EFFECT OF ROPE SKIPPING ON VISCERAL FAT INDICES AMONG MALE STUDENTS OF DEMONSTRATION SECONDARY SCHOOL, FCE, ZARIA, KADUNA STATE

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Abstract

The purpose of this study was to assess the Effect of Rope Skipping on Centripetal Fat Patterning Indices Among Male Students of Demonstration Secondary School, FCE, Zaria, Kaduna State''. 25 selected participants undergoing a secondary education at Demonstration Secondary School Federal College of Education Zaria, Kaduna State were used for the study. They were 12 through 15 years old that took part in the study. One group repeated measure research design method was adopted in this study. All the participants selected satisfied the inclusion criteria and were assigned to rope skipping for 8 weeks. However, data were taken at the baseline (0-week), 4th-week, and 8-week. The exercise session was conducted between the hours of 4:00 pm to 5:00 pm on Monday, Wednesday, and Friday alternatively. The data collected were analyzed using the statistical package for social sciences and simple percentages was used to answer the demographic data of participants, descriptive statistics of mean and standard deviation was used to answer the research questions and repeated analysis of variance (ANOVA) were used to test the hypotheses at the statistically significant level $P<0.05$. The results of the study revealed that rope skipping significantly reduced visceral fat percent, at ($P=.001 < 0.05$) of male students of Demonstration Secondary School FCE Zaria. Based on these results, it was concluded that 8-week rope skipping had a significant effect in reducing visceral fat percent of male students of Demonstration Secondary School FCE Zaria that were involved in the exercise. In conclusion, the study recommended that rope skipping exercise should be used as an alternative method in reducing excess centripetal fat patterns, that rope skipping exercise could be used as an alternative model to reduce the prevalence of centripetal fat in male students, and rope skipping exercise could be an effective form of exercise to manage the visceral fat percent of the male students.

keywords: Rope Skipping, Visceral Fat, Male, Students

Introduction

Understanding student's participation in exercises is crucial to promoting an active lifestyle and maintenance of normal weight. Nowadays, no student wants to be tagged "fatty individual" but unfortunately lacks modalities that could keep him or her under the appropriate weight. Participating in regular physical activities has positive effects on students' health and academic performance as well as general well-being (Zeng, Hipscher & Leung, 2011). Despite the well-known paybacks of physical activities, about 80% of students between ages 18 to 35 years still do not engage in the recommended sixty (60) minutes of moderate to vigorous physical activity per day (Seelen, Mikkelsen & Wolderslund, 2018). One of the predictors of physical inactivity among male students is using technological devices (Alotaibi, Almuhanna, Alhassan, Alqadhib, Mortada, & Alwhaibi, 2020). Kenney and Gortmaker (2017), discovered that heavy usage of cell phones, tablets, laptops, and video games was positively associated with inactivity.

Additionally, it was discovered that watching television reduced a student's time for physical activity (Alotaibi *et al.,* 2020). One study on 12 to 15-year-old adolescents found that those who utilise electronic devices heavily lead fewer active lives and are more likely to be sedentary. Similarly, Webster, Martin, & Staiano (2019) found inverse relationships with screen time but favourable associations with young people's reliable physical exercise and basic motor abilities.

However, using modern technology can cause adolescents to engage in less physical exercise since it disrupts their daily routines (Alotaibi *et al.,* 2020). Lack of physical activity is associated with over 3.2 million deaths per year worldwide, making it a risk factor for high mortality. To maintain appropriate blood pressure and glucose levels, a healthy body weight, better sleep habits, an improved immune system, and improved metabolism, physical activity is crucial (World Health Organization, 2017).

The World Health Organization (WHO) states that inactive young people need at least one hour of vigorous to moderate physical activity every day (WHO, 2017). If daily movement lasts more than 60 minutes, the effect is greater (WHO, 2017). This challenge has kept the rising rate of overweight and obesity which are the leading cause of death as of today, and inactivity levels among students on the high side over time.

Fat tissue or fatty tissue also known as adipose tissue is a connective tissue that is mainly composed of fat cells called adipocytes. Adipocytes are energy-storing cells that contain large globules of fat known as lipid droplets surrounded by a structural network of fibres. Adipose tissue is usually stored in different compartments of the body and the distribution varies between genders. According to researchers (Camilleri & Pit, 2021), centripetal fat is known to be an accumulation of fat around the abdominal region (adipose tissue) surrounding the visceral organs (android fat distribution) in men while, in women, the accumulation of adipose tissue generally occurs in the gluteal-femoral regions (gynoid fat distribution). In some cases, however, the android distribution could be found in women and gynoid distribution could equally be found in men depending on the interaction of a variety of genetic and environmental factors such as sex hormone secretion, age, gender and socioeconomic status (Bose, 2002).

Centripetal fat patterning is the distribution of human adipose tissue mainly around the trunk of the human body as a course of central/abdominal/ truncal obesity (Bose, 2002). This condition occurs as a result of excessive accumulation of visceral fat around the stomach and abdomen which has built up to the extent of likely hurting one's health. Abdominal obesity has been powerfully allied to cardiometabolic disorders such as obesity, type 2 diabetes, hypertension, coronary artery disease, stroke, diabetes mellitus, dyslipidaemia, mortality etc. However, individuals with higher central adiposity show a greater risk of developing some cardiovascular disorders compared to those with higher gluteal adiposity who exhibit a lower risk of the aforementioned diseases. About this, Moller, Ritz, Kjolbaek, Vuholm, Korndal, Larsen, Pedersen, Saris, Astrup, Lauritzen, Kristensen & Lind, (2019) posited that in epidemiological studies and clinical practice, the Visceral adipose tissue (VAT), is one of the anthropometric measurements used to access centripetal fat patterning (Bose, 2002).

Visceral adipose tissue (VAT) is also known as intra-abdominal adipose tissue (IAAT) which refers to the body fat or adiposity that is accumulated within the abdominal cavity around the visceral organs (Crabtree, LaFountain, Hyde, Chen, Pan, Lamba, Sapper, Short, Kackley, Buga, Miller, Scandling, Andersson, Barker, Hu, Volek, & Simonetti, (2019). Subcutaneous adipose tissue (SAT) also is another type of fat depot recognized around the Android region. However, the adverse metabolic risk profile associated with VAT is found to be about 2-folds stronger than that of SAT because it has a tougher association with metabolic risk factors and metabolic syndrome than subcutaneous adipose tissue (SAT) such as insulin resistance which could upshot to diabetes, dyslipidaemia, glucose intolerance and hypertension (Yokokawa, Fukuda, Saita, Goto, Kaku, Miyagami, Takahashi, Hamada, Hisaoka, & Naito, 2021; De Lucia Rolfe, Ong, Sleigh, Dunger, & Norris, 2015). According to (Tayyem, Al-Radaideh, Hammad, Al-Hajaj, Allehdan, Agraib, Al-Fayomi, Malkawi & Hijjawi, 2019). Studies have shown that visceral adipose tissue seems to be differentially influenced by dietary factors and lifestyle adjustment can condense the high value of VAT in an individual's body.

Rope skipping is a simple and effective physical activity that helps to enhance physical fitness and maintain a good body shape of an individual while training for agility and stamina. Skipping rope exercise involves the use of muscles in arms and legs as the arms rotate the rope and both legs perform repeated jumping, at the same time to maintain constant vertical take-off and landing phases (Sharma, & Biswas, 2023). This relatively improves cardiovascular function and metabolism as well as centripetal fat patterning indexes which are essential for inhibition of metabolic disorders and cardiovascular risk diseases. The importance of rope skipping includes enhancement of body Coordination and timing, stronger bones, strength and power, self-confidence, and cardiovascular health (Matthew, & Watson, 2023). Lots of epidemiological studies have shown that a sedentary lifestyle leads to the early onset and progression of life-threatening diseases such as hypertension, cardiovascular disease, overweight and obesity (Hruby, & Hu, 2015; Park, Moon, Kim, Kong, & Oh, 2020). These are serious health problems that are common among adults and even youth (Silvers, & Harvey-Jenner, 2023). It is therefore essential to be fit physically and improve the cardiovascular fitness parameters to reduce the increasing rate of mortality among men and women or higher education students.

Purpose of the Study

The purpose of this study was to assess the effect of rope skipping on:
Visceral fat among male students of Demonstration Secondary School FCE Zaria.

Research Question

Would participation in rope skipping adjust Visceral fat among male students of Demonstration Secondary School FCE Zaria?

Hypothesis

There is no significant effect of rope skipping on the visceral fat of male students of Demonstration Secondary School FCE Zaria

Method and Material

One-group repeated measures research design method was adopted for this study. A total of twenty-five (25) participants nine (9) from JSS 1, eight (8) from JSS 2, and eight (8) from JSS 3 stratum (level). All participants were selected using informed consent form and Physical Activity Readiness Questionnaire (PAR-Q). The participants' Visceral Fat (VF) was tested at 0week, 4th week and 8th week.

The training was carried out in the evening between 4:00-5:00 pm, three times a week on Mondays, Wednesdays and Saturdays of the week for 8 weeks. Before the training program, the participants performed a five-minute steady warm-up exercise such as stretches; jogging etc this was done to prepare the body system for physical exertion to prevent musculoskeletal injuries during the program. Succeeding the warm-up was rope skipping by the participants from moderate to high-intensity interval training which was properly supervised by the researcher and two research assistants who were trained for two days. The exercises incorporated into the training were taken from the 'jump variation'. During the training, the participants were advised to remain hydrated by drinking water, but never to stop the rope from moving to remain active and keep the heart rate from dipping back to sedentary mode. The participants were allowed to have 5 minutes' rest in between each training session as some of them may not be able to go for a longer duration at a stretch. The intensity of the training was changed from time to time depending on the rate of perceived physical exertion (RPE) of the participants using the Borg Scale that rates from 6-20. Similarly, to determine exercise intensity is to use the participants' heart rate values. To exercise at a moderate intensity, aim for 40-50 %, 50-60 % of the maximum heart rate. To exercise at a vigorous intensity, aim for 60-70 % of the maximum heart rate.

The researcher used the rating of perceived exertion (RPE) scale, which is a subjective measure of exercise intensity based on how hard you feel you are working. The RPE scale ranges from 6-20, during a moderate-intensity workout, it was aimed at RPE of13-14, hard 15-16, very hard 17-18 and extremely hard 19.

To monitor the intensities of rope skipping, a high correlation exists between the participant's perceived exertion rating times 10 and the actual heart rate during physical activity; so, the participant exertion rating may provide a fairly good estimate of the actual heart rate during activity (Borg, 1998). For example, if the participant's rating of perceived exertion (RPE) was 13, then 13 x 10 = 130; so, the heart rate should be approximately 130 beats per minute. Note that this calculation only approximates heart rate, and the actual heart rate can vary quite a bit depending on age and physical condition.

In this study, the duration of the training session of the somewhat hard phases 13-14 was observed for 35 minutes, while the hard training session 15-16 lasted for 40 minutes, very hard session 17- 18 was done for 45 minutes, and extremely hard phase 19 was 50 minutes respectively.

However, the participants skipped from 0-2 weeks of the somewhat hard session at 13-14, meaning 13×10 =130 to 14×10 = 140, 3-4 weeks of hard session 15×10 =150 to 16×10 = 160, 5-6 weeks very hard at 17×10 = 170 to 18×10 = 180 and extremely hard 19×10 = 190 approximates maximal heart rate

Results and Discussion

Table 1 Demographic Characteristics of Participants

Variables		Frequency	Valid Percent	Cumulative Percent
Class	JSS 1	9	36	36
	JSS 2	8	32	68
	JSS 3	8	32	100
	Total	25	100	
Age Range	12 years	3	12	12
	13 years	5	20	32
	14 years	8	32	64
	15 years	9	36	100
	Total	25	100	
Gender	Male	25	100	100
	Total	25	100	100

Class, Age range, and gender (Frequency, Percentages and Cumulative Percent).

Table 1 above displays the distribution by class of the participants from JSS 1-3 at Demonstration Secondary School, Federal College of Education Zaria, Kaduna State, Nigeria. An observation of this table, revealed that nine (9) participants, representing (36 %) were from JSS 1, whereas 8 participants representing (33 %) were from JSS 2. Furthermore,8 participants, representing 32 % were from JSS 3. Consequently, the findings indicate that majority of the participants who took part in this study were from JSS 1.

Table 1 above also shows distribution by age of participants from 12 years through 15 years. This table also showed that 3 (12 %) of the participants were 12 years old, whereas, 5(20 %) were 13 years old, 8 (32 %) of the participants were 14 years old and 9 (36%) of the participants were 15 years old. Therefore, the results of this study shows that the majority of the participants who took part in the study were 15 years old during the time of the study.

Table 1 above also displays the demographic characteristics of the gender of participants. The table also shows that, 25 participants representing (100 %) were male. Consequently, the findings of this study shows that all the participants involved in this research were male.

Table 2 Result of pretest, 4^{th} and 8^{th} weeks of rope skipping

Variables	Measurement	N0	Mean	Std. Deviation	Std. Error
Visceral Fat	VF Baseline	25	7	0.91287	0.18257
	VF 4^{th}-wk	25	6.44	0.65064	0.13013
	VF 8^{th}-wk	25	4.72	0.89069	0.17814

(VF Baseline, 4^{th}, 8^{th}, Mean, Std D, and Std. Error)

Table 2 presented above displays the outcome of visceral fat observed at the baseline, 4th and 8th week with regards to the percentages of visceral fat was reduced from the average value of (7 ± 0.91287) at the baseline, to (6.44 ± 0.65064) at 4th week of engaging in rope skipping, and to (4.72 ± 0.89069) at the 8th week of rope skipping. This observation shows that participation in rope skipping had significant effect on visceral fat of participants.

Table 3 Repeated measures ANOVA of the rope skipping on visceral fat of participants

Visceral Fat	Sum of Squares	df	Mean Square	F	P
Between Groups	70.587	2	35.293	51.649	.001
Within Groups	49.200	72	.683		

Table 3 presented above-described repeated measures ANOVA analysis of rope skipping on visceral fat of participants. An observation of these results showed a significant reduction in visceral fat of the participants, at $P<0.001$. The examination of the findings indicated that rope skipping for 8 weeks had a significant effect on visceral fat of participants at a significance

level of $P < 0.001$, which is less than $p < 0.05$. Consequently, the hypothesis that suggests that there is no significant effect of rope skipping on visceral fat of male students of Demonstration Secondary School FCE Zaria was rejected.

Discussion

This study assessed the effect of rope skipping on some selected centripetal fat patterning indices among male students of Demonstration Secondary School FCE, Zaria. However, the result of these findings showed that rope skipping had a significant effect on visceral fat percent after 8 weeks of intervention. This finding is in line with the study by Verheggen, Maessen, Green, Hermus, Hopman, and Thijssen (2016), they compared the effects of exercise training and a hypocaloric diet on body weight and visceral adipose tissue (VAT).

The results demonstrated that both caloric restriction and exercise training effectively decrease VAT, with exercise training showing a greater reduction compared to caloric restriction. The correlation analysis further supported the distinct effects of these interventions on total body weight and VAT. While similar to the aforementioned study, the present research differs in that it focuses on overweight and obese participants from diverse ethnic backgrounds. Furthermore, this study specifically examines the impact of rope skipping on VAT, using Repeated Measures ANOVA as the analytical method. The duration of the exercise training, however, remains consistent with both studies, consisting of an 8-week training period. It is important to note that there were no dietary restrictions during the intervention of the rope-skipping exercise. Additionally, this study aligns with the findings of Van et al (2019), who investigated the effect of diet with or without exercise on abdominal fat in postmenopausal women. Their research revealed a 6–7 % reduction in both subcutaneous and intra-abdominal body fat following a 6-week running exercise. However, the difference in intra-abdominal fat loss between the exercise-plus diet group and the exercise-only group was not statistically significant.

Conclusions

Based on the results of this study, the following conclusions were drawn:

Rope skipping for the 8th week significantly reduced the visceral fat percentage of male students of Demonstration Secondary School FCE Zaria ($P = .001$)

Recommendation

Based on the findings of the study, the following recommendations were made:

That rope skipping exercise could be used as an alternative model to reduce the prevalence of centripetal fat in male students.

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