review, is a method of conditioning that utilizes the progressive use of a wide variety of resistive loads and training modalities designed to enhance health, fitness, and sports performance. Faigenbaum

(2007) notes that if appropriate training guidelines are followed, the potential benefits of resistance training in youth include increased muscle strength and power, increased local muscular endurance, increased bone mass, increased cardiorespiratory fitness, improved blood lipid profile, improved body composition, and an increased resistance to injury as well as enhanced mental health and psychological well-being.

The effects of resistance training on various aspects of psychological well-being in both children and adolescents have been documented by researchers. Lubans, Aguiar, & Callister (2010) studied the effects of resistance training on adolescent's self-perceptions and found that resistance training improved self-perceptions of body attractiveness in girls. Faigenbaum et al., (1997) investigated the effects of strength training on the self-concept and self-efficacy of children and found that strength training had no significant effect on self-concept or self-efficacy. Holloway, Bueter, & Duda (1988) examined the relationship between resistance training and global self-esteem in adolescent girls by looking at mediating factors that included measures of self-efficacy. While these authors have studied resistance training and its effects on self-esteem, self-concept and self-efficacy, a broader review of the literature reveals that more research has attempted to study the effects of general physical activity on various measures of psychological well-being, rather than specifically looking at the effect of resistance training.

Self-Esteem: Components and Factors Associated with Physical Activity

In studying self-esteem and its relationship with physical activity, it is helpful to consider the components that make up self-esteem. Global self-esteem refers to generalized feelings of self-worth that may not be specific to a particular situation (Levy & Ebbeck, 2005); but in studying the self-esteem and physical activity relationship, it is useful to consider specific facets of self-esteem. Previous researchers have noted the multi-dimensional, hierarchical structure of

self-esteem and noted the importance of physical self-esteem when examining its association with physical activity (Spence, McGannon, & Poon, 2005). Physical self-esteem is comprised of one's perceptions of physical competence and one's perceptions of physical appearance, both of which can be influenced by physical activity. It is through these components of physical self-esteem that physical activity is thought to influence global self-esteem (Spence et al., 2005).

Physical Activity and Skills, Body Image and Self-Esteem

Similar to the manner of examining the components of global self-esteem, researchers also take a multi-faceted approach when investigating the connections between self-esteem and physical activity. Sonstroem & Morgan (1989) developed a multidimensional exercise and self-esteem model to provide a theoretical guideline for the study of the relationship of exercise and self-esteem. This model is a hierarchical structure in which physical self-efficacy makes up the first level, physical self-competence and physical acceptance compose the middle level, and global self-esteem resides at the top. Sonstroem et al., (1989) propose that changes in physical fitness lead to enhanced self-efficacy, which in turn affects physical competence and results in an increase in global self-esteem (as cited in Spence et al., 2005).

Levy and Ebbeck (2005) applied Sonstroem et al.'s (1989) exercise and self-esteem model specifically to women. Through their research, the authors confirm that there is a direct relationship between exercise behavior and physical competence, but they also propose that physical acceptance plays an important role in the physical activity and self-esteem relationship in women. This confirms the importance of body image to women and provides an incentive to consider the component of perceptions of physical appearance when investigating the relationship of physical activity and self-esteem in women.

Looking for other factors that may play a role in the physical activity and self-esteem relationship, Spence et al., (2005) in their meta-analysis, explored the moderating factors that could influence exercise's effects on self-esteem. They find that the only significant moderators in this relationship are the type of exercise program and a change in fitness level. The types of exercise programs that result in an increase in self-esteem appear to be those that focus on exercise and lifestyle rather than skills training. Spence et al. (2005) also noted in their review that skills training activities have no effect on self-esteem. These results are notable because skills training activities could, in theory, improve physical competence that, according to Sonstroem et al., (1989) model, is a precursor to global self-esteem.

Other researchers have noted the improvement of self-esteem through the physical self-esteem subcomponent of global self-esteem. Bowker (2006) investigated the relationship between sports participation and self-esteem in early adolescence and finds that sports participation did affect global self-esteem through an improvement in physical self-esteem. Contrary to Spence et al., (2005) Bowker proposes physical competence to be the component of physical self-esteem that is improved through participation in sports based on the acquisition of new skills. Other researchers also note the relationship between improved skills resulting from participation in sports and improvement in self-esteem. These findings indicate that physical competency is an important component to consider when investigating how physical activity may influence self-esteem (Rasmussen & Laumann, 2012).

Sports Participation and Self-Esteem

Richman & Shaffer (2000) find that sports participation could influence self-esteem through improved physical competency. The same researchers find physical competency to be a significant moderator of sports participation and improved self-esteem. Their conclusions

reinforce the theory that learning the physical skills associated with a sport could influence one's physical self-efficacy, lead to a change in physical competence, which in turn would affect self-esteem.

Research in the area of sports participation and its influence on psychological well-being such as that reported by Greenleaf, Boyer, & Petrie (2009) and Richman et al., (2000) has examined the mediating influences of body image, physical competence, gender attributed stereotypes, and instrumentality, defined as the tendency to approach the world with an assertive attitude. Greenleaf et al. (2009) propose that the physical requirements of sport allow for the participants to develop an appreciation of the body's function rather than appearance, and this could improve participants' feelings of physical competence. They also find that psychological well-being was most strongly influenced by instrumentality and body image in first semester female college students.

Other research has noted that physical activity is consistently and positively related to instrumentality and an internal locus of control (Parsons et al., 2001). Given this relationship, it appears that developing feelings of instrumentality, along with a strong sense of control in one's physical health, could be potential benefits from participation in a resistance training program. While the research does not explain a cause and effect relationship, it is interesting to note the consistent connection between instrumentality and physical activity.

Physical Activity and Adolescent Females

Despite that evidence that physical activity provides many benefits to physical and mental well-being, physical activity levels appear to be declining through adolescence, particularly among girls (Troiano , Berrigan, Dodd, Masse, Tilert, & McDowell, 2008; Nader, Bradley, Houts, McRitche, & O'Brien 2008). Researchers such as those cited below have

attempted to explain this decline in physical activity among adolescent girls. Davison, Schmalz, & Downs (2010) report low perceived athletic competence as well as excessive perceived fatigue associated with physical activity as self-reported explanations. Similarly, Slater and Tiggemann (2010) report lack of interest, lack of competence, insufficient time, as well as crossing gender boundaries as reasons given by adolescent girls for ceasing to play a sport. These authors further explore the issue of gender identities as it relates to participation in sport and report associations between body image and sport among girls. These findings are of interest as they relate to possible conflicts that adolescent girls may have between their ideal body image and their perceptions of how resistance training may change their appearance.

Dwyer, Allison, Goldenberg, Fein, Yoshida & Boutilier (2005) also report body-centered issues as self-reported barriers to participation in physical activity among adolescent girls. The authors find that gender stereotypes as well as concerns about physical appearance both are reasons that girls report for not participating in physical activity. Yungblut, Schinke, & McGannon (2012) report that when girls are able to challenge feminine ideals and renegotiate gender stereotypes, they are more likely to participate in sports. Educating individuals who engage in exercise about the realistic changes they could expect to see in their physical appearance, along with challenging other strength training related myths, could be important in helping adolescent girls begin a regular resistance training program.

Resistance Training and Adolescent Girls

Despite findings from research indicating that children and adolescents can improve strength by 30-50% after eight to 12 weeks of resistance training, there are many different reasons that adults give as to why young people should not participate in resistance training. Some of these reasons are based on outdated research, while others reflect popular myths. The

primary concerns associated with resistance training at this age are related to safety and effectiveness; however, many professional organizations, including the American Academy of Pediatrics, the American College and Sports Medicine, and the National Strength and Conditioning Association, report that a resistance training program that is supervised and follows recommended guidelines can be both safe and effective (Dahab & McCambridge, 2009).

One myth related to resistance training in young people is that it can be ineffective for increasing strength because children and some adolescents may lack the necessary hormones to build muscle. When researchers in a 1998 study examined the cross-sectional area of trunk musculature in adolescent girls, they found that athletes participating in routine physical training displayed an increase in cross-sectional area of trunk muscles when compared to non-athletes (Peltonen, Taimela, Erkintalo, Salminen, Oksanen & Kujala, 1997). These findings suggest that children and adolescents can increase their muscular size through training and receive benefits similar to mature adults.

In the past, researchers such as Brown and Harrison (1986) have examined the effects of strength training on measures of both physical strength and self-concept in differently aged women. Brown and Harrison studied two groups of women, who were grouped by age, and report that regardless of age, participation in a strength training program increased measures of physical strength as well as improved the women's self-concept and self-esteem.

While researchers in the fields of exercise science and physiology have documented the effects of resistance training on physical measures of health, others have also studied how this type of physical activity affects psychological well-being in adolescent females. Holloway et al. (1988) suggest that training for strength not only can improve physical strength in adolescent girls, but they also find that participation in a resistance training program can improve

confidence in a variety of tasks as well as improve general self-efficacy and general self-esteem. The authors propose that strength training could be included in more interventions for adolescent girls with low self-esteem.

Body image and physical appearance are important concerns of adolescents and they also can be two motives for participation in regular physical activity. In this regard, resistance training may be a useful part of a larger plan to help those that are affected by body image difficulties. Research in this area suggests that participation in a resistance training program may be a useful way to help individuals develop an appreciation for the body that is competency based rather than one based on physical appearance alone (Williams & Cash, 2001).

Resistance Training Program Models for Adolescents

The resistance training program utilized in the experimental groups of Levy et al., (2005) study consisted of basic strength exercises. Participants in the free weight training program completed a five-minute cardiovascular activity to warm up, followed by dynamic stretching. The participants then completed two sets of eight to 12 repetitions for 10 exercises. Rest between sets was between 60 and 90 seconds and the entire session was 45-60 minutes in duration. Similarly, Faigenbaum (2007) recommends that youth and adolescent resistance training sessions start with five to 10 minutes of dynamic stretching to warm up followed by one set of 10-15 repetitions of a variety of exercises. He further recommends that participants progress to two or three sets of six to 15 repetitions as strength improves and that resistance training should be performed two to three times a week on nonconsecutive days.

Resistance training appears to be a physical activity through which adolescent females may improve their feelings about themselves. Through consistent experience in a professionally prescribed, supervised, prolonged resistance training program, adolescent girls may have the

opportunity to develop physical competency, which can improve their physical self-esteem; these improvements could influence other measures of psychological well-being, including global self-esteem (Rasmussen & Laumann, 2012; Richman et al., 2000). Resistance training may also provide a means by which adolescent females develop a healthy appreciation for the body's functionality rather than focusing solely on physical appearance (Williams et al., 2001).

CHAPTER III

METHODS

Design

The purpose of this research was to determine the effects of resistance training on adolescent girls' physical self-perceptions and strength. This study utilized a quasi-experimental pre-test-post-test design. Participants and a comparison group were administered a questionnaire designed to measure self-perceptions of physical competence before and after the treatment group completed a resistance training intervention. Participants' and comparison group members' upper and lower body muscular strength also were pre- and post-tested and compared to determine whether the resistance training intervention impacted the strength of the participants.

Participants

The participants in this study attended a small private all-girls school in northern Baltimore with an upper school population of 315 students. Initial volunteers for the study ranged in age from 14-18 years old with one ninth grader, two tenth graders, five eleventh graders, and five twelfth graders.

Participants for the sample were selected through a convenience sample. An attempt was made to ensure the similarity of the treatment and control groups by evenly assigning students who were playing spring sports to them. Initially, the treatment group included 10 students. Six of these students were not playing a spring sport while four of them were. The control group included seven students. Among these students, three were not playing a spring sport and four were doing so. However, since only six of the 10 students assigned to the resistance training (RT) group actually completed the program and both the pre and post tests, and since four of the

students assigned to the control group did not follow through with post-testing, the groups had to be reconfigured. Ultimately, the RT group consisted of six participants. Four of these six participants were not playing a sport and two were running track. The four students who were assigned to complete the resistance training but did not do so were then treated as part of the control group. The control group finally consisted of seven participants. Three of these participants were not playing a sport, while two were playing both lacrosse and badminton.

Instruments

Before and after the resistance training intervention, all participants in this study were administered a self-report questionnaire using items modified from the Physical Self-Description Questionnaire (PSDQ) (Marsh, Richards, Johnson, & Roche, 1994). The PSDQ is a 70-item questionnaire designed to measure self-perceptions of physical self-concept across nine components. For the purpose of this study, a 24-item questionnaire measuring six components of physical competence was developed and used. The modified survey included subscales assessing self-perceptions of coordination, sports competence, physical strength, flexibility, endurance, and resistance training competence. Participants responded to each item using a seven-point Likert scale, with responses ranging from one, strongly disagree, to seven, strongly agree yielding a possible score of up to 28 for each component and a total score of up to 168. A copy of the questionnaire is attached in Appendix A. In tallying scores, responses were scored so that a value of one always indicated a perception of lower competence and a value of seven always indicated a perception of higher competence.

All participants also performed a three repetition maximum strength test on a chest press machine to test upper body strength and a three repetition maximum strength test on a leg press machine to test lower body strength before and after the intervention.

Procedure

Students were presented with the opportunity to participate in this study during a regular morning meeting, which was attended by all upper school students. All students in ninth through twelfth grade were eligible for participation. All participants were informed of the purpose and nature of the study and were reminded that their participation was voluntary and results would be confidential. As noted above, 17 students initially volunteered and 13 followed through and provided usable data for the study.

All participants were first administered the 24 item modified PSDQ. Participants were instructed to read each item carefully and select the responses that most clearly described the way they felt. Following completion of the pre-test, all participants performed a three-repetition maximum strength test on both the chest press machine and the leg press machine. For each strength test, participants were instructed to perform two warm up sets of between eight and 10 repetitions at a self-selected weight. Participants then were encouraged to choose a weight that they felt they could lift for only three repetitions. If the participants felt that they could perform any more than three repetitions, the set was repeated with a heavier weight after a two-minute rest period. Participants were given three attempts to find the heaviest weight they could lift for three repetitions. The maximum weights lifted three times for both the upper and lower body strength tests were recorded for each participant. All pre-test and post-test answer sheets were numerically coded to protect the participants' identities.

Participants were then assigned either to the resistance training (RT) group or the control group as described above. Participants in the control group were instructed to not change or modify their current physical activity regimen. Participants in the treatment group participated in a three-week basic strength-training program. Each workout consisted of a five-minute

cardiovascular warm-up, followed by three sets of 10 reps of six different exercises. These exercises included five selectorized strength training machines; seated chest press, seated shoulder press, lateral pull-down, seated row, and leg press, as well as one body weight exercise; traditional sit-ups. Participants were instructed to choose a weight that they could lift for only 10 repetitions for each strength machine. Each workout was performed in a circuit fashion, in which participants performed one exercise followed by the next. Rest times between exercises were not monitored, participants were simply instructed to “rest as long as is needed to move to the next machine” between exercises. Participants were free to choose the order in which they performed the exercises and a typical workout session lasted between 20 and 30 minutes. Participants performed the workout twice per week on non-consecutive days. As the participants progressed through the workouts, they were further instructed to adjust the weight for each machine as needed. If the participants felt that they could complete more than 10 repetitions after the third set of an exercise, they were advised to add weight on the next workout session.

Upon completion of the three week training program, all participants in the resistance training and control groups were asked to complete the modified PSDQ again and to repeat a three repetition maximum strength test for upper body strength on a seated chest press and a three repetition maximum strength test for lower body strength on a leg press machine. The results of the modified PSDQ and strength tests were then compared to determine whether the resistance training program affected the physical self-perceptions or the strength of the treatment group.

CHAPTER IV

RESULTS

The purpose of this research was to determine the effects of resistance training on adolescent girls' physical self-perceptions and strength. This study utilized a quasi-experimental pre-test-post-test design.

Comparison of Physical Self Perceptions of Girls Participating and Not Participating in Resistance Training

The initial null hypothesis of study stated that there would be no difference in physical self-perception between adolescent girls who participated in a resistance training program and a similar group of adolescent girls who did not participate in a resistance training program. To assess physical self-perceptions, a modified version of the PSDQ was developed and administered before and after the resistance training intervention. The survey asked the participants to consider how they described themselves physically and yielded scores reflecting six different components of a physical self-description as well as a total score. These components assessed self-perceptions of coordination, sports competence, physical strength, flexibility, endurance, and resistance training.

Table 1 below presents descriptive statistics for the measures of physical self-perceptions gathered before and after the intervention. The statistics were disaggregated by group (treatment group, which participated in resistance training, and control group, which did not). The descriptive statistics indicate that the average score for each sub-scale increased following the intervention for both the treatment group and the control group. The resistance training group scored higher on post-test results on the subscale assessing self-perceptions of physical strength, while the control group scored higher on all other categories.

Table 1**Descriptive Statistics for Pre-and Post-intervention MODIFIED PSDQ SURVEY by Group**

GROUP		Mean	Range	Std. Deviation
Control	PRE			
N=7	COORDINATION	22.286	19-25	1.976
	SPORTS	18.714	16-23	2.563
	STRENGTH	15.571	9-25	6.779
	FLEXIBILITY	18.143	10-26	6.414
	ENDURANCE	19.571	16-24	2.760
	RESISTANCE	23.857	21-27	1.864
	TOTAL	118.143	108-136	10.730
	POST			
	COORDINATION	23.571	21-27	2.370
	SPORTS	21.714	19-24	1.890
	STRENGTH	17.286	9-24	6.075
	FLEXIBILITY	20.429	12-28	5.713
	ENDURANCE	21.143	17-25	3.185
	RESISTANCE	25.143	23-28	1.676
	TOTAL	129.286	119-140	7.228
Resistance Training	PRE			
N=6	COORDINATION	20.333	16-26	3.830
	SPORTS	16.833	5-26	7.468
	STRENGTH	18.833	10-25	5.269
	FLEXIBILITY	15.333	13-19	2.066
	ENDURANCE	15.833	5-22	7.333
	RESISTANCE	20.667	11-25	4.926
	TOTAL	107.833	72-135	22.480
	POST			
	COORDINATION	23.500	17-28	4.231
	SPORTS	20.167	11-27	6.795
	STRENGTH	22.500	16-27	4.324
	FLEXIBILITY	17.500	14-24	3.886
	ENDURANCE	16.667	8-25	8.116
	RESISTANCE	23.833	16-28	4.535
	TOTAL	124.167	85-148	26.483

Comparisons of the treatment (RT) and control groups' mean scores on each subscale and the total score of the MODIFIED PSDQ SURVEY were made using t-tests of independent samples to determine whether the groups' physical self-perceptions differed significantly after the treatment group took part in the resistance training intervention.

Table 2

t-test for Independent Samples Comparing Post-intervention Modified PSDQ SURVEY Scores Across Groups

POST TEST Modified PSDQ	t-test for Equality of Means*						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
COORDINATION	-.038	11	.970	-.071	1.862	-4.170	4.027
SPORTS	-.581	11	.573	-1.548	2.664	-7.412	4.316
STRENGTH	1.752	11	.108	5.214	2.977	-1.338	11.766
FLEXIBILITY	-1.060	11	.312	-2.929	2.762	-9.009	3.1517
ENDURANCE	-1.351	11	.204	-4.476	3.314	-11.769	2.817
RESISTANCE	-.714	11	.490	-1.309	1.835	-5.349	2.730
TOTAL	-.494	11	.631	-5.119	10.368	-27.939	17.701

*Equal variances assumed

The results of the *t*-tests showed that none of the six subscale means nor the total mean scores differed significantly across the two groups. Therefore, null hypothesis 1, which posited that there would be no difference between the physical self- perceptions of the two groups, was retained.

Comparison of Gains in Physical Strength by Group

The second hypothesis for the study stated that there would be no difference in muscular strength between adolescent girls who participated in a resistance training program and a similar group of adolescent girls who did not participate in a resistance training program. Participants were assigned to the two conditions as described in Chapter III. Table 3 presents descriptive statistics for the measures of upper and lower body strength taken before and after the intervention. Data are disaggregated for the treatment group, which participated in resistance training, and the control group, which did not.

Table 3
Descriptive Statistics Regarding Upper and Lower Body Strength Measures and Gain Scores by Group

Group	N	Mean	Range	Std. Deviation
CONTROL	7			
UPPER BODY STRENGTH PRE		52.86	30-85	17.286
POST		56.43	35-85	15.469
LOWER BODY STRENGTH PRE		194.29	135-250	42.173
POST		205.00	100-245	49.160
<i>GAIN IN UPPER STRENGTH</i>		3.57	0-10	3.780
<i>GAIN IN LOWER STRENGTH</i>		10.71	-40-60	31.415
RESISTANCE TRAINING	6			
UPPER BODY STRENGTH PRE		60.83	45-75	14.287
POST		72.50	45-40	17.819
LOWER BODY STRENGTH PRE		202.50	150-240	32.825
POST		257.50	150-400	114.619
<i>GAIN IN UPPER STRENGTH</i>		11.67	0-25	8.756
<i>GAIN IN LOWER STRENGTH</i>		55.00	-35-175	87.407

As indicated by the data presented in Table 3, participants in both groups increased their upper and lower body strength over the course of the intervention. Participants who completed the resistance training program made larger increases in both upper and lower body strength, however.

The significance of the difference in the two groups' mean gains on the two measures of strength were compared using a *t*-test for independent samples. Results, which are posted below in Table 4, indicate that the RT group's mean gain of 11.67 pounds on the upper body strength test was statistically significantly larger than the control group's mean gain of 3.57 pounds ($t=2.228$, mean difference= 8.095, $p<.048$). However, the difference in the mean gains in lower body strength (55 pounds for the RT group and 10.71 pounds for the control group), although larger at face value, was not large enough to be determined statistically significant ($t=1.257$, mean difference=44.286, $p<.235$). Hence the null hypothesis that the strength of the participants in resistance training would not differ significantly from that of the controls was rejected in the case of upper body strength but retained in the case of lower body strength.

Table 4

t-Test for Independent Samples Comparing Mean Gains in Upper and Lower Body Strength for the RT and Control Groups

Strength Test	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
UPPER	2.228	11	.048	8.095	3.633	.099	16.091
LOWER	1.257	11	.235	44.286	35.235	-33.266	121.838

Equal variances assumed

CHAPTER V

DISCUSSION

The purpose of this research was to determine whether participation in a brief resistance training program would affect the physical self-descriptions and muscular strength of adolescent girls.

The null hypothesis that the physical self-perceptions of adolescent girls who participated in a resistance training program would not differ from those of adolescent girls who did not participate in a resistance training program was retained. There were no statistically significant differences between the mean Modified PSDQ subscale or total scores for resistance training program participants and non-participants.

The null hypothesis that the muscular strength of adolescent girls who participated in a resistance training program would not differ from that of adolescent girls who did not participate in a resistance training program was partially rejected. Results from the post-intervention strength tests revealed a statistically significant difference between gains in upper body strength for the resistance training program participants and non-participants; however, there was no statistically significant difference in the gains made by the two groups' lower body strength.

Implications for Resistance Training on Strength and Physical Self-Perceptions

The results of this study indicate that participation in a resistance training program could improve physical strength in adolescent girls. While the resistance training program participants increased their lower body strength, the difference was not statistically significant when compared to gains made by the control group; however, participants in this research who completed the resistance training program did significantly increase their upper body strength. These findings concur with previous research that indicated that children and adolescents can

improve strength by up to 30-50% through participation in a resistance training program (Dahab et al., 2009).

While the results of this study show no significant differences between resistance training program participants and non-participants on a measure of physical self-description, the data indicate a slight improvement across all sub-components of the modified PSDQ when comparing participants' pre- and post-intervention scores. Similar to the research findings of Williams et al., (2001), the improvements observed in resistance training program participants, while not statistically significant, could indicate that through resistance training, the girls were able to develop an appreciation for the body's functionality rather than focusing solely on appearance.

Limitations of the Study

A few threats to the validity of this study have been identified. The small size of the sample, attrition as described in Chapter III, and the narrow sample (female private school students) likely limit the generalizability of these results to other populations.

The manner in which the participants completed their resistance training programs also could have influenced the results of the study. Most of the participants came to the fitness center in small groups and the researcher often observed that many of the participants in these groups appeared reluctant to be the strongest one. This likely limited how they selected their weights for each machine, which also could impact the magnitude of any measures of strength gains achieved. Similarly, participants working in pairs or groups could create competition and influence the amount of weight used for each exercise.

Some of the participants in this study also were participating in interscholastic sports during the intervention and this experience may have influenced their physical self-descriptions. Of the 13 participants who completed the study, six were participating in a spring sport. Without

controlling for this variable, any differences observed between participants and non-participants may not be completely attributable to participation in the resistance training program, as participation in a sport previously has been shown to influence adolescents' perceptions of physical competence (Richman et al., 2000).

In addition, the relatively short time span of the resistance training program may have influenced the magnitude of the differences found between the treatment and control groups. School closings for winter weather and spring break holidays limited time for the intervention to only three weeks. While participants in the treatment group demonstrated an increase in physical strength, a longer and more consistent intervention may have yielded greater increases in strength and larger differences between the groups on the dependent measures of interest.

Connections to Prior Research

Previous researchers have noted the multi-dimensional structure of self-esteem and noted the importance of physical self-esteem when examining its relationship with physical activity (Spence et al., 2005). These same researchers also suggested that physical activity could influence global self-esteem through the components of physical self-esteem, which includes perceptions of one's physical competence. Following this logic, this study investigated resistance training as a means to influence physical competence, which could in turn, influence self-esteem.

The psychological effects of physical activity have been investigated by many different researchers and the outcome of resistance training in children and adolescents also has been examined. For example, Lubans et al. (2010) studied the effects of resistance training on adolescent's self-perceptions and found that resistance training improved self-perceptions of body attractiveness in girls. While this study attempted to find similar results, no significant

improvements were found. Similarly, Faigenbaum et al., (1997) found that strength training had no significant effect on the self-concept and self-efficacy of children.

In prior years, researchers such as Brown & Harrison (1986) have examined strength training in women and its effects on physical strength and self-concept. This study was comparable to that conducted by Brown and Harrison, as it indicated that strength training could improve physical strength in females. Dissimilarly, Brown et al., (1986) research indicated that strength training also could improve measures of self-concept and self-esteem in women.

Recommendations for Future Studies

Implications for future studies of the effects of resistance training for adolescents can be inferred from the limitations to this study. A larger sample of students who do not participate in interscholastic sports could help control for some of the threats to validity.

If possible, future research could utilize strength machines in which the amount of weight is not visible to the study participants. This could help participants choose the appropriate weights without any preconceived notion of using a “heavy” weight.

In order to reduce any influence from participants working in pairs or groups, future research could assign individual times for workouts. In addition, increasing the duration of the resistance training intervention likely would impact physical strength to a greater extent, which in turn could have a broader influence on participants’ physical self-perceptions and descriptions.

Conclusion

This study was conducted as an attempt to determine if participation in a resistance training program could influence the physical self-descriptions and physical strength of adolescent girls. While the results indicated no significant differences in physical self-descriptions, the results did show an increase in participants’ upper body strength after a brief

resistance training intervention. Future research is recommended to investigate how resistance training influences strength and physical self-descriptions in a broader sample of adolescent girls and to investigate whether the impact differs for those who play and do not play sports.

REFERENCES

- Bowker, A. (2006). The relationship between sports participation and self-esteem during early adolescence. *Canadian Journal of Behavioural Science/Revue Canadienne Des Sciences Du Comportement*, 38(3), 214-229. doi:10.1037/cjbs2006009
- Brown, R. D., & Harrison, J. M. (1986). The effects of a strength training program on the strength and self-concept of two female age groups. *Research Quarterly for Exercise and Sport*, 57(4), 315-320.
- Dahab, K. S., & McCambridge, T. M. (2009). Strength training in children and adolescents: Raising the bar for young athletes? *Sports Health: A Multidisciplinary Approach*, 1(3), 223-226.
- Davison, K., Schmalz, D., & Downs, D. (2010). Hop, skip ... no! explaining adolescent girls' disinclination for physical activity. *Annals of Behavioral Medicine*, 39(3), 290-302. doi:10.1007/s12160-010-9180-x
- Dwyer, J. J., Allison, K. R., Goldenberg, E. R., Fein, A. J., Yoshida, K. K., & Boutilier, M. A. (2005). Adolescent girls' perceived barriers to participation in physical activity. *Adolescence*, 41(161), 75-89.
- Faigenbaum, A. D. (2007). State of the art reviews: Resistance training for children and adolescents: Are there health outcomes? *American Journal of Lifestyle Medicine*, 1(3), 190-200. doi:10.1177/1559827606296814

- Faigenbaum, A., Zaichkowsky, L. D., Wescott, W. L., Long, C. J., LaRosa-Loud, R., Micheli, L. J., & Outerbridge, A. R. (1997). Psychological effects of strength training on children. *Journal of Sport Behavior*, 20(2), 164-175. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1997-04888-003&site=ehost-live>
- Greenleaf, C., Boyer, E., & Petrie, T. (2009). High school sport participation and subsequent psychological well-being and physical activity: The mediating influences of body image, physical competence, and instrumentality. *Sex Roles*, 61(9), 714-726. doi:10.1007/s11199-009-9671-z
- Holloway, J. B., Beuter, A., & Duda, J. L. (1988). Self-Efficacy and training for strength in adolescent Girls1. *Journal of Applied Social Psychology*, 18(8), 699-719.
- Levy, S. S., & Ebbeck, V. (2005). The exercise and self-esteem model in adult women: The inclusion of physical acceptance. *Psychology of Sport and Exercise*, 6(5), 571-584.
- Lubans, D. R., Aguiar, E. J., & Callister, R. (2010). The effects of free weights and elastic tubing resistance training on physical self-perception in adolescents. *Psychology of Sport and Exercise*, 11(6), 497-504. doi:<http://dx.doi.org/10.1016/j.psychsport.2010.06.009>
- Marsh, H. W., Richards, G. E., Johnson, S., & Roche, L. (1994). Physical Self-Description Questionnaire: Psychometric properties and a multitrait-multimethod analysis of relations to existing instruments. *Journal of Sport & Exercise Psychology*.

- Nader, P. R., Bradley, R. H., Houts, R. M., McRitchie, S. L., & O'Brien, M. (2008). Moderate-to-vigorous physical activity from ages 9 to 15 years. *JAMA: The Journal of the American Medical Association*, *300*(3), 295-305.
- Parsons, E. M., & Betz, N. E. (2001). The relationship of participation in sports and physical activity to body objectification... *Psychology of Women Quarterly*, *25*(3), 209. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=5230055&site=ehost-live>
- Peltonen, J. E., Taimela, S., Erkontalo, M., Salminen, J. J., Oksanen, A., & Kujala, U. M. (1997). Back extensor and psoas muscle cross-sectional area, prior physical training, and trunk muscle strength—a longitudinal study in adolescent girls. *European Journal of Applied Physiology and Occupational Physiology*, *77*(1-2), 66-71.
- Physical activity guidelines for everyone: Children. (2011). Retrieved 11/02, 2013, from <http://www.cdc.gov/physicalactivity/everyone/guidelines/children.html>
- Poole, J. R., Mathias, K., Stratton, R. K., & Richard, K. (1996). Higher-Skilled and Lower-Skilled children's perceived ability and actual performance with kicking and striking tasks. *PHYSICAL EDUCATOR*, *53*, 214-221.
- Rasmussen, M., & Laumann, K. (2012). The academic and psychological benefits of exercise in healthy children and adolescents. *European Journal of Psychology of Education*, , 1-18.
- Richman, E. L., & Shaffer, D. R. (2000). If you let me play sports. *Psychology of Women Quarterly*, *24*(2), 189-199.

- Slater, A., & Tiggemann, M. (2010). "Uncool to do sport": A focus group study of adolescent girls' reasons for withdrawing from physical activity. *Psychology of Sport and Exercise*, 11(6), 619-626. doi:<http://dx.doi.org/10.1016/j.psychsport.2010.07.006>
- Sonstroem, R. J., & Morgan, W. P. (1989). Exercise and self-esteem: rationale and model. *Medicine & Science in Sports & Exercise*,
- Spence, J. C., McGannon, K. R., & Poon, P. (2005). The effect of exercise on global self-esteem: A quantitative review. *Journal of Sport & Exercise Psychology*, 27(3), 311. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=18014693&site=ehost-live>
- Troiano, R. P., Berrigan, D., Dodd, K. W., Mâsse, L. C., Tilert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine and science in sports and exercise*, 40(1), 181.
- Williams, P. A., & Cash, T. F. (2001). Effects of a circuit weight training program on the body images of college students. *International Journal of Eating Disorders*, 30(1), 75-82.
- Yungblut, H. E., Schinke, R. J., & McGannon, K. R. (2012). Views of adolescent female youth on physical activity during early adolescence. *Journal of Sports Science & Medicine*, 11(1), 39-50. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=74441971&site=ehost-live>

APPENDIX A

The Modified Physical Self-Description Questionnaire

Name: _____

The purpose of this study is to understand how people see themselves physically. Please read each statement carefully and decide your answer. Respond by circling the number that corresponds to the answer with which you most closely identify. Each number represents how closely you agree with the statement, with a 1 indicating you strongly disagree with it to a 7 indicating you strongly agree with it

1	2	3	4	5	6	7
<i>Strongly disagree</i>	<i>Mostly disagree</i>	<i>Slightly agree but mostly disagree</i>	<i>neither agree or disagree</i>	<i>Slightly disagree but mostly agree</i>	<i>Mostly agree</i>	<i>Strongly agree</i>

1. I am not intimidated when I walk into a fitness center.

1 2 3 4 5 6 7

2. I consider myself to be a flexible person.

1 2 3 4 5 6 7

3. I would perform well on a test of physical endurance.

1 2 3 4 5 6 7

4. Controlling my movements comes easily to me.

1 2 3 4 5 6 7

5. I would perform well on a test of physical strength.

1 2 3 4 5 6 7

6. If given a choice, I would prefer to lift weights rather than run a 5K.

1 2 3 4 5 6 7

7. In my group of friends, I am the strongest one.

1 2 3 4 5 6 7

8. When I walk into a fitness center, I know what most machines are used for.

1 2 3 4 5 6 7

9. I am better than most of my classmates at sports.

1 2 3 4 5 6 7

10. I can run for a long distance without stopping.

1 2 3 4 5 6 7

11. I would perform well on a test of flexibility.

1 2 3 4 5 6 7

12. Other people think I am good at sports.

1 2 3 4 5 6 7

13. Learning new sports comes easily to me.

1 2 3 4 5 6 7

14. I feel confident when doing complex coordinated physical movements.

1 2 3 4 5 6 7

15. I consider myself to be a physically strong person.

1 2 3 4 5 6 7

16. If given a choice, I would prefer to run a 5K rather than perform strength training activities.

1 2 3 4 5 6 7

17. I would feel comfortable giving advice if a friend asked me for help with a work out.

1 2 3 4 5 6 7

18. I am not awkward during most physical activities.

1 2 3 4 5 6 7

19. I am flexible enough to perform most physical activities well.

1 2 3 4 5 6 7

20. My muscles stretch and move in most directions well.

1 2 3 4 5 6 7

21. I could beat most of my friends in a distance run.

1 2 3 4 5 6 7

22. I am coordinated when I play sports and perform physical activities.

1 2 3 4 5 6 7

23. I am good at most sports I try.

1 2 3 4 5 6 7

24. I can work out on my own without someone helping me figure out what to do.

1 2 3 4 5 6 7