EXAMINING THE IMPACT OF WEIGHT TRAINING ON PHYSICAL AND PHYSIOLOGICAL PARAMETERS IN FOOTBALL PLAYERS

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ABSTRACT

Introduction: Embracing a high quality of life alongside consistent engagement in resistance training epitomizes the essence of fitness. The objective of this investigation is to scrutinize the impact of weight training (WT) on chosen physical and physiological factors among female football players. Methodology: This study adopts an experimental research approach with a pre- and post-test design, incorporating both a weight training group and a control group. Thirty female participants were chosen for this research and divided into two groups: Group A (n=15) designated as the experimental group and Group B (n=15) as the control group. Participants' ages encompassed a range from 18 to 24 years. The weight training program was structured to include two sessions every week, and each session extended for duration of 45 minutes. Subjects were assessed both before and after the 6-week session. In the realm of statistical scrutiny, ANCOVA and the prowess of SPSS 22 were harnessed for meticulous analysis. The confidence threshold for the level of impact was set at 0.05. In scrutinizing disparities among participants before and after the tests, the tool of descriptive statistics was enlisted. Observations and Discussion: The results pointed to a significant influence of weight training on the designated physical traits, encompassing muscular strength, muscular endurance, and flexibility. Regarding the physiological parameters, such as resting heart rate and breath-holding time, there was also a sizable variation. Conclusion: It is manifestly clear that engaging in weight training proves to be advantageous for the enhancement of both physical and physiological variables. Expanding the number of training sessions per week is poised to yield more substantial effects,

contributing to a noteworthy improvement in the overall fitness levels among the student population.

Key-words: Physical, Physiological, Exercise, and Weight training (WT).

INTRODUCTION

Weight training (WT) is a crucial technique for enhancing everyone's well-being and performance [1]. One of the most common kinds of activity used for improving one's level of fitness and for conditioning reasons is weight training, often known as strength or resistance training [2]. Weight training is founded on the idea that when necessary, the body's muscles will strive to get over a resistant force. Your muscles get stronger when you lift weights frequently and regularly [3]. It's important to comprehend how the body functions to appreciate the benefits of weight training. It may not be feasible to fully comprehend the body of a person since it is more complicated than any machine ever created. We now know why applying resistance from external weights causes our bodies to grow bigger, stronger, and more powerful throughout the previous century of studies on the general advantages of weight training [4]. Numerous studies have shown that combining weight training with cardiovascular workouts can help lower blood pressure, enhance cardiovascular fitness, assist reduce body fat, and increase muscular mass [5]. The American College of Sports Medicine advises performing 8 to 12 sets of an RT activity for every important muscle group at a workload of 40%–80% of one's maximum heart rate, with 2-3 minutes of rest in between each set [6]. To sustain or build power and bulk, current guidelines state that WT should be done a minimum of twice per week with an average to strenuous intensity [7]. Prior research looked at the impact of a 12-week RT program on reducing blood pressure, heart rate, and rate of perceived effort. The research conducted on walking, jogging, and cycling programs did not reveal significant differences. However, resistance training (RT), particularly circuit training, demonstrated improvements in various measures of aerobic capacity among cardiac rehabilitation patients [8]. Despite the proven benefits of RT, there was historical reluctance to recommend it for children and adolescents due to perceived injury risks [9]. In a study addressing the health and performance of athletes, various parameters were considered; emphasizing the importance of RT. Skinner asserted that exercise, particularly RT, is a potent medicine for controlling conditions such as obesity, joint pains, muscle weakness, and neuromuscular coordination issues [10]. Fitness professionals have highlighted the significance of push-up exercises, considering them as fundamental for individuals of all fitness levels. Push-ups contribute to chest development and play a crucial role in shaping

and defining the abs, triceps, shoulders, and torso [11]. The prescription of sets, reps, exercises, and weights in RT varies based on the specific goals of athletes. Sets with fewer reps are often performed with higher weights, with the combination tailored to the individual's objectives during the exercise routine [12]. The effectiveness of push-ups lies in their ability to enhance upper-body muscular push strength, shoulder strength, and overall performance in activities requiring high relative strength [13]. In summary, exercise, particularly resistance training, is likened to medicine, offering therapeutic benefits for various health conditions and performance enhancement in both rehabilitation and athletic settings.

The goal of this study was to determine how WT affected the physiological and physical characteristics of female football players.

The inquiry concentrated on the following goals:

1. Creating a successful weight training regimen for female football players.
2. Monitoring, executing, and managing the participants' training program.
3. Determining whether the selected physiological factors have changed.
4. Determining how WT affects specific physical factors
5. Making suggestions.

MATERIALS AND METHODS

This research utilizes an experimental approach, employing a weight training (WT) group and a control group, supplemented by both pre-tests and post-tests. To achieve the study's aims, thirty university-level female football players from the Annamalai University campus in Tamil Nadu were selected at random. Each group received 15 participants, with Group A serving as the experimental group (n= 15) and Group B serving as the control group (n= 15). The average age of those included was 18 to 24. The WT program comprised 45-minute sessions which took place twice a week. Before and after the 6-week session, all subjects underwent testing. To every subject, the test technique was orally discussed and genuinely stated. The participants' uncertainties were cleared up. The distribution of a handout and timetable helped to gather details regarding the students' daily workout regimen as well as intensity.

Selection of subjects:

Thirty university female footballers from Annamalai University's campus in Tamil Nadu were chosen randomly as research participants to fulfill the study's objectives. The individuals' ages varied from 18 to 24 years old.

Selection of Variables

The researcher read books, journals, periodicals, magazines, study papers, and other scientific material on weight training, physical fitness, and physiological variables. They also spoke with professionals and instructors. The remaining factors were chosen while taking into account the feasibility requirements, equipment availability, and significance of the research project's variables.

Independent Variables

Two separate groups were chosen for this experiment, one of which served as the experimental group and the second served as the control group, allowing for comparison of the results.

- ❖ Weight Training

Dependent Variables

- ❖ **Physical Fitness Parameters**
  - Muscular strength
  - Muscular endurance
  - Flexibility
- ❖ **Physiological Parameters**
  - Resting heart rate
  - Breath-holding time

Selection of test items

The primary objective of this research was to examine the effects of weight training on key physical and physiological characteristics in female football players. The best evaluations for the study were chosen by the investigator after consulting with experts and physical education specialists and reviewing relevant literature, as stated in the table below.

Table-1: The particulars regarding the physical factors, assessments, and units of measurement.

S.No	Criterion Variables	Test Items	Unit of Measurement
1	Muscular Strength	1RM (Bench Press Test)	Kgs
2	Muscular Endurance	Sit-ups (60 sec)	Reps (score)
3	Flexibility	Sit and reach test	Cm's

Table-2: The particulars regarding the physical factors, assessments, and units of measurement.

S.No	Criterion Variables	Test Items	Unit of Measurement
4	Resting pulse rate	Radial Pulse Test	Score/ minute
5	Breadth holding time	Digital watch	Seconds/ minutes

Training Protocol

Crafted with a keen understanding of the academic commitments of female players, this meticulously designed twelve-week training program seamlessly integrates into their busy schedules. The weight training (WT) unfolds twice weekly, with each session lasting 45 minutes and encompassing a diverse set of eight targeted exercises, including sitting calf raises, leg extensions, standing leg curls, high pulley front, chest press, sitting triceps extensions, sitting shoulder press, and abductors. The regimen commences with a comprehensive warm-up, incorporating general warm-up activities, stretching exercises, and specific warm-up drills like free squats, push-ups, and sit-ups. In the initial two weeks, the workout maintains a 20% intensity level with two sets of 20 reps and a one-minute rest between sets. Progressing into week's three to five, a dynamic shift occurs with the first set at 20% intensity and the second set escalating to 40%, featuring 15 repetitions per set and one-minute rest intervals. Weeks six and seven usher in a more intense phase with a 30% intensity for the first set and 60% for the second set, coupled with 12 reps each and a two-minute interlude between sets. The subsequent weeks eight to ten introduce a nuanced structure with the first set at 20% intensity (15 reps), the second set at 40% intensity (12 reps), and a formidable third set at 80% intensity (10 reps), accompanied by a three-minute respite between each set. Culminating in weeks eleven and twelve, the program orchestrates a finale with the first set at 20% intensity, paired with 15 reps and a three-minute intermission. The second set intensifies to 60%, embracing 12 reps with a three-minute breather, while the

climactic third set commands 100% intensity, featuring 6 reps and a triumphant three-minute standing ovation. Bringing the curtain down, the schedule concludes with a tailored cool down exercise, ensuring a harmonious conclusion to this empowering training program tailored specifically for female players.

Statistical Analysis

The data were examined by using the correct statistical techniques. The statistical software SPSS-22 was employed. In order to see if there were any variations during the pre- and post-test between those who participated, descriptive statistical methods for data scores were used. The significance was determined using ANCOVA, mean, and standard deviation. The level of statistical significance was established using a degree of confidence of 0.05.

RESULTS AND DISCUSSION

Table-3: Mean and S.D of the Selected Physical Variables for Experimental and Control Group

Selected variables	Groups	Pre-test		Post-test	
		Mean	S.D	Mean	S.D
Muscular Strength	Experimental	31.89	1.25	41.88	2.29
	Control	31.78	1.40	31.96	1.98
Muscular Endurance	Experimental	42.80	4.04	47.40	3.77
	Control	42.73	3.82	43.13	4.39
Flexibility	Experimental	24.51	0.46	27.23	1.80
	Control	24.42	0.53	24.66	0.32

Table 3 presents the mean and standard deviation (SD) values for muscular strength in the experimental group, indicating a change from pre to post-test as (31.89, 1.25) and (41.88, 2.29), respectively. The experimental group demonstrated a notable enhancement in performance between the two testing points. Conversely, the control group exhibited no discernible alterations from the pre to post-test. In terms of muscular endurance performance within the experimental group, the mean and SD values shifted from (42.80, 4.04) to (47.40, 3.77), illustrating an improvement. The control group, however, did not exhibit any significant changes between the pre and post-tests. Additionally, concerning flexibility performance in the experimental group, the mean and SD values changed from (24.51, 0.46) to (27.23, 1.80), indicating an enhanced flexibility performance from pre- to post-test.

Conversely, the control group displayed no observable changes in flexibility between the two testing phases.

Table-3.1: An Analysis of Co-Variance of the Data on the Selected Physical Variables for the Experimental and Control Group

Variables	Adjusted Post mean		SOV	SOS	Df	MS	'F'ratio
	Experimental	Control					
Muscular Strength	41.84	32	Between	725.11	1	725.11	203.63
			With in	96.142	27	3.561	
Muscular Endurance	47.37	43.16	Between	132.48	1	132.48	48.13
			With in	74.13	27	2.752	
Flexibility	27.23	24.66	Between	49.02	1	49.02	28.34
			With in	46.71	27	1.73	

*Significant at 0.05 level of confidence

The corrected post-test mean values for the experimental and control groups for muscular strength are 41.84 and 32, respectively, as indicated in the aforementioned table 3.1. The calculated F-ratio for the modified post mean was 203.63, which is larger than the acceptable table value of 4.21 at 1 and 27 df and 0.05 level of confidence. The corrected post-test means for the experimental group and control group for muscular endurance are 47.37 and 43.16, respectively, as indicated in the following table 3.1. The calculated F-ratio for the modified post mean was 48.13, which is larger than the acceptable table value of 4.21 at 1 and 27 df and 0.05-degree of confidence. According to table 3.1, the experimental group and control group's adjusted post-test mean scores for flexibility are 27.23 and 24.66, respectively. The calculated F-ratio for the modified post mean was 28.34, which is greater than the necessary table value of 4.21 for 1 and 27 df at 0.05 degree of confidence. With regard to the three physical parameters that were chosen—muscular strength, muscular endurance, and flexibility—WT had a considerable impact on the experimental group. Furthermore, the specified physical factors did not significantly alter in the control group. It is clear that WT plays a significant role in helping university students improve their physical characteristics. It is obvious that WT training over the course of two days resulted in positive consequences, and WT training over the course of four days may have even greater effects on participants' physical well-being.

Table-4: The Mean and S.D of chosen Physiological Variables between the Experimental and Control Groups

Selected variables	Groups	Pre-test		Post-test	
		Mean	S.D	Mean	S.D
Resting Heart Rate	Experimental	70.22	0.76	67.62	1.94
	Control	70.07	0.66	70.35	0.78
Breath Holding Time	Experimental	37	0.65	44.87	4.45
	Control	36.93	0.59	37.07	0.59

Table 4 above displays the analysis results for the chosen physiological factors. From the pre- to post-test, the experimental group subjects' mean and standard deviations for resting pulse rate was (70.22, 0.76) and (67.62, 1.94), respectively. The findings reveal a noteworthy surge in performance for the experimental group between the pre- and post-tests, while the control group exhibited no discernible distinctions during this period. Exploring the breath-holding time transformation from pre- to post-test, the experimental group's participants showcased a remarkable shift, with mean and standard deviation values of (37, 0.65) and (44.87, 4.45), respectively. The experimental group's students performed better between the pre- and post-test. When compared to the test group, the control group did not exhibit any positive improvements.

Table-4.1: An Analysis of Co-Variance of the Data on Selected Physiological Variables for Experimental and Control Group

Variables	Adjusted Post mean		SOV	SOS	Df	MS	'F'ratio
	Experimental	Control					
Resting Pulse Rate	67.59	70.38	Between	57.32	1	57.32	26.17*
			With in	59.14	27	2.19	
Breath Holding Time	44.86	37.07	Between	453.44	1	453.44	43.37*
			With in	282.28	27	10.45	

*Significant at 0.05 level of confidence

The corrected post-test mean value for resting pulse rate for the experimental and control groups, respectively, is shown in table-4.1 as 67.59 and 70.38. The computed F-ratio

of 26.17 for the modified post means above the necessary table value of 4.21 for 1 and 27 df at 0.05 degree of confidence. The corrected post-test mean value for breadth holding time for the experimental group and control group, respectively, is 44.86 and 37.07, as shown in table 4.1. The computed F-ratio for the adjusted post mean was 43.37, which is larger than the necessary table value of 4.21 for 1 and 27 df at 0.05 degree of confidence. In comparison to the control group, the experimental group is significantly affected by WT in terms of resting pulse rate and breadth holding time. Furthermore, it is clear that WT helps football players by enhancing their physiological characteristics.

Table 3.1 signifies the significance of all examined variables, including muscular strength, muscular endurance, and flexibility. This implies that the training regimen yielded positive effects on all the selected variables. In contrast, Table 4.1 highlights the significance of specific variables, namely resting pulse rate and breath-hold time.

Several research studies align with the findings of the present study. One investigation suggested that engaging in a 12-week, thrice-weekly strength training regimen significantly improved resting pulse rate and vital capacity among football players compared to a control group. This underscores the pivotal role of commitment to strength training in enhancing athletes' overall physical well-being [14]. Another study incorporating high-load strength training with soccer-specific movements could be an effective strategy for enhancing strength and speed [15]. Another study indicated that the resistance training yields favorable effects on the body composition, as well as the muscular strength and endurance, of elite male and female players compared to a control group [16]. In a different research study, it was observed that adolescent boys who underwent resistance training at a moderate velocity showed a favorable impact on the advancement of explosive strength ($p = 0.05$) in comparison to a control group [17]. A twelve-week study demonstrated that cardio-respiratory endurance training, resistance training, and core strength training significantly improved selected physical fitness variables among college athletes [18]. The effects of a 12-week resistance and free weight training program were proven to greatly increase the research findings in relation to muscle strength in a previous investigation [19]. In a recent investigation, it was found that the combination of Visual and Kinesthetic Imagery with Single Limb Resistance Training significantly improved self-perception among intermediate-level male bodybuilders, as opposed to Group I (undergoing visual imagery training) and Group II (undergoing kinesthetic imagery training) [20,21]. According to this study's findings, RT for seven weeks significantly improved the subject's leg explosive strength and agility [5]. According to the findings of an earlier investigation, stationary circuit training and

moving circuit training significantly affected anaerobic power when compared to the untreated group [21].

CONCLUSION

In light of all the chosen physical characteristics, including muscular strength, muscular endurance, and flexibility, it is determined that the effect of WT on the experimental group was considerable. In addition, the control group exhibited no noticeable alterations in the chosen physical characteristics. Additionally, it can be said that the experimental group had a notable performance in terms of resting pulse rate and breadth holding duration. The selected physiological variables did not change for the control group between the pre-and post-test, in addition. This clearly shows that participating in WT twice a week for 45 minutes at a time is good for the participants' physical and physiological factors. More training sessions each week, such as three, four, or five, will be more beneficial for raising students' overall fitness levels.

Recommendations

Drawing from the study's findings, the researcher has identified several related issues that could be chosen for future research endeavors. The insights gained from this study, along with its findings, can offer valuable guidance to researchers and physical education professionals in the realm of sports training. In light of this, the following suggestions can be put forward:

1. To enhance and maintain a healthy routine, school and college level students are encouraged to participate in the weight training programs.
2. Coaches and those involved in physical education are advised to incorporate diverse weight training methods emphasized in the current study. This is crucial for elevating the physical and physiological attributes of football players.
3. A larger sample size could be utilized in a similar study.
4. It is suggested that further studies be conducted to validate these findings over an extended training period.
5. Research should also explore different age groups for a more comprehensive understanding.
6. Obese students can be the subject of further studies using various training methodologies.

7. It is advisable to conduct studies with varying training durations on different variables, comparing them with alternative training modalities not utilized in this research.

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