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Dr. G Radhakrishnan
Director of Physical Education, Sir Theagaraya College, Chennai, Affiliated to the University of Madras, Chennai, Tamil Nadu, India

Corresponding Author:
Dr. G Radhakrishnan
Director of Physical Education, Sir Theagaraya College, Chennai, Affiliated to the University of Madras, Chennai, Tamil Nadu, India

Effect of Kettlebell training on selected health related variabels among obese college students

Dr. G Radhakrishnan

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Abstract
The purpose of this study was to find out effect of kettlebell training (KBT) on selected flexibility and body mass index among obese college students. To achieve the purpose of this study thirty (n=30) college were selected from Chennai, Tamil Nadu. The selected subject's age ranged between 17 to 25 years. Further they were classified at random in two equal groups of 15 (n=15) subjects each. Group - I (Experimental Group) underwent (KBT) for thrice in a week of six weeks, and each section lasted 45minutes and the Group - II - acted as a control group (CG) they did not participate in any kind of training programme apart from the daily activities. The selected criterion variables such as cardiovascular endurance, flexibility and balance were measured by 12 min run and walk test, sit and reach test and single-leg stance test were used with standardized equipment. The collected data were analysed statistically through analyze of covariance (ANCOVA) to find the significance improvement. The results of the study showed that selected criterion variables were significantly improved due to KBT among obese college women students.

Keywords: Kettlebell training, flexibility, body mass index, sit and reach test, single leg stance

Introduction
Kettlebell training is a form of strength and conditioning exercise that utilizes a cast-iron or steel weight known as a kettlebell, resembling a cannonball with a handle. Originating in 18th-century Russia, Kettlebells were initially used as counterweights in markets before becoming a staple in physical training, particularly within the Soviet military and among athletes. Today, kettlebell training is popular worldwide, offering a unique way to improve strength, endurance, flexibility, and balance (Tsatsouline, 2006) [11].

The benefits of kettlebell training are numerous: it provides a full-body workout by engaging multiple muscle groups simultaneously, improves strength and power through dynamic movements, enhances cardiovascular fitness, increases joint flexibility and mobility, boosts core stability, and offers versatility with exercises like swings, lifts, squats, and presses (Mayo Clinic Staff, n.d.).

Basic kettlebell exercises include the kettlebell swing, which targets glutes, hamstrings, back, shoulders, and core; the goblet squat, focusing on quadriceps, glutes, hamstrings, and core; the Turkish get-up, which works shoulders, core, and legs; the kettlebell clean and press, targeting shoulders, back, biceps, and core; and the kettlebell deadlift, focusing on glutes, hamstrings, and lower back (ACE Fitness, n.d.).

Safety tips for kettlebell training include starting with a lighter weight to master form, performing a dynamic warm-up, focusing on proper technique, considering guidance from a certified instructor, and listening to your body to avoid injury. To get started with kettlebell training, you'll need an appropriately weighted kettlebell, comfortable workout attire, and a clear space to move around. Begin with basic exercises and, as you gain confidence and strength, incorporate more complex movements and routines. Many fitness centers offer kettlebell classes, and there are numerous online resources and video tutorials available (Mayo Clinic Staff, n.d.).

Kettlebell training is a versatile and effective way to enhance overall fitness, providing a balance of strength, endurance, and flexibility, making it a valuable addition to any workout regimen (Tsatsouline, 2006) [11].

Kettlebell training for obese college students

Kettlebell training can be an excellent exercise option for obese college students, offering a comprehensive workout that promotes weight loss, improves overall fitness, and enhances physical health. This type of training is especially beneficial for individuals who are new to exercise or looking for a versatile and effective way to get fit.

The benefits of kettlebell training for obese college students are numerous. Firstly, it supports weight loss and caloric burn through high-intensity, full-body movements that can burn a significant number of calories in a short amount of time (Jay, 2011) [4]. Additionally, many kettlebell exercises are low impact, making them easier on the joints compared to high-impact exercises like running or jumping, which is crucial for those with joint pain or mobility issues (McGill & Marshall, 2012) [6].

Kettlebell training also improves metabolic rate, leading to continued calorie burn even after the workout is finished. It enhances functional fitness by mimicking real-life movements, making everyday activities easier and reducing the risk of injury. Furthermore, kettlebell exercises build muscle strength, which is important for increasing metabolism and supporting overall health (Tanimoto, Sanada, Yamamoto, & Tabata, 2008) [10].

Recommended exercises for obese college students include the kettlebell deadlift, which focuses on the glutes, hamstrings, and lower back; the kettlebell squat, targeting the quadriceps, glutes, and hamstrings; and the kettlebell swing, which engages the entire body, particularly the core, glutes, and shoulders. Other effective exercises are the goblet squat, which helps with stability and posture, and the kettlebell press, which strengthens the shoulders, chest, and arms (Jay, 2011) [4].

Safety tips for kettlebell training include starting with a light weight to ensure proper form and prevent injury, performing a dynamic warm-up to prepare muscles and joints, and focusing on correct technique. Beginners should consider working with a certified trainer to learn proper form. It is also important to progress gradually by increasing the weight and intensity over time and to listen to the body to avoid pain or discomfort and ensure adequate rest and recovery (McGill & Marshall, 2012) [6].

To get started with kettlebell training, obese college students should choose an appropriately weighted kettlebell and perform a basic set of exercises 2-3 times per week, with each session lasting about 20-30 minutes. As fitness levels improve, the complexity and intensity of the exercises can be increased (Tanimoto *et al*., 2008) [10].

Kettlebell training is a versatile and effective exercise option for obese college students, providing numerous health benefits while accommodating various fitness levels. By focusing on form, starting with manageable weights, and gradually increasing intensity, students can safely and effectively use kettlebell training to improve their overall fitness and health (Jay, 2011) [4].

Methodology

To achieve the purpose of this study thirty (n=30) college were selected from Chennai, Tamil Nadu. The selected subject's age ranged between 17 to 25 years. Further they were classified at random in two equal groups of 15 (n=15) subjects each. Group - I (Experimental Group) underwent (WBE) for thrice in a week of six weeks, and each section lasted 45minutes and the Group - II - acted as a control group (CG) they did not participate in any kind of training programme apart from the daily activities. The selected criterion health related variables such as flexibility and cardiorespiratory endurance and balance were measured by 12 min run and walk test, sit and reach test and single leg standing were used with standardized equipment.

Statistical Procedure

The collected data were analysed statistically through analyze of covariance (ANCOVA) to find the significance improvement.

Results on Cardiovascular Endurance

Table 1: Computation of analysis of covariance of pre-test post-test and adjusted post- test on cardiovascular endurance for experimental and control group (scores in meters)

Test	Ex-1 KBT	CG	Source of Variance	Sum of Square	df	Mean Square	"F"
Pre	1041.50	1049.14	BG	438.38	1	438.38	0.83
			WG	14761.09	28	527.18	
Post	1121.69	1027.49	BG	66560.78	1	66560.78	11.13*
			WG	167452.23	28	5980.44	
Adjusted	1119.74	1029.44	BG	59390.26	1	59390.26	9.80*
			WG	163596.97	27	6059.15	

*Significant at 0.05 level of confidence.(Table value required for significant at 0.05 level of confidence with df (1,27 & 1,28) were 4.21 & 4.20 respectively.

BG - Between Groups, WG - Within Groups, df - Degrees of Freedom

Table 1 displays the pre-test cardiovascular endurance means: 1041.50 (Ex-1) and 1049.14 (CG).The pre-test F-value of 0.83 indicates no significant difference in starting scores.

The post-test means were 1121.69 (Ex-1), and 1027.49 (CG). The post-test F-value of 11.13 reveals a substantial difference in scores.

Adjusting for pre-test and post-test means, the analysis of covariance resulted in an F-value of 9.80, confirming significant differences among the treated groups.

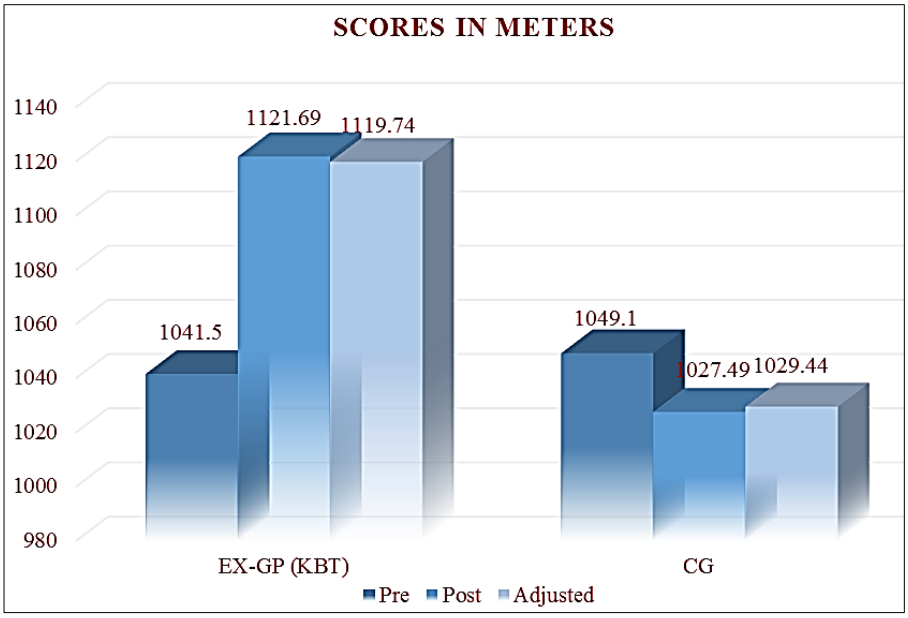

Fig 1: Bar diagram showing pre-test post-test and adjusted post- test means on cardiovascular endurance

Results on Flexibility

Table 2: Computation of analysis of covariance of pre-test post-test and adjusted post- test on flexibility for experimental and control group (scores in centimetres)

Test	Ex-1 KBT	CG	Source of Variance	Sum of Square	df	Mean Square	"F"
Pre	14.93	14.00	BG	6.53	1	6.53	1.29
			WG	140.93	28	5.03	
Post	17.60	14.73	BG	61.63	1	61.63	**8.61***
			WG	200.53	28	7.16	
Adjusted	17.16	15.16	BG	28.72	1	28.72	**9.75***
			WG	79.51	27	2.94	

*Significant at 0.05 level of confidence. (Table value required for significant at 0.05 level of confidence with df (1,27 & 1,28) were 4.21 & 4.20 respectively.

BG - Between Groups, WG - Within Groups, df - Degrees of Freedom

Table 2 displays the pre-test flexibility means: 14.93 (Ex-1) and 14.00 (CG).The pre-test F-value of 1.29 indicates no significant difference in starting scores.

The post-test means were 17.60 (Ex-1), and 14.73 (CG). The post-test F-value of 8.61 reveals a substantial difference in scores.

Adjusting for pre-test and post-test means, the analysis of covariance resulted in an F-value of 9.75, confirming significant differences among the treated groups.

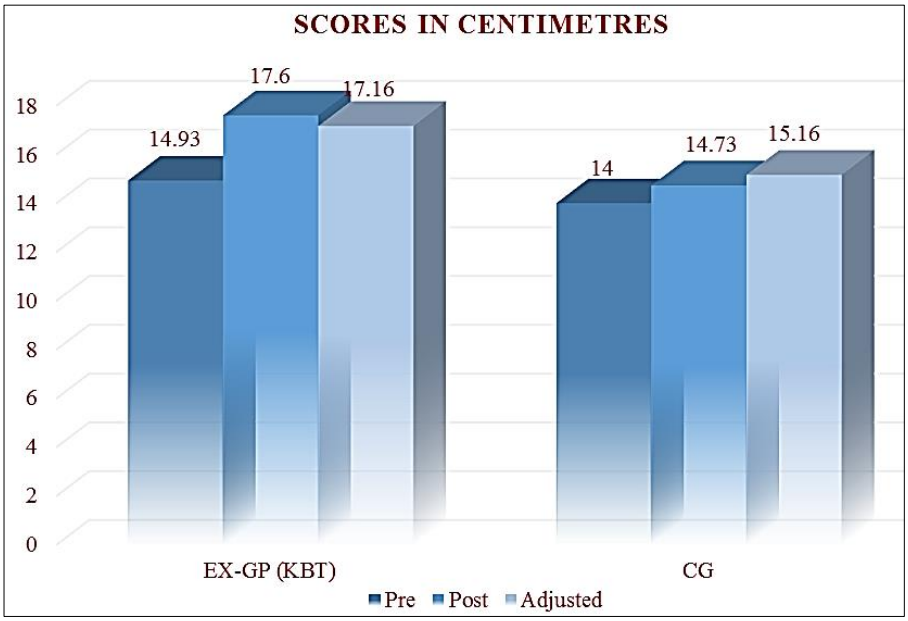

Fig 2: Bar diagram showing pre-test post-test and adjusted post- test means on flexibility

Results on Balance

Table 3: Computation of analysis of covariance of pre-test post-test and adjusted post- test on balance for experimental and control group

Test	Ex-1 KBT	CG	Source of Variance	Sum of Square	df	Mean Square	"F"
Pre	20.86	21.33	BG	1.63	1	1.63	0.14
			WG	333.07	28	11.89	
Post	27.00	21.86	BG	197.63	1	197.63	13.77
			WG	401.73	28	14.35	
Adjusted	27.20	21.65	BG	229.93	1	229.93	45.75
			WG	135.70	27	5.03	

*Significant at 0.05 level of confidence. (Table value required for significant at 0.05 level of confidence with df (1,27 & 1,28) were 4.21 & 4.20 respectively.

BG - Between Groups, WG - Within Groups, df - Degrees of Freedom

Table 3 displays the pre-test balance means: 20.86 (Ex-1) and 21.33 (CG).The pre-test F-value of 0.14 indicates no significant difference in starting scores.

The post-test means were 27.00 (Ex-1), and 21.86 (CG). The post-test F-value of 13.77 reveals a substantial difference in scores.

Adjusting for pre-test and post-test means, the analysis of covariance resulted in an F-value of 45.75, confirming significant differences among the treated groups.

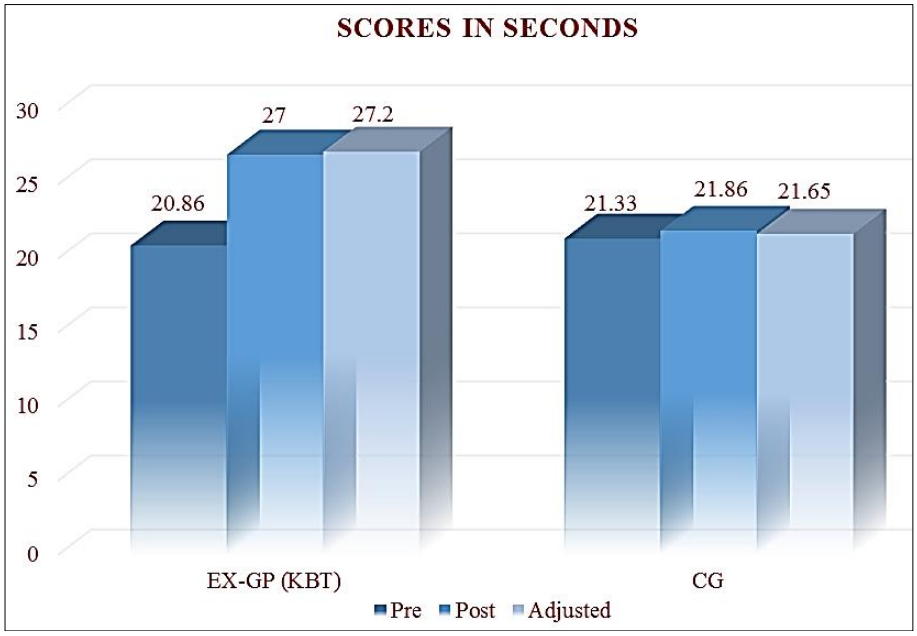

Fig 3: Bar diagram showing pre-test post-test and adjusted post- test means on balance

Discussion on Findings

The findings from the study indicate significant improvements in health-related variables (cardiovascular endurance, flexibility, and balance) among participants in the experimental group (KBT) compared to the control group among obese college women students. The pre-test and post-test results show notable differences in mean scores, with the experimental group (KBT) consistently outperforming the control group across all three variables.

In terms of cardiovascular endurance, the experimental group (KBT) exhibited a substantial increase in mean scores from pre-test to post-test, while the control group showed a slight decrease. This suggests that the intervention implemented in the experimental group (KBT), likely involving targeted aerobic exercise or cardiovascular training, effectively improved participants' ability to sustain prolonged physical activity. A discussion on the mechanisms underlying these improvements, such as increased aerobic capacity, improved heart function, and enhanced oxygen utilization by muscles, would be relevant in interpreting these findings (Fletcher *et al*., 2018) [2].

Similarly, the significant improvements in flexibility and balance among the experimental group highlight the efficacy of the intervention in enhancing musculoskeletal health and functional movement. These improvements may be attributed to specific exercises targeting flexibility and balance, such as stretching routines, yoga, or proprioceptive training. Discussion on the importance of flexibility and balance in preventing injuries, enhancing athletic performance, and promoting overall physical well-being would provide context for these findings (Hrysomallis, 2011; Shumway-Cook & Woollacott, 2017) [3, 9]. Additionally, Parasuraman (2020) [7] revealed that volleyball players performance improved due to circuit training using Kettlebell and Parasuraman (2018) [8] significant increase in core strength as well as muscular endurance after the 6 week of kettlebell training of Inter collegiate volleyball players while comparing to the control group.

Overall, the study's results underscore the importance of targeted interventions and structured exercise programs in improving various aspects of physical fitness. The findings have implications for designing comprehensive wellness

programs, particularly in educational or clinical settings, aimed at promoting holistic health and reducing the risk of injuries and chronic diseases.

Conclusions

The findings from this study underscore the significant benefits of structured kettlebell training interventions in enhancing health related variables (cardiovascular endurance, flexibility, and balance) among obese college women students. emphasize the importance of promoting physical activity as a cornerstone of overall health and well-being.

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