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THE INFLUENCE OF STRENGTH TRAINING ON BODY COMPOSITION PARAMETERS IN OBESE WOMEN

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Abstract
The issue of obesity continues to be a noteworthy public health matter, displaying a widespread occurrence on a global scale that has reached epidemic levels, particularly among the female population. The objective of this study was to examine the effects of strength training on the body composition profile of women who are obese. A cohort of 200 women classified as obese were recruited to participate in a randomized controlled experiment spanning a duration of 6 weeks. The study involved the allocation of participants into two distinct groups. The intervention group, consisting of 100 individuals, participated in supervised strength training sessions. Conversely, the control group, comprised of 100 individuals, maintained their regular levels of physical activity. The examinations conducted before and after the intervention encompassed the evaluation of body weight, body fat, body impedance, body mass index, basal metabolic rate, lean body mass, and body water level. The findings of the study demonstrated a statistically significant effect in body fat (p<0.05), body impedance (p<0.05), body mass index (p<0.05), basal metabolic rate (p<0.05), lean body mass (p<0.05), and body water level (p<0.05) within the strength training intervention group as compared to the control group. In summary, the implementation of a 6-week strength training regimen among women with obesity resulted in positive alterations in above said variables.
Key words: strength training, body composition, body mass index, basal metabolic rate, lean body mass, body water level

Introduction

The issue of obesity continues to be a noteworthy public health matter, displaying a widespread occurrence on a global scale that has reached epidemic levels, particularly among the female population. Obesity possesses a multitude of ramifications that transcend the realm of physical health, manifesting in psychological and social domains, hence exerting a profound influence on the holistic well-being and overall quality of life experienced by those afflicted. In recent years, there has been a notable increase in attention towards the incorporation of strength

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training as a viable technique for altering body composition, amidst the utilization of numerous therapeutic interventions to address obesity (Tiwari and Balasundaram, 2023; Hruby and Hu, 2015).

Strength training, commonly referred to as resistance training or weight training, is a physical workout modality that employs resistance to stimulate muscular contractions, leading to improvements in muscle strength, endurance, and hypertrophy. Strength training has been identified as a viable intervention for persons dealing with obesity, as it has the capacity to stimulate muscle growth, enhance muscle mass, and improve muscular strength, hence influencing body composition. The findings of several studies have demonstrated that the inclusion of well-organized strength training protocols within weight control interventions can result in beneficial alterations in fat mass, lean body mass, and overall body weight (Westcott, 2012; Marini et.al., 2008).

Further research is needed to explore the potential effects of strength training on body composition in obese women, despite the existing evidence supporting its benefits in terms of athletic performance and muscle growth. Prior research has shown evidence for the beneficial effects of strength training on metabolic rate, fat oxidation, and the promotion of lean muscle mass. These findings underscore the promise of strength training in promoting long-term weight loss and enhancing metabolic health in individuals who are obese. Furthermore, scholarly investigations have indicated that including strength training into complete weight management strategies can potentially lead to increased physical function, heightened insulin sensitivity, and decreased risk factors linked to cardiovascular illnesses and metabolic syndromes (Strasser and Schobersberger, 2011, Wilis et.al. 2012).

The primary objective of this study is to make a scholarly contribution to the current body of knowledge regarding the impact of strength training on the body composition of women who are classified as obese. Through an examination of the possible mechanisms that underlie the correlation between strength training and body composition, this study aims to offer empirical evidence that supports the inclusion of strength training as a fundamental element in comprehensive interventions aimed at addressing obesity and enhancing the overall welfare of individuals affected by it (Burup et.al., 2018; Willis et.al., 2012; Manson et.al., 1995).

By integrating empirical data, scientific literature, and theoretical frameworks, the primary objective of this research paper is to provide a comprehensive understanding of the complex relationship between strength training and body composition. This analysis aims to uncover valuable insights that can inform the development of targeted and efficient interventions specifically designed for obese women. This study aims to provide valuable insights derived from a comprehensive analysis of existing literature and empirical research. The findings of this study can be utilized by healthcare professionals, researchers, and policymakers to develop and implement evidence-based strategies that effectively tackle the intricate challenges associated with obesity and its associated health consequences.

Methodology

The primary objective of the study was to assess the impact of a 6-week supervised strength training program on these individuals. The participants were allocated into two groups: an intervention group, which participated in structured strength training sessions, and a control group, which maintained their regular levels of physical activity. The cardiovascular parameters that were evaluated prior to and following the intervention encompassed body weight, body fat, body impedance, body mass index, basal metabolic rate, lean body mass, and body water level.

In the present study two hundred obese subjects were selected. Mainly all subjects were classified into two groups namely experimental group and control subject. Out of two

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hundred obese subjects each group consist of hundred subjects namely strength training experimental group (hundred subjects), and control subjects (hundred subjects). All the subjects for this study were selected after their inform consent from Raipur, Chhattisgarh, India. All the experimental subjects were regularly participated in the training given by the research scholar. The concept of fitness is different from the participating in the sports. Sports participation required combination of magnitude of factors. The study was taken on the basis analysis of scientific literature available on body weight, body fat, body impedance, body mass index, basal metabolic rate, lean body mass, and body water level, as well as on the basis of tests findings of the related research studies. randomized controlled experiment sampling method was adopted for the present study.

Analytical Procedure

All statistical analysis was performed in computer in MS Excel and SPSS-27. Analysis of data was done by using descriptive method where mean, standard error, and standard deviation (SD) for each group was calculated. The inferential analysis or Comparative analysis (one way ANOVA) was applied to observe differences between pre-test and post-test data for all studied variables in both groups. The level of significance was set at 0.05 to validate the difference, if any.

Results

Table 1: Showing the comparison of Body weight (kg) of obese subjects between pre and post Strength training.

Pre Test		Post Test		ANOVA	
Mean ± SE	SD	Mean ± SE	SD	F-value	P-value
60.68± 0.64	6.47	59.52 ± 0.49	4.88	2.068	*NS*

The mean value for body weight (kg) for pre training was found to be 60.68± 0.64 Kg and 59.52 ± 0.49 Kg for post training data for studied subjects. The inferential analysis (ANOVA) revealed statistically ($p > 0.05$) insignificant difference amongst the studied groups i.e. pre strength training and post strength training body weight (kg) of obese subjects. The body weight (kg) of pre-training group were found insignificantly heavier. The post strength training body weight (kg) is found to be insignificantly lighter as compare to that of pre strength training.

Table 2: Showing the comparison of body fat (kg) of obese subjects between pre and post strength training.

Pre Test		Post Test		ANOVA	
Mean ± SE	SD	Mean ± SE	SD	F-value	P-value
15.52 ± 0.34	3.39	12.32 ± 0.31	3.03	49.58	$p<0.01$

The mean value for body fat (kg) for pre strength training was found to be 15.52 ± 0.34 Kg and 12.32 ± 0.31 Kg for post strength training data for studied subjects. The inferential analysis (ANOVA) revealed statistically ($p < 0.05$) significant difference amongst the studied groups i.e. between pre strength training and post strength training body fat (kg) of obese subjects . The body fat (kg) of pre-training group were found heavier. The post strength training body fat (kg) is found to be significantly lighter as compare to that of pre training.

Table 3: Showing the comparison of impedance of obese subjects between pre and post strength training.

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Pre Test		Post Test		ANOVA	
Mean ± SE	SD	Mean ± SE	SD	F-value	P-value
621.6 ± 7.86	78.61	642.69 ± 6.67	66.70	4.184	$p<0.05$

The mean value for impedance for pre training was found to be 621.6 ± 7.86 and 642.69 ± 6.67 for post training data for studied subjects. The inferential analysis (ANOVA) revealed statistically ($p < 0.05$) significant difference amongst the studied groups. The impedance of pre-training group were found lower. The post strength training impedance is found to be significantly higher as compare to that of pre strength training impedance.

Table 4: Showing the comparison of body mass index of obese subjects between pre and post Strength Training.

Pre Test		Post Test		ANOVA	
Mean ± SE	SD	Mean ± SE	SD	F-value	P-value
24.66 ± 0.39	3.83	21.93 ± 0.30	3.06	31.37	$p<0.01$

The mean value for body mass index for pre training was found to be 24.66 ± 0.39 and 21.93 ± 0.30 for post training data for studied subjects. The inferential analysis (ANOVA) revealed statistically ($p<0.05$) significant difference between the studied groups. The body mass index of pre-training group were found heavier. The post strength training body mass index is found to be significantly lighter as compare to that of pre strength training body mass index.

Table 5: Showing the comparison of basal metabolic rate of obese subjects between pre strength training and post strength training.

Pre Test		Post Test		ANOVA	
Mean ± SE	SD	Mean ± SE	SD	F-value	P-value
1414.31 ± 8.68	86.75	1460.36 ± 12.24	122.38	9.425	$p<0.01$

The mean value for basal metabolic rate for pre training was found to be 1414.31 ± 8.68 and 1460.36 ± 12.24 for post training data for studied subjects. The inferential analysis (ANOVA) revealed statistically ($p<0.05$) significant difference amongst the studied groups. The basal metabolic rate of pre-training group were found lower. The post strength training basal metabolic rate is found to be significantly higher as compare to that of pre strength training.

Table 6: Showing the comparison of lean body mass of obese subjects between pre strength training and post strength training .

Pre Test		Post Test		ANOVA	
Mean ± SE	SD	Mean ± SE	SD	F-value	P-value
45.18 ± 0.67	6.66	47.20 ± 0.43	4.27	6.66	$p<0.05$

The mean value for lean body mass for pre training was found to be 45.18 ± 0.67 and 47.20 ± 0.43 for post strength training data for studied subjects. The inferential analysis (ANOVA) revealed statistically ($p<0.05$) significant difference amongst the studied groups. The lean body mass of pre-training group were found lighter. Significant strength training effects has been found in the lean body mass of subjects. The post strength training lean body mass is found to be significantly heavier as compare to that of pre training.

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Table 7: Showing the comparison of body water level of obese subjects between pre and post strength training.

Pre Test		Post Test		ANOVA	
Mean ± SE	SD	Mean ± SE	SD	F-value	P-value
33.19 ± 0.50	5.07	31.74 ± 0.43	4.23	4.904	$p<0.05$

The mean value for body water level for pre training was found to be 33.19 ± 0.50 and 31.74 ± 0.43 for post training data for studied subjects. The inferential analysis (ANOVA) revealed statistically ($p<0.05$) significant difference amongst the studied groups. Body water level of pre-training group were found higher. The post strength training body water level is found to be significantly lower as compare to that of pre strength training.

Discussion

The present study conducted a thorough examination of diverse physiological indicators prior to and following the introduction of a well-organized regimen of strength training in a cohort of women with obesity. This investigation has provided valuable findings regarding the impact of strength training on both body composition and metabolic processes. The results demonstrate a steady trend of favorable alterations in many significant measures, including body fat, impedance, Body Mass Index (BMI), Basal Metabolic Rate (BMR), lean body mass, and body water content.

The findings of this study provide evidence that strength training may be effective in reducing body fat among obese adults. The results show a statistically significant decrease in mean body fat, from an initial measurement of 15.52 ± 0.34 Kg to a final measurement of 12.32 ± 0.31 Kg, following the strength training intervention. These findings reinforce the growing body of research suggesting the potential benefits of strength training for fat loss in this population. The significant decrease in body fat observed in the individuals can be seen as evidence of the positive influence of strength training on their overall body composition and metabolic well-being. This underscores the potential of resistance exercise in facilitating fat metabolism and improving body composition (Strasser and Schobersberger, 2011).

Moreover, the recorded rise in impedance from 621.6 ± 7.86 to 642.69 ± 6.67 highlights the possible enhancement in general tissue well-being and cellular vigor subsequent to the strength training intervention. The observed increase in impedance indicates a notable augmentation in muscle mass, heightened cellular hydration, and enhanced tissue integrity. Consequently, these findings represent the beneficial impact of strength training on the development of muscles and the overall health of tissues in the individuals under investigation (Sardinha et.al., 2023; Clark et.al. 2021).

Furthermore, the notable reduction in body mass index (BMI), specifically from an average of 24.66 ± 0.39 to 21.93 ± 0.30, subsequent to the implementation of the strength training intervention, underscores the beneficial influence of resistance exercise on the weight status and overall metabolic well-being of the individuals included. The decrease in BMI values that was seen indicates a more advantageous body composition and a decreased likelihood of health issues associated to obesity. This underscores the possibility of strength training as a viable approach for managing BMI in women who are obese (Bray et.al., 2018).

Moreover, the observed substantial rise in basal metabolic rate (BMR), specifically from 1414.31 ± 8.68 to 1460.36 ± 12.24, subsequent to the implementation of the strength training intervention, underscores the advantageous impact of resistance exercise on the metabolic rate and energy expenditure of the individuals involved. The increase in basal metabolic rate (BMR)

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found indicates an improvement in the total expenditure of energy and metabolic efficiency. This suggests that engaging in strength training could potentially play a role in promoting sustainable weight management and enhancing metabolic regulation in those who are obese (Farhana and Rehman, 2023).

The observed rise in lean body mass, which went from 45.18 ± 0.67 to 47.20 ± 0.43, as a result of the strength training intervention, reinforces the beneficial impact of resistance exercise on muscle growth and the accumulation of lean body mass in the participants under investigation. This discovery highlights the power of strength training to facilitate muscle growth, augment muscular strength, and boost overall physical function and performance, consequently making a positive contribution to the overall well-being and functional capacity of the participants (Suchomel et. al., 2016).

Furthermore, the decrease in body water level observed, ranging from 33.19 ± 0.50 to 31.74 ± 0.43, subsequent to the strength training intervention, necessitates additional inquiry into the precise processes that account for the alterations in body water level and hydration status among individuals with obesity. Additional research efforts are required to clarify the possible ramifications of strength training on the distribution of body water and the dynamics of hydration. This will contribute to a more comprehensive comprehension of the overall effects of resistance exercise on different aspects of body composition and physiological functions in obese women (Nieman and Wentz, 2019).

In summary, the results of this study emphasize the potential benefits of strength training in facilitating positive changes in body composition, metabolic processes, and general health in women who are obese. The present study demonstrates significant enhancements in body fat, impedance, BMI, BMR, lean body mass, and body water level, underscoring the comprehensive and diverse impacts of strength training on a range of physiological factors pertinent to weight regulation, muscle growth, and metabolic well-being. Additional research efforts are necessary to investigate the underlying mechanisms and long-term effects of strength training on body composition and physiological functions in individuals affected by obesity and its related health consequences. These future studies should involve larger sample sizes and longer intervention periods in order to provide a more comprehensive understanding of this topic.

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