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ORIGINAL ARTICLES. PHYSICAL EDUCATION

Role of aerobics exercise and kettlebell training improving on selected health related physical fitness parameters in obese male adults

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Abstract

Purpose: The aim of the this research is to assess the improvement in various variables related to health fitness among obese adults on administrating a twelve weeks aerobics exercise training and kettlebell training.

Materials and Methods: Total sixty male adults with obese (Mean \pm SD; age: 18.92 ± 1.54 yrs.; height: 172.4 ± 5.4 cm.; weight: 84.4 ± 6.3 kg) were randomly allocated into three equal ($n = 20$) groups: Aerobic Exercise Training (AET), Kettlebell Training (KBT) and a control group. The AET & KBT training protocol was performed three days per week for 12 weeks. All the selected variables of physical fitness has been examined at baseline and 12 weeks. Control group does not perform any exercise.

Analysis and findings: There were significant difference in terms of Flexibility (F), Muscular Endurance (ME), Muscular Strength (MS) and Cardiovascular Endurance (CE), between the AETG & KBTG have been compared with control group ($p < 0.05$). Body Composition (BF) significant reductions in AET & KBT groups have been compared with control group ($p < 0.05$).

Conclusion: Our findings suggest that AET & KBT protocols have greater effects than control group on health related physical fitness variables in obese male adult individuals. It is recommended that schools and colleges should administrate the aerobic exercise session and kettlebell training among adults for better health perspectives.

Keywords: Different exercise training, Aerobic exercise, Kettlebell training, Health related fitness, obese



Анотація

Каруппасамі Говіндасамі, Чандрабабу Суреш, Саран КС, Мітхін Ананд, Ділпріт Каур, Джон Боско Аніта, Алі Алуї, Хіба Буганмі, Імен Ачурі. Роль аеробіки та тренування з гирями в покращенні вибраних параметрів фізичної підготовки, пов'язаних зі здоров'ям, у дорослих чоловіків із ожирінням

Мета. Мета цього дослідження полягає в тому, щоб оцінити покращення різних змінних, пов'язаних із фізичною формою здоров'я, серед дорослих із ожирінням під час виконання дванадцяти тижнів аеробіки та тренувань з гирями.

Матеріали та методи. Всього шістьдесят дорослих чоловіків із ожирінням (середнє \pm SD; вік: $18,92 \pm 1,54$ року; зріст: $172,4 \pm 5,4$ см; вага: $84,4 \pm 6,3$ кг) були випадковим чином розподілені на три рівні ($n = 20$) групи: «аеробні вправи», «тренування з гирями» та контрольна група. Протокол навчання груп «аеробні вправи» і «тренування з гирями» виконувався три дні на тиждень протягом 12 тижнів. Усі вибрані змінні фізичної підготовленості досліджувалися на початку та через 12 тижнів. Контрольна група не виконує жодних вправ.

Аналіз і висновки. Існувала значна різниця в показниках гнучкості, м'язової витривалості, м'язової сили і серцево-судинної витривалості між групами «аеробні вправи» і «тренування з гирями» у порівнянні з контрольною групою ($p < 0,05$). Значне зниження складу тіла у групах «аеробні вправи» і «тренування з гирями» порівнювали з контрольною групою ($p < 0,05$).

Висновок: наші висновки свідчать про те, що протоколи груп «аеробні вправи» і «тренування з гирями» мають більший вплив, ніж контрольна група, на пов'язані зі здоров'ям змінні фізичної підготовки у дорослих чоловіків із ожирінням. Рекомендується, щоб школи та коледжі проводили аеробні вправи та тренування з гирями серед дорослих для кращого здоров'я.

Ключові слова: різні вправи, аеробні вправи, тренування з гирями, фітнес, пов'язаний зі здоров'ям, ожиріння

Аннотация

Каруппасами Говиндасами, Чандрабабу Суреш, Саран КС, Митхин Ананд, Дилприт Каур, Джон Боско Анита, Али Алуи, Разве Буганми, Имен Ачурі. Роль аэробики и тренировки с гирями в улучшении выбранных параметров физической подготовки, связанных со здоровьем, у взрослых мужчин с ожирением

Цель. Цель этого исследования состоит в том, чтобы оценить улучшение различных переменных, связанных с физической формой здоровья, среди взрослых с ожирением во время выполнения двенадцати недель аэробики и тренировок с гирями.

Материалы и методы. Всего шестьдесят взрослых мужчин с ожирением (среднее \pm SD; возраст: $18,92 \pm 1,54$ года; рост: $172,4 \pm 5,4$ см; вес: $84,4 \pm 6,3$ кг) были случайным образом распределены на три равные ($n = 20$) группы: «аэробные упражнения», «тренировка с гирями» и контрольная группа. Протокол обучения групп «аэробные упражнения» и «тренировка с гирями» выполнялся три дня в неделю в течение 12 недель. Все выбранные переменные физической подготовленности исследовались в начале и через 12 недель. Контрольная группа не выполняет никаких упражнений.

Анализ и выводы. Существовала значительная разница в показателях гибкости, мышечной выносливости, мышечной силы и сердечно-сосудистой выносливости между группами «аэробные упражнения» и «тренировка с гирями» по сравнению с контрольной группой ($p < 0,05$). Значительное снижение состава тела в группах «аэробные упражнения» и «тренировка с гирями» сравнивали с контрольной группой ($p < 0,05$).

Вывод: наши выводы свидетельствуют о том, что протоколы групп «аэробные упражнения» и «тренировки с гирями» оказывают большее влияние, чем контрольная группа, на связанные со здоровьем переменные физической подготовки у взрослых мужчин с ожирением. Рекомендуется, чтобы школы и колледжи проводили аэробные упражнения и тренировки с гирями среди взрослых для лучшего здоровья.

Ключевые слова: разные упражнения, аэробные упражнения, тренировки с гирями, фитнес, связанный со здоровьем, ожирение



Introduction

Machines have changed human life, and humans now enjoy the maximum level of physical comfort. Modern technology is working hard to make our lives easier, more luxurious, and more pleasant while also reducing our physical exertion. As a result, humans appear to be becoming increasingly inactive all over the globe. Humans now ride instead of walking, sit instead of standing, and watch instead of participating, and these lifestyle changes have definitely reduced physical labour while increasing mental stress and strain. As a result, it is critical to effect good changes in today's lifestyles through involvement in sports and physical education programmes. The development of physical fitness among the public or participants should be one of the major goals of every physical education and sports programme. Physical education should try to make every child physically, cognitively, and emotionally healthy, as well as to develop personal and social traits in him, allowing him to live happily with others and develop as a good citizen. As a result, an individual's health fitness can be enhanced through different variety of programmes [1].

Obesity is becoming more prevalent all over the world besides in economically developed or backward nations [2, 3]. Obesity is a life-threatening condition caused by a sedentary lifestyle. Obesity and overweight impact millions of people in both developed and developing nations. Obesity was once thought to be a issue only in developed nations [4]. Obesity, on the other hand, is on the rise in all types of nations at present. Obesity and overweight contribute the most to noncommunicable disease morbidity and mortality [5]. In 2008, the WHO estimated that over 1.4 billion adults have been found overweight in which 50% among them were being obese [6]. Obesity frequency was 39.6 percent among rural population in 2005–2008, as compared to urban population which has been recorded 33.4 percent as per investigation carry out by the National Health and Nutrition Examination Survey [7]. A latest ICMR-INDIAN survey has been conducted among three states of India (Maharashtra, Tamil Nadu, and Jharkhand) along with Chandigarh a union territory of India. The number of people who were generally obese ranged from 11.8% to 33.6% [8]. When we observed the results of the two surveys conducted by the NFHS-2 (National Family Health Survey) during 1998–1999 and the NFHS-3 in 2005–2006, this revealed that the proportion of obese Indian women has gone from 10.6% to 12.6% [9]. When age was considered, the Chennai Urban Rural Epidemiology Study showed that 45.9% of people were obese [10].

Pavel Tsatsouline made hardstyle kettlebell training popular in the 2000s. Its techniques involve tension and relaxation and are said to improve health-related fitness [11]. In trial with participants (younger), there were progress in upper-limb perseverance [12], vertical jump and dynamic balance [13], leg power and trunk stamina [14], standing long jump and strength of grip [15], VO₂ [16], and 1RM barbell deadlift [17]. Physical fitness and Aerobic exercise can be compared to anaerobic exercise, which includes running short distances and strength training. The two forms of exercise differ in how energy is made in the muscle and how long and hard muscle contractions are. The latest study on the endocrine functions of contracting musculature has discovered that aerobic and anaerobic exercise increases the release of myokines. This has several benefits, including tissue repair, new growth of new tissue, and anti-inflammatory functions that lower the risk of developing inflammatory diseases. The quantity of muscle contracted, as well as the duration and severity of contractions, all influence myokine secretion. Count is used in floor aerobics. Floor aerobics was created to eliminate the need for open-air exercise. Day by day, the women took advantage of the opportunities that were presented to them [18–20]. Many gyms and fitness facilities with a group workout programme offer step aerobics programmes. Previously Aerobic exercise and resistance training was investigated obese adolescents on the selected health related physical fitness parameters [1]. Hence, in our knowledge so far there is no investigation on the topic. Therefore, the presents study aims to effects the improvement in health related physical fitness among obese adults on administrating a twelve weeks aerobics exercise and kettle bell training.

Material and methods

Participants

Participants Recruitment

Sixty obese male adults were recruited from the SRM Institute of Science and Techlogy, Kattankulathur, Tamilnadu, India. The participants came from various family backgrounds and took part in similar academic activities. The participants were selected at random. Total sixty male adults with obese (Mean \pm SD; age: 18.92 ± 1.54 yrs.; height: 172.4 ± 5.4 cm.; weight: 84.4 ± 6.3 kg) were randomly allocated into three equal ($n = 20$) groups: Aerobic Exercise Training (AET), Kettlebell Training (KBT) or a control group. The flow diagram is displayed in figure 1.

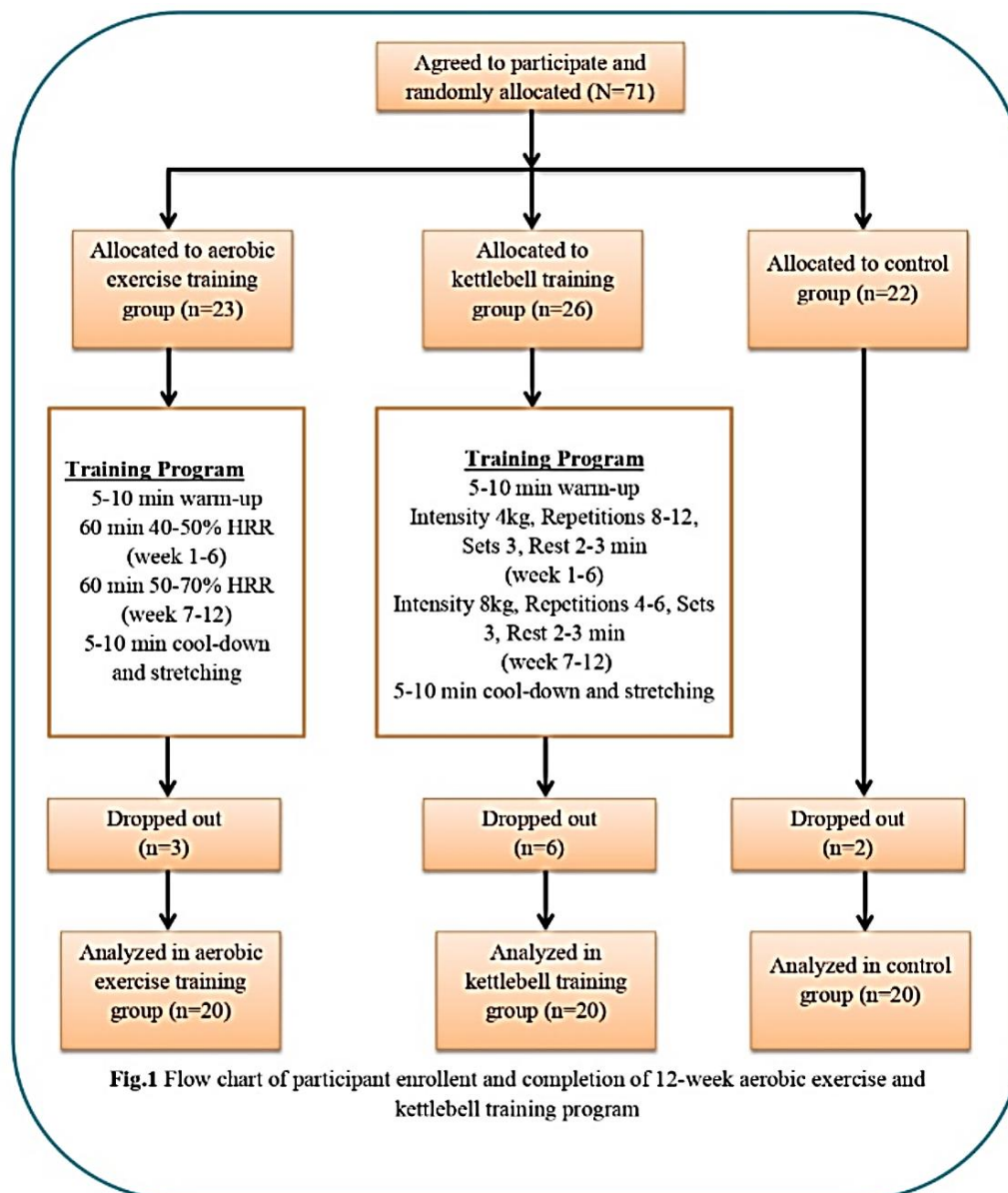


Fig.1. Flow diagram of the study program, AET, Aerobic exercise training group; KET, Kettlebell training group; CG, Control Group

Obesity

The following formula was used to calculate the obesity based on their BMI: Metric: BMI = kilograms/meters². Males with a BMI of 30kg/m² or higher are considered obese for the purposes of this research.

Study Design

The respondents were classified into three groups at random, with each group consisting of twenty participants subjects. All participants were randomly divided into three groups with 20 participants in each group: Aerobic Exercise Training (AET), Kettlebell Training (KBT) or a

control group. AET and KBT group were intervened with respective workout for twelve weeks whereas control group does not perform any exercise. Parameters of physical fitness associated with health have been compared at baseline and at endpoint in all groups. First, before the study started, the participants were told everything they needed to know about the experiment, including how it would work, when they would work out, and what tests they would have to take. This was done to get their full cooperation with the work they had to do—the subjects trained a week thrice from 6:30 to 7:30 a.m., except on Saturdays and Sundays. The exercises were slowly brought in. Methods that ranged from easy to the complex were used. This study was conducted in accordance with the Declaration of Helsinki and the protocol was fully approved by the



local institutional ethical committee of the SRMCHRC, Kattankulathur, Tamilnadu India (Number 3070/IEC/2022) before the commencement of the measurements.

Measures of Health Associated Physical Fitness

The health associated physical fitness of people with obese adult individuals who participated in this study was measured using measuring instruments available in the department of physical education, kattankulathur campus, tamilnadu, India. As for the measurement criteria: Cooper's 12 Minute Run / Walk test has been applied to examine cardiovascular endurance. The test of Sit and Reach has been used to assess muscular flexibility. While Push ups method has been applied to assess muscular strength. The half squat jump test has been applied to examine muscular endurance. "The following formulae were used to calculate body composition. % body fat = $0.41563 \times (\text{sum of three sites}) - 0.00112 \times (\text{sum of 3 sites})^2 + 0.36661 \times (\text{age}) + 4.03653$, where the sum of three sites was skinfold calibre measurements at the triceps, medial region of the supraillium and navel".

Training Intervention

At SRM IST's Fitness Center, exercise programmes were held for 12 weeks, with three 60-minute sessions a week that got progressively harder (Fig. 1). Every session had 10-minute periods to stretch and warm up, cool down. The AETG did aerobic exercises for 40–50% HRR in weeks 1–6 and 50–70% HRR in weeks 7–12. On a Polar Accurex monitor from Kempele, Finland, the heart rate was tracked all the time so that the workload could be changed to reach the target heart rate. The KBTG performed the kettlebell exercise for consisted of 30 sec to 1 min of rest between each exercise and 2–3 min rest between each circuit. Weeks 1–6 were used for fixed intensity 4kg, Repetitions 8–12, sets 3, The weight was progressed from body weight 4 and 8 kg and the circuits increased from two to three, while repetition remained at eight. Progressions during week's 4–12 intensity 8kg, Repetitions 6–8, sets 3 were based on the participants' ability. Throughout the 12-week study, all participants were told not to change how they ate or how much they practised. The CG was also related not to changing how they exercised or how much they did.

Statistical Analysis

All data were described using means and standard deviations (\pm), and the data's normality was determined using the Kolmogorov-Smirnov and

Shapiro-Wilk tests. To ensure that there were no significant differences between groups, a one-way ANOVA was used to compare all of the baseline data among the three groups. To compare the changes of three groups for all variables, a two-way ANOVA repeated measures test (Groups by time) was used. Following a significant group-by-time interaction, a Bonferroni post hoc test was performed. Additionally, effect sizes (ES) were calculated using partial eta-squared from the ANOVA output. Furthermore, within-group ES were calculated using the equation: $(\text{mean post-mean pre})/\text{SD} = \text{ES}$ [21]. Hopkins et al. classify ES as trivial (0.2), small (0.2–0.6), moderate (0.6–1.2), large (1.2–2.0), and very large (2.0–4.0) [22]. To indicate statistical significance, a p-value of 0.05 was used. SPSS for Windows, version 23.0, was used to perform all statistical analyses (SPSS Inc., Chicago, United States). The sample size was calculated to detect a difference in the study variables with a 95 percent confidence interval for the analysed measures.

Results

In all the study groups (i.e., control; AETG; KBTG), no significant differences ($p > 0.05$) were observed for age, weight, height, BMI, CE, MS, ME, F and BC (Table 1). Data's normality was determined using the Kolmogorov-Smirnov and Shapiro-Wilk tests (Table 2). Moreover, there were no significant differences ($p > 0.05$) between the groups for health related physical fitness variables at baseline (Table 3).

The following results can be found in (Table 3), unless otherwise stated. A significant interaction between group and time was observed for CE ($F_{2,57} = 79.9$ and $(p < 0.05)$), MS ($F_{2,57} = 5.12$ and $(p < 0.05)$), ME ($F_{2,57} = 5.02$ and $(p < 0.05)$) and F ($F_{2,57} = 5.024$ and $(p < 0.05)$) Health related physical fitness significantly increased in both training protocols (i.e., AETG and KBTG), when compared with the control group ($p < 0.05$). BC% ($F_{2,57} = 190.06$ and $(p < 0.05)$) Significantly decreased in both training protocols (i.e., AETG and KBTG), when compared with the control group ($p < 0.05$). However, these increases were significantly greater in KBTG when compared with the AETG protocol ($p < 0.05$). Moreover, paired sample t-test indicated significant increases ($p < 0.05$) in health related physical fitness following 12 weeks when compared with baseline in both training protocols. Data analysis showed a significant increased was observed in AETG and KBTG protocols in comparison with the control group ($p < 0.05$). However a more significant decreases was observed in KBTG compared with the AETG protocol ($p < 0.05$). Neither training protocols showed significant increased from baseline to 12 weeks in CE, MS, ME, F and BC%.



Table 1

Mean and SD (\pm) Characteristics of Participants

Characteristics	Control	AETG	KBTG
Age (years)	18.95 \pm 1.43	18.65 \pm 1.13	19.15 \pm 1.98
Height (cm)	174.7 \pm 6.44	170.7 \pm 4.52	171.9 \pm 4.78
Weight (kg)	92.20 \pm 6.96	87.25 \pm 4.60	88.80 \pm 6.59
BMI (kg/m ²)	30.18 \pm 1.25	29.94 \pm 1.31	30.00 \pm 1.22
CE (ml/kg/min)	28.97 \pm 2.15	28.89 \pm 2.13	29.35 \pm 1.74
MS (numbers)	18.90 \pm 1.86	19.10 \pm 1.37	19.15 \pm 2.18
ME (numbers)	23.55 \pm 1.63	22.85 \pm 2.30	22.95 \pm 1.82
F (cm)	23.20 \pm 2.28	22.85 \pm 1.75	21.95 \pm 2.60
BC (%)	39.71 \pm 0.42	39.46 \pm 0.41	39.74 \pm 0.56

AETG, aerobic exercise training group; KBTG, kettlebell training group, BMI, body mass index; CE, cardiorespiratory endurance; MS, muscular strength; ME, muscular endurance; F, Flexibility; BC, body composition.

Table 2

Normality Test Calculation

Group	Variables	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
CG AETG KBTG	CE (ml/kg/min)	0.092	60	0.200	0.986	60	0.733
CG AETG KBTG	MS (numbers)	0.111	60	0.063	0.971	60	0.163
CG AETG KBTG	ME (numbers)	0.109	60	0.072	0.974	60	0.240
CG AETG KBTG	F (cm)	0.108	60	0.076	0.972	60	0.178
CG AETG KBTG	BC (%)	0.102	60	0.191	0.968	60	.0114

AETG, aerobic exercise training group; KBTG, kettlebell training group, BMI, body mass index; CE, cardiorespiratory endurance; MS, muscular strength; ME, muscular endurance; F, Flexibility; BC, body composition.

Table 3

Pretest and the Posttest Mean and SD (\pm) Values of Health Related Physical Fitness Variables

Variable	Group	Pre	Post	Partial Eta Squared
CE (ml/kg/min)	AETG	28.89 \pm 2.13	41.18 \pm 2.92 ^{*#†}	0.93
	KBTG	29.35 \pm 1.74	40.20 \pm 2.62 ^{*†}	
	Control	28.97 \pm 2.15	30.82 \pm 3.01	
MS (numbers)	AETG	19.10 \pm 1.37	20.45 \pm 1.43 [†]	0.69
	KBTG	19.15 \pm 2.18	20.90 \pm 1.41 [†]	
	Control	18.90 \pm 1.86	19.95 \pm 1.76	
ME (numbers)	AETG	22.85 \pm 2.30	25.00 \pm 1.16 ^{*†}	0.77
	KBTG	22.95 \pm 1.82	25.40 \pm 1.27 ^{*#†}	
	Control	23.55 \pm 1.63	24.10 \pm 1.51	
F (cm)	AETG	22.85 \pm 1.75	25.40 \pm 1.27 ^{*#†}	0.78
	KBTG	21.95 \pm 2.60	25.00 \pm 1.16 ^{*†}	



	Control	23.20 ± 2.28	24.10 ± 1.51	
BC (%)	AETG	39.46 ± 0.41	37.46 ± 0.32* [†]	0.98
	KBTG	39.74 ± 0.56	36.57 ± 0.33* ^{#†}	
	Control	39.71 ± 0.42	38.66 ± 0.35	

CE, cardiorespiratory endurance; MS, muscular strength; ME, muscular endurance; F, Flexibility; BC, body composition, AETG, aerobic exercise training group; KBTG, kettlebell training group

*Significant difference with the control group ($p < 0.05$).

[#]Significant difference between training protocols ($p < 0.05$).

[†]Indicates significant difference from baseline ($p < 0.05$).

However these changes in AETG and KBTG were significant ($p < 0.05$) after 12 weeks when compared with baseline. No significant changes were observed in MS in both training protocols when compared with the control group.

Discussion

Mendonça FR, et al. had previously investigated the effects of aerobics exercise, and resistance training on physical fitness regarding health among adolescents [1]. After undertaking aerobics exercise, combination resistance training for a period of twelve weeks, it was shown that adolescents showed considerable improvement in all of the selected health related physical fitness parameters. After participating in aerobics exercise, combination resistance training for a period of twelve weeks, adolescents showed significant improvements in muscular and cardiorespiratory fitness. Some another studies also investigated physical fitness and physical activity regarding health among schools of elementary education and the results showed significantly association in students [2]. Similar results were obtained in present study in which the health related physical fitness variables of the obese male adults was found to improve after twelve-week intervention of AET & KBT groups. Clary et al. Found the effects of step aerobics, Ballates, and walking on balance in women having age group of 50 to 75. When compared to the Ballates programme, walking programmes and step aerobics resulted in better improvements in static balance and postural stability (1). In our study however, similar results were obtained in case of aerobic exercise groups.

Melam et al. examine the impact of brisk walking and aerobics on overweight people. For ten weeks, this programme was carried out five days a week [2]. Body mass index, hip circumference and waist, subscapular area, and skinfold thickness of the belly, biceps, and triceps were measured before and after the study for all three groups of women. All attributes went down in women who walked quickly and did aerobics for ten weeks. In present study also,

the body composition was found to be improved significantly among adult obese male after twelve weeks of aerobic exercises and kettle bell training. Maiyanga and Gunen observed the influence of step aerobics on per cent visceral and body fat in obese female nurses at Bauchi's speciality hospital. They found that step aerobics lowers per cent body fat [24,25]. Being piolet in nature, present study has several limitations that suggests the lacune on which future studies could be carried out. One limitation of the study is that we take only the male participants in current study. Obesity is also prevalent in females and therefore future studies could be conducted by taking the female participants. Other limitation of the study is that present study is focused specific age group, future studies could be conducted by taking all age group. This will help in validating the result of current study for all age groups. Another constraint of the this study is the size of the sample itself. Because the sample size of the present study is very small, the result of present study cannot be validated for general population. Moreover, present study is a single centric study, future study by taking the multicentric approach should be conducted to find the role of aerobic exercise in management of obesity among adults.

A randomised control design with strictly controlled supervised exercise sessions for both training protocols was one of the study's strengths. Given the exercise training for adult obese men, our KBT protocol could be an attractive proposition. However, more studies in different populations (e.g., individuals with obesity, diabetics, and cardiovascular patients) are required to confirm the effectiveness and tolerability of the protocols of this study.

Conclusion

Overall the components of health related physical fitness have been found significantly associated with the obese adults engaging AET & KBT but the control group there were not significant. Present study revealed significant improvement in adult obese in terms of muscular strength, body



composition, muscular endurance, cardiorespiratory endurance and flexibility domains after practising the AET & KBT. Aerobics exercise and kettlebell training proved to be helpful in management of the health-related physical fitness in obese adult individuals. It is recommended that schools and colleges should administrate the aerobic exercise session and kettlebell training among adults for better health perspectives.

Ethics Statement

The studies involving human participants were reviewed and approved by the local institutional ethics committee of the SRM Medical College Hospital and Research Centre, Kattankulathur, Tamilnadu, India (Number 3070/IEC/2022). Written informed consent to participate in this study was provided by the participants.

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Conflict of Interest

The authors hereby declare that they don't have any financial and personal conflict of interest.

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