ORIGINAL ARTICLE

The Impact of Core Stability Exercises on Weight Loss and Body Composition among Obese Patients

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Abstract

Background: While the advantages of core stability exercises for overall fitness and injury prevention are well-established, further research is needed to understand their impact on weight reduction and body composition in the obese population. Hence, the present study aims to determine the effects of core stability exercises on weight loss, BMI and body composition measures among obese individuals.

Methods: This pre-post intervention design involved adults aged 18-40 years with BMI ≥ 30 kg/m² engaged in a supervised core stability exercise program for 12 weeks. The exercise sessions occurred thrice weekly, each lasting approximately 40 minutes.

Results: After 12 weeks of intervention, a pre-post comparison was performed which revealed a significant mean difference ($p<0.05$) in all the outcome measures. The value of BMI was reduced to 27.53±2.56, weight to 75.25±3.34, BF% to 30.14±1.56 and WHR to 0.85±0.56.

Conclusion: The study found that 12-week core stability exercises significantly decreased weight, BMI, BF%, and WHR in an obese group. The planned and focused nature of the exercises resulted in improved body composition and weight loss. Thus, these exercises in regular fitness routines can be an effective strategy for reducing obesity and enhancing overall health.

Keywords

Body Fat, Body Mass Index, Exercises, Obesity.

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Introduction

Obesity is a chronic condition characterized by an excessive accumulation of body fat, particularly in the abdominal area, which poses several health hazards. Morbid obesity, or extreme obesity, is defined as a BMI of 40 kg/m² or more[1]. Obesity prevalence is impacted by a variety of risk factors, including overeating, alcohol use, sedentary lifestyle, lack of self-control, inadequate sleep, and stress[2]. This disorder has multiple comorbidities and is closely connected to metabolic diseases, including diabetes (DM), hypertension (HTN), dyslipidemia, and heart disease. It also causes musculoskeletal disorders and raises the risk of several types of cancer, emphasizing its importance in overall health[3-4].

Many developing nations, such as Pakistan, are currently dealing with the twin dilemma of underweight and overweight population[5]. Excess body weight was always thought to be primarily a concern in the developed world, but it is now rapidly affecting developing countries. In recent years, the prevalence of overweight and obesity in nations such as Pakistan has increased dramatically[5-6]. In 2014, worldwide disease estimates placed Pakistan 8th among 10 nations, accounting for half of the world's 693 million obese people. This highlights the significant incidence of obesity in Pakistan, making it a vital public health concern that must be addressed immediately[7].

Physical activity (PA) is an essential component of weight or obesity management, as well as nutrition, behavioral support, and comorbidity therapy[8]. PA or exercise, is predicted to result in weight reduction and fat loss while preserving lean mass and subsequent maintenance of weight loss[9]. Well-conducted systematic reviews and meta-analysis found evidence of the benefits of exercise on weight reduction and body composition. However, there was a paucity of information on the effects of certain forms of exercises, particularly core stability exercise, on weight loss[10]. Over the last decade, there has been a surge of interest in exercise's impact on visceral adipose tissue and the preservation of lean body mass in obese individuals[11].

Planks, bridges, and rotational movements are some exercises that can help with core stability training, which focuses on strengthening the muscles of the belly, lower back, and pelvis to improve balance, stability, and total core posture, injury prevention, and sports performance[12-13]. Core stability exercises may significantly impact weight reduction and body composition by enhancing muscle activation and energy expenditure[14]. While the advantages of core stability exercises for overall fitness and injury prevention are well-established, further research is needed to understand their impact on weight reduction and body composition in the obese population. Hence, the present study aims to determine the effects of core stability exercises on weight loss, body mass index (BMI) and body composition measures among obese individuals.

Methodology

Study Design and Duration

The study involved a pre-post intervention design to investigate the effects of core stability exercises on weight and body composition in an obese population. All participants were assigned to a single intervention group, which performed core stability exercises for 12 weeks.

Study Setting

The study was conducted at the Armed Institute of Rehabilitation Medicine, Rawalpindi equipped with the necessary facilities for exercise training and assessments.

Participants Recruitment Criteria

Inclusion Criteria

- Adults aged 18-40 years.
- BMI ≥ 30 kg/m².
- Willingness to participate in a 12-week exercise program.
- No participation in a structured exercise program in the last 6 months.

Exclusion Criteria

- Medical conditions contraindicating exercise (e.g., severe cardiovascular diseases).
- Pregnancy.
- Major musculoskeletal disorders.
- Current participation in weight loss programs or taking weight loss medication

Intervention

Participants engaged in a supervised core stability exercise program for 12 weeks. The exercise sessions occurred thrice weekly, each lasting approximately 40 minutes. The program included the following exercises targeting the abdomen, lower back, and pelvis:

- **Planks**
  - **Standard Plank:** Participants held a prone position, supported on their forearms and toes, maintaining a straight line from head to heels. Each hold lasted for 30-60 seconds.
  - **Side Plank:** Participants lay on one side, supported on one forearm and the side of one foot, holding a straight line from head to heels. Each hold lasted for 30-60 seconds per side.

- **Bridges**
  - **Glute Bridge:** Participants lay on their backs with their knees bent and feet flat on the floor, lifting their hips to create a straight line from shoulders to knees. Each hold lasted 20-30 seconds, repeated for 10-15 repetitions.

  - **Single-Leg Bridge:** Similar to the glute bridge, but performed with one leg lifted and the other foot flat on the floor. Each hold lasted 20-30 seconds per leg, repeated for 10-15 repetitions.

- **Rotational Movements**
  - **Russian Twists:** Participants sat on the floor with their knees bent, leaning back slightly and twisting their torso from side to side while holding a weight or medicine ball. Each set consisted of 20-30 twists.

  - **Standing Trunk Rotations:** Participants stood with feet shoulder-width apart, holding a resistance band or cable, and rotated their torso from side to side. Each set consisted of 15-20 rotations per side.

- **Lower Back Exercises**
  - **Bird Dog:** Participants started on their hands and knees, extending one arm and the opposite leg simultaneously, maintaining a straight line from fingers to toes. Each hold lasted 10-15 seconds, repeated for 10-15 repetitions per side.

  - **Superman:** Participants lay face down, lifting their arms and legs simultaneously off the ground, holding for 5-10 seconds. Each set consisted of 10-15 repetitions.

Outcome Measures

- **Weight** was measured for accuracy using a calibrated digital scale. Participants were asked to remove heavy clothing or accessories and stand still with both feet on the weighing machine, equally distributing the weight on both feet in kilograms.

- **BMI** was calculated as weight in kilograms divided by height in square meters, kg/m^2. Using a stadiometer, the height was obtained in bare feet and an upright position. It estimates body fat and classifies underweight, average, overweight, and obese categories.

- **Body fat** was measured using a skin fold thickness calliper. The skinfold measurements were taken at standard sites on the body, such as the triceps, biceps, subscapular, and suprailiac areas. Several measurements were taken to estimate total body fat% (BF%) through standardized formulae. The developed procedure is put into practice by a qualified professional in order to ensure its accuracy.

- **Waist measurement** is the smallest circumference of the torso, usually measured next to the navel, and hip measurement is taken as the largest circumference of the buttocks. This waist-to-hip ratio (WHR) assessed one's risk of developing cardiovascular and metabolic diseases owing to body-fat distribution.

Data Collection

Baseline measurements for weight, BMI, BF%, and WHR were taken before the intervention. Follow-up measurements were taken at the end of the 12 weeks to assess changes in these outcome measures.

Statistical Analysis

Data were analyzed using paired t-tests to compare pre-and post-intervention outcomes. Statistical significance was set at $p<0.05$. SPSS version 22 was used for analysis purposes.

Ethical Consideration

The study was per ethical guidelines as suggested by international bodies for human subjects. Consent was obtained before enrollment, and all participants were given complete autonomy to leave the study at any time without being assigned any reason.

Results

Demographic description revealed that the mean age of the participants was 33.56±3.54 with the number of male (n=35) and female population (n=15). Further baseline details like average height, weight, BMI, WHR and BF% were provided in Table-1:

Table-1 Demographic Description and Baseline Values of Assessment Parameters

Variables	Mean±SD
Age	33.56±3.54
Weight in Kg	83.56±2.56
BMI Kg/m^2	33.54±2.98
BF%	32.15±3.86
WHR	0.93±0.71

Further, after 12 weeks of intervention, a pre-post comparison was performed, and the analysis revealed a significant mean difference of $p<0.005$ in all the outcome measures. The value of BMI was reduced to 27.53±2.56, weight to 75.25±3.34, BF% to 30.14±1.56 and WHR to 0.85±0.56 (Table-2).

Table-2 Pre-Post difference in Mean Values Observed after 12 Weeks of Intervention

Variables	Baseline Mean±SD	After 12 weeks Mean±SD	Mean Difference Mean±SD	t-test	Level of Significance
Weight in Kg	83.56±2.56	75.25±3.34	8.31±1.52	6.78	0.001
BMI Kg/m²	33.54±2.98	27.53±2.56	6.01±2.05	5.11	0.001
BF%	32.15±3.86	30.14±1.56	2.01±1.08	3.26	0.02
WHR	0.93±0.71	0.85±0.56	0.08±0.03	1.1	0.03

Discussion

This study found substantial changes in weight, BMI, BF%, and WHR after a 12-week core stability training in an obese group. The study found that participants' average weight decreased from 83.56±2.56 kg to 75.25±3.34 kg, resulting in an 8.31±1.52 kg difference ($p<0.001$). The considerable weight loss demonstrates the efficiency of the core stability workout program. Similarly, BMI decreased from 33.54±2.98 kg/m² to 27.53±2.56 kg/m², with a mean difference of 6.01±2.05 kg/m² ($p<0.001$). This reduction brings participants closer to the overweight group rather than the obese category, implying a beneficial influence on their health. Additionally, BF% decreased from 32.15±3.86% to 30.14±1.56%, with a mean difference of 2.01±1.08% ($p = 0.02$), indicating improved body composition. The WHR decreased significantly from 0.93±0.71 to 0.85±0.56, with a mean difference of 0.08±0.03 ($p=0.03$), indicating a reduction in abdominal fat. These findings indicate that core stability exercise help with weight reduction, improve total body composition, and reduce central obesity, which is critical for decreasing the risk of metabolic and cardiovascular disorders.

In a study of the effect of core stability exercises on various health parameters in obese people awaiting bariatric surgery, it was discovered that implementing an 8-week core stabilization exercise program (CSEP) in conjunction with physical activity counselling resulted in significant improvements in functional capacity, physical fitness and activity, fatigue, and quality of life (QoL) when compared to physical activity counselling alone[15]. The exercise group that completed the CSEP exhibited significant improvements in all evaluated parameters except body composition, with effect sizes ranging from 0.40 to 0.87 ($p<0.05$)[15]. These findings are consistent with our study's findings, which found substantial decreases in weight, BMI, BF%, and WHR among an obese group after a 12-week core stability training. The changes in body composition, such as a decrease in BF% and WHR, highlight the efficacy of core stability exercises in improving general health and lowering obesity risks. Both studies emphasize the need to include core stability exercises in obese patients' PA routines to gain significant health benefits[15]. A recent study on the effect of a 9-week lower and upper extremity plyometric training program on adolescent basketball players found substantial improvements in maximum strength levels and decreases in BF% among participants[16]. These findings are consistent with more extensive research on exercise regimens, such as our 12-week core stability exercise routine for obese people, which

found significant changes in weight management and body composition. Both findings emphasize the importance of organized exercise programs in improving physical fitness across varied demographics[16]. In another study that was conducted on football players, the effect of core stabilization exercises was identified on body composition and agility, and the findings revealed that not only did core stabilization exercise significantly improve body composition but also had significant improvement on the speed and agility of the players[17]. The study's strengths include its well-defined methodology, a precise intervention regimen of core stability exercises aimed at particular muscle groups and accurate and reliable methods to assess weight, BMI, BF%, and WHR. The organized exercise program and regular supervision likely contributed to the considerable improvements reported in all end measures, confirming the effectiveness of core stability exercises in changing body composition among obese patients. However, the study had drawbacks, including the lack of a randomized control group, which makes it difficult to ascribe observed improvements entirely to the intervention. Furthermore, the small sample size and brief intervention duration may impact the findings' generalizability and long-term relevance. Further study with more significant, randomized samples and extended follow-up periods is required to confirm these findings.

Conclusion

The study found that a 12-week core stability training program significantly decreased weight, BMI, BF%, and WHR in an obese group. The planned and focused nature of the core stability exercises resulted in improved body composition and weight loss. These findings indicate that including these exercises in regular fitness routines can be an effective strategy for reducing obesity and enhancing overall health. Future studies should use more significant sample numbers and longer intervention durations to validate these findings and investigate the long-term advantages of core stability training in other groups.

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None.

Conflict of Interest
None.

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None.

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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

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Acquisition, Analysis or Interpretation of Data: Niaz A, Asadullah M, Azhar N, Ali M

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All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.