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Effects of a 16-Week Aerobic Training Program on Obesity-Related Morphological Parameters Among University Students in Algeria.

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Abstract

This study aimed to evaluate the effectiveness of a structured 16-week aerobic training program on reducing obesity-related morphological parameters in male university students in Algeria. A sample of 45 obese male students (BMI ≥30 kg/m²) participated in a 16-week intervention comprising four weekly aerobic sessions (fast walking, jogging, swimming, and cycling), lasting 50–70 minutes each. Anthropometric and morphological variables—including body weight, body mass index (BMI), fat mass, body fat percentage (BFP), waist circumference, and conicity index—were measured pre- and post-intervention. Nutritional guidance was also provided to all participants. Statistically significant reductions were observed across all measured variables. Body weight decreased from 95.9 ± 1.66 kg to 73.8 ± 1.02 kg ($p < 0.001$), BMI from 31.75 ± 1.05 to 24.53 ± 0.56 kg/m² ($p < 0.001$), fat mass from 29.02 ± 1.22 kg to 12.01 ± 1.02 kg ($p < 0.001$), and BFP from 30.26% to 16.25%. Waist circumference dropped by 19 cm (from 105 to 86 cm), and conicity index decreased from 1.31 to 1.07. The 16-week aerobic training program significantly improved body composition and reduced obesity indicators among the participants. These findings affirm the critical role of sustained, structured aerobic exercise—combined with dietary modifications—in obesity management among young adults. Future studies are recommended to replicate these findings in broader populations and explore long-term adherence and outcomes.

Introduction

Obesity is a medical condition characterized by an execessive accumuclation of body fat that increases the risk of health problems, it is commonly measured using the Body Mass Index (BMI), where a BMI of 30 or heigher is classified as obese. Obesity results from imbalance between calorie intake and expenditure and can lead to serious health issues such as heart disease, diabetes and hight blood pressure.

As of 2022, approximately 16% of adults worldwide were classified as oese, according to the World Health Organization (WHO, 2024), this equates to over one billions individuals living with oesity globally (WHO, 2024). The prevalence of obesity has seen a significant increase over the past decades, between 1990 and 2022 global obesity rates more than boubled among adults and quadrupled among children and adolescents aged 5 to 19 years.(WOA, 2024)

Projections indicate that if current trends continue, the number of adults living with obesity could rise to 1.53 billions by 2035, with a sigbificant portion of this increase occurring in low and middle- income countries. (WOA, 2024)

Obesity prevalence in Algeria has seen a subject of various studies, yielding differing results based on demographics and methodologies. A 2013 study reported that approximately (30.1%) of Algerian woman and 9.1% of Algerian men were classified as obese (Madjid A. & coll, 2013). Another study focusing on adults aged 18 to 64 in Algiers found on overall rate of 24.9%, with 12.7% prevalence among males and 66.4% among female. Additionally, a 2024 report ranked Algeria 91st globally, with an obesity rate of 24.25%. (Madjid A. & coll, 2013)

Theses datas and statistics underscore the growing global health challenge posed by obesity, highting the need for comprehensive public health strategies to adress its root causes and mitigate associated health risks. When we analyzed the scientifics studies that focused on the topic of obesity, we found that Aerobic Training plays a crucial role in the prevention and management of obesity through both physical exercise and educational interventions.

Physical training includes various activities which contribute to calorie expenditure, muscle development and metabolic enhancement. Regular participation in these activities significantly aids weight management and overall health improvement. Beyond aerobic exercise,

educational training and behavioral coaching are essential in adressing obesity, nutritional education promotes healthy eating habits and portion control, while behavioral coaching helps individuals adopte sustainable life stylechanges. Additionally, methodological training programs developped in collaboration with healthcare professionnals that interventions are tailored to individual needs and health conditions.

A comprehensive approach that integrates structured physiical training is fundamental to effectively combating obesity, this holistic strategy not only facilitates weight reduction but also fosters long-term health and well-being.

The above explantations and arguments about the importance of physical exercise intreating obesity are derived from the results of many documented scientific studies and researchs in many countries around the world. For example, we find the results of DE SEA & coll (2016) conducted in Brazil on obese type 2 diabetes patients confirm the importance of practicing moderate intensity aerobic exercise at least three time a week, which effectively contributes to reducing body weight and waist circumference, in the same context, the results of Pelemis & coll(2015) study conducted in Serbia confirm that moderate intensity training as an effective way to improve the physical and biochimical parameters of health presevation and weight reduction.

In the results of another study not far from Serbia, specifically in Hungary, Horavath & coll (2024) proved that six weeks of aerobic training regardless of its intensity could induce favorable changes in functional tests, body composition and sunconditioned serum lipids, even in severely obese, extremly unconditioned patient. However, moderate intensity aerobic training should at least increase cardio-respiratory capacity and yield a better lipid profile oxidatives status and inflammation profil.

In a study in the eastern part of the world and in Iran the study of Ahmadi (2020) evaluated the effect of an eight weeks aerobic training program in obese woman, the results showed a significant reductions in body weight, waist circumference and body fat percentage, as well as improvement in cholesterol and triglyceride levels.

This study aims to adress the issue of obesity among university students in Algeria, with a specific focus on students university. A random sample of fourty unibersity students was selected to participate in a structured aerobic training program designed to reduce various morphological parameters, including body weight, body mass index (BMI), fat mass and waist circumference.

The proposed aerobic training program is charaterized by methodological rigor, which the researchers believe will contribute to achieving the intended objectives of reducing body weight, fat mass, waist circumference and BMI. One of the key methodological aspects of this program is its relatively long duration of 16 weeks, allowing for sustained physiological adaptations. Additionally, the program incorporates a varied selection of aerobic exercises, including fast walking, jogging, swimming and cycling, to enhance engagement and effectiveness.

Furthermore, the implementation of fast walking, jogging and cycling on campus was strategically designed to promote a culture of aerobic exercise among university students, encouraging physical activity as an integral part of their daily routines.

Methods

a)Participants

To implement the proposed training program for weight loss, a sample of fourty five students university (Algeria) was selected. The participants exhibit a high degree of homogenity in their descriptive characteristics, as all individuals have a body mass index (BMI) exceeding 30, classifiying them as obese. Additionally, all participants are male, and their average ages are relatuvely similar, ensuring consistency in the student sample, the following table presents a detailed overview of the research samples characteristics.

Table N°1 : Demographics Characterictics of the research sample

Descriptive Data	Means (X)	SD(±)
Ages (years)	18.20	0.45
Height (cm)	174.55	2.88
Weight (Kg)	95.90	1.66
BMI	31.75	1.05

b)Anthropometrics measurements

- **Measurement of Height and Weight**

The weight and height of each participant were assessed using the followings instruments :

- A portable height/length measuring board for stature measurement.
- A portable electronic weighing scale for weight assessement.

All measurements were conducted understandarized conditions to ensure accuracy and reliability, participants were measured :

-in the morning at 08.00 am.

-Wearing only under wear minimize clothing related weight variations.

-Without headgear, shoes or socks to ensure precise height and weight measurements.

Height was recorde in centimeters (Cm), while Weight was measured in kilograms (Kg).

- **Measurement of Body Mass Index (BMI)**

The body Mass Index (BMI) is a widely used metric for assessing an individual's corpulence by establishing the relationship between body weight and height. It is calculated using the following formula :

$BMI = Weight(kg) / Height^2(m)$

This index is considered a reliable indicator for evaluating body composition in adult aged (18) to (65) years. Based on BMI values, individuals are classified into the following categories :

- Under Weight : $BMI < 18.5\ kg/m^2$
- Normal Weight : $18.5\ kg/m^2 \leq BMI \leq 24.9\ kg/m^2$
- Over Weight : $25\ kg/m^2 \leq BMI \leq 29.9\ kg/m^2$
- Obesity : $BMI \geq 30\ kg/m^2$

Additionally, obesity is furthercategorized into three levels based on severity :

- Class I Obesity (Moderate) : $30\ kg/m^2 \leq BMI \leq 34.9\ kg/m^2$
- Class II Obesity (Severe) : $35\ kg/m^2 \leq BMI \leq 39.9\ kg/m^2$
- Class III Obesity (Morbid) : $BMI \geq 40\ kg/m^2$

The following table provides a comprehensive overview of BMI classification, serving as reference for assessing weight status and associated health risks.

C) Fat Mass Measurement Weight

In order to measure the fat mass of the subjects, we used an indirect method to calculate the fat mass in Kilogram, which is to conduct eight measurements of skinfolds at reference sites (points) on the body using Harpenden Skinfold Caliper, and the we collected the data and applied the following index to calculated the fat mass in kilograms.

To measure body fat weight (mass) in kilograms, we apply the following indicator :

$Fat\ Mass(F.M.) = d \times s \times k$

F.M. : Fat Mass

$d=1/2(d1+d2+d3+d4+d5+d6+d7)/12$

d1 :Subscapular skinfold

d2 : skinfold (biceps+triceps)/2
d3 :Pectoral skinfold
d4 :Fore arm skinfold
d5 :Abdomen skinfold
d6 :thigh skinfold
d7 :leg skinfold
S : body surface
Body Surface is calculated according to the method of Izakson (1958)
BS=100 + Weight(kg) + (Height(cm) – 160) / 100
K : constant is equal 1.3
Classification of Obesity
Measuring fat mass enables us to determine its percentage of total body weight or body fat percentage (BFP). (BFP) also is a measure fo fitness leve. Also B.FP. score is intepreted by the American Council of Exercise and is given in table N°3, (ACE, 2010)

Table N°3 : Categories of BFP (Rani, 2015)

Body Fat Percentage (BFP%)	Description
6 – 13	Athletes
14 – 17	Fitness
18 – 24	Acceptable
≥ 25	Obese

d)Waist-to-Hip Ratio (WHR) :

The waist-to-hip ratio is a key anthropometric indicator used to assess the risk od developong cardiovascular diseases, diabetes and other metabolic disorders. It is calculated by measuring the circumference of the waist and hips in centimeters

- Waist Circumference is measured at the narrowest point of the abdomen located between the lowest rid and the iliac crest.
- Hip Circumference is measured at widest part of the hips, just above the buttocks.

The WHR serves ab important metric in evaluating gat distrivution patterns and identifying individuals at greater risk for obesity related health complications.
The following table shows the classification of waist circumference standards for men abdomen.

Table N°4 : Classification of Waist Circumference standards for men and women

Classification	Men	Women
Low Health Risk	>94 cm	>80 cm
High Health Risk	>102 cm	>88 cm

Conicity Index

Conicity index as an indicator of andominal obesity, it is a key anthropometric measure used to assess abdominal obesity by evaluating body shape and fat distribution. The theorical values of this index range from 1.0 to 1.37.

- A value of 1.0 indicates a cylindrical body shape which is considered normal.
- A value of 1.37 suggest a double-cone shape indicating a heigher degree of obesity.

The conicity index is calculated using the following formula (measured in meters) :

$$\text{Conicity Index} = \frac{Waist\ Circumference}{0.109 \times \sqrt{Height\ (cm) \times Weight(Kg)}}$$

This index provides valuable insight into central fat accumulation, serving as an important predictor of metabolic and cardiovascular health risks. (Bray & Gray, 1988)

Deroulement of the Study

The experimental study of this research was conducted over a period of 16 consecutive weeks, spaming from january 1, 2025 to april30, 2025. The study took place at the campus and sports facilities of the university.

As previously stated, the proposed aerobic training program was designed to incorporate a variety of aerobic activities, including fast walking, jogging, swimming and cycling. Participants engaged in 4 training sessions per week, resulting in a total of 64 sessions over the week period.

Each session lasted between 50 to 70 minutes with the total of accumulated training time reaching approximately 3840 minutes.

The training program was structured into 16 microcycles, each containing similar content to ensured consistency. The weekly distribution of activities was a follows :

- Session 1 : Fast Walking.
- Session 2 : Jogging.
- Session 3 : Cycling.
- Session 4 : Swimming.

To optimize the program's effectiveness, the principles of progressive overload and training continuity were strictly adhered to Gradual increases in training load were implemented to enhance participants endurance and physical adaptations overtime.

Additionally, participant's received strict nutritional guidelines aimed at promoting healthier eating habits. They were advised to gradually eliminate uuits, unhealthy foods and beverages, such as fast food, soft drinks, refind sugar and excessive bread consumption. Instead, they were encouraged to consume nutrient dense foods, including vegetables, fruits, white meat, fish, eggs, dairy products and mineral water. Participants were also instructed to maintain adequate hydrations levels by consuming 4 to 6 liters of water daily, particularly before, during and after physical activity.

The following tavle presents a sample wekkly training microcycle outlining the structure of the proposed training program.

Table N°5 : Sample of one microcycle training from the proposed program

Days of training	Objectifs of session	Duration of session (m)	Load of training (VMA %)
Friday	Fast Walking	60	50
Saturday	Jogging	50	60 to 70
Sunday	Cycling	60	60 to 70
Monday	Swimming	70	70 to 80

Statistical Analysis

Data analysis was performed using XLSTAT software (version.3.1, Addinsoft, Paris, France) integrated with Microsoft Excel. Descriptive statistics—including means and standard deviations (±SD)—were computed for all anthropometric variables, namely body weight, BMI, and fat mass.

To assess the impact of the aerobic intervention, paired t-tests were conducted to examine differences between pre- and post-training measurements. Statistical significance was established at the threshold of $p < 0.05$.

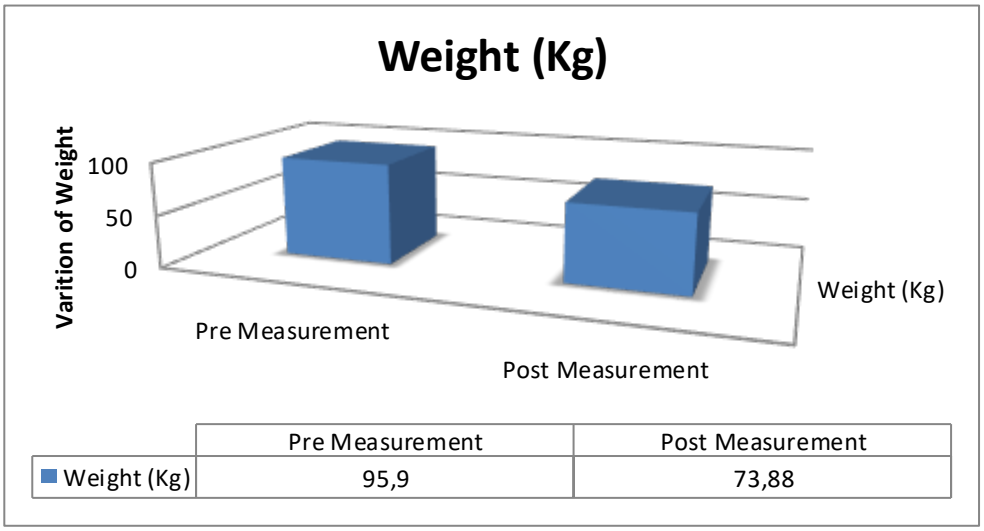
Furthermore, relative change percentages were derived to illustrate the magnitude of variation across the variables. Visual representations—such as bar charts and line plots—were used to demonstrate the progression of physical parameters over the 16-week training period.

Prior to conducting the inferential analyses, the data were screened for normal distribution and compliance with test assumptions, ensuring the robustness of the applied statistical procedures. The findings are

detailed in both the tabular and graphical formats within the Results section.

Results

In this section of this research we have presented and analyzed the results of study obtained of the pre and post measurements of body weight, BMI, Fat Mass, Body Fat Percentage, Waist Circumerence and Conicity Index of the participants in this study.



	Pre Measurement	Post Measurement
Weight (Kg)	95,9	73,88

Figure N°01 : Differences of Body Weight between PRE and POST Measurement

The data presented in figure N° 01 illustrate a significant reduction in body weight among the student participants following the aerobic training program. The mean body weight prior to the intervention was 95.66 Kg, which decrease to 73.88 Kg post-intervention . This represents a mean weight reduction of 22.02 Kg. These findings underscore the efficacy of sustained aerobic exercises in mitigating obesity, particularly when maintained over an extended period.

In this study, we conducted serial measurements of the participant's body weight at four distinct intervals, specifically every four microcycles if training. This approach was designed to monitor and analyze the temporal progression of weight changes throughout the intervention period. The results obtained from these periodic assessments are illustrated in the accompanying figure.

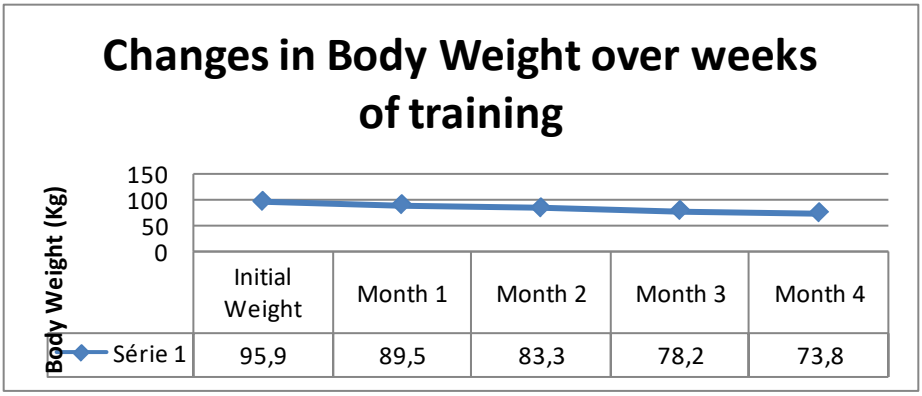


Figure N°02 :Changes in Body Weight over Weeks of Training

Upon analyzing the data depicted in figure 2, it is evident that participants experienced a consistend and progressive reduction in body weightthroughout the 16 weeks training regimen, averaging a decrease of approximately 1.73 Kg per week. The most pronounced weight loss occured during the initial month with an average reduction of 6.4 Kg, while the final month exhibited a comparatively lower decrease of 4.4 Kg.

This steady decline in body weight serves as a positive indicator of the body's adaptations to aerobic energy production mechanisms, particularly the enhancement of mitochondrial fat oxidation processes. Regular aerobic exercise has been shown to increase the content of fatty acid transport proteins in skeletal muscle, there by facilitating improved fat metabolisme. (Mûsculla A. & coll,2020)

Furthermore, engaging in aerobic exercise exceeding 150 minutes per week at moderate intensity or greater has been associated with clinically significant reductions in body weight and fat mass, underscoring the effectiveness os sustained aerobic activity in weight management. (Boles A. N., & coll, 2016)

These findings underscore the importance of consistent aerobic exercise in promoting weight loss and enhancing metabilic health. Upon analyzing the pre and post intervention measurements, we observed a mean body weight difference of 22.02 Kg among participants. To assess the statistical significance of this observed difference we applied the paired sample t-test, aiming to determine if the change was significant at the 0.001 level. This approach is consistent with methodologies employed in similar such as the evaluation of weight differences before and after measurements.

Tale N°06 : Results of the student t-test between the Pre and Post measurement of Body Weight

Body Weight	Pre-measurement		Post-measurement		T calculated	T tabular	Level of significance	Significance
	$\bar{X}$	**Sd**	**$\bar{X}$**	**Sd**				
Indicator Body Weight	**95.9**	**1.66**	**73.8**	**1.02**	**1.930**	**1.684**	**0.001**	*******

Upon conducting a t-test to assess the statistical significance of the difference in body weight measurements before and after the training program among study participants, we obtained a calculated t-value of 1.930, this value exceeds the critical t value of 1.684 at the 0.001 level. Consequently, we reject the bull hypothesis, indicating that the observed reduction in body weight following the training program is statistically significant at the 0.001 level.

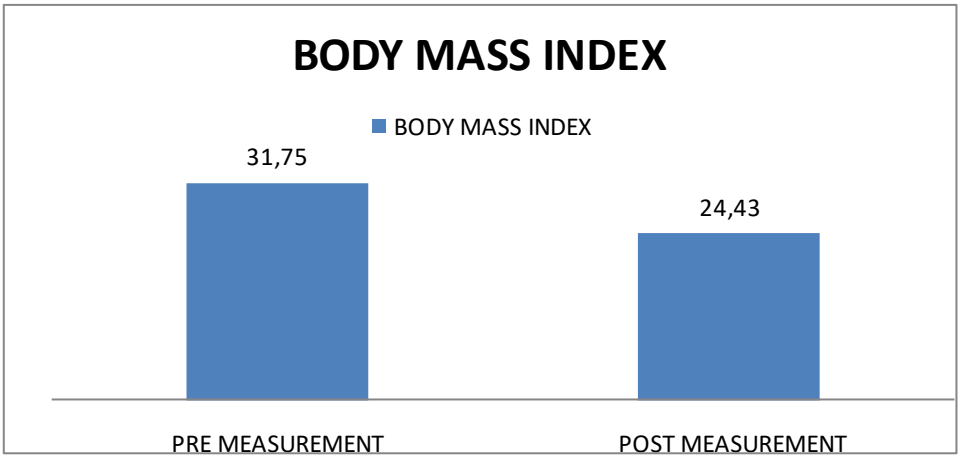


Figure N°3 : Difference in mean of Body Mass Index (BMI) between PRE and POST measurements among student's samples

Figure N°3 presents the comparative analysis of mean body mass index (BMI) of the research cohort, measured prior the initiation and subsequent to the completion of the training program. The initial mean of BMI was recorded at 32.03 Kg/m^2 , categorizing the participants within the class I obesity range (30-34.9 Kg/m^2) as per the world health organization's (WHO) standards. (Connor B. & Weir A. J., 2025)

This classification indicates that the students were obese before the intervention. (Connor B. & Weir A. J., 2023)

Post measurement, the mean BMI decreased to 24.53 Kg/m^2, positioning the participants within the normal weight range (18.5-24.9 Kg/m^2) according to WHO critiria. (WHO, 1995)

This significant reduction in BMI underscores the efficacy of the implemented training microcycles in not only reducing body weight but also in reclassifying the participant's weight status from obese to normal.

Table N°07 : Results of the student t-test between the Pre and Post measurement of Fat Mass

Fat Mass (Kg)	Pre-measurement		Post-measurement		T calculated	T tabular	Level of significance	Significance
	$\bar{X}$	**Sd**	$\bar{X}$	**Sd**				
Indicator								
Fat Mass	**31.75**	**1.05**	**24.43**	**0.56**	**5.333**	**3.659**	**0.001**	*******

The analysis yielded a calculated t-value of 5.333 which exceeds the critical t-value of 3.659 at the 0.001 significance level. This finding indicates a statistically significant reduction in Body Mass Index (BMI) following the training program. Moreover, this outcome is collaborated by the shift in participants morphological classification from the obesity category to the normal weight category, underscoring the efficacy of intervention.

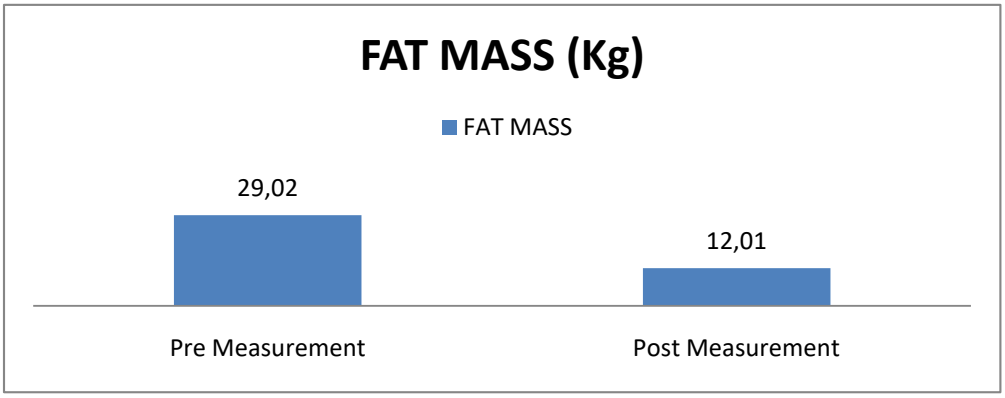


Figure N°4 : Difference in Fat Mass between the PRE and POST Measurement among students participating in this study.

Figure N°6 illustrates the mean fat mass of students participating in this study, comparing pre-intervention measurementd (prior the commencement of the training program). The initial mean fat mass was 29.02 Kg, which decreased to 12.01 Kg post- intervention, indicating a reduction of 17.01 Kg. This substantial decrease in fat mass is attributed to the aerobic exercises incorporated into the training regimen, which primarily utilize fat oxidation as the main enery source during physical ativity.

Aerobic exercise particularly at intensities between 60% and 65% of VO2 max, has been shown to maximize fat oxidation, thereby effectively reducing body fat. (Hargreaves M. & Spriet L., 2020)

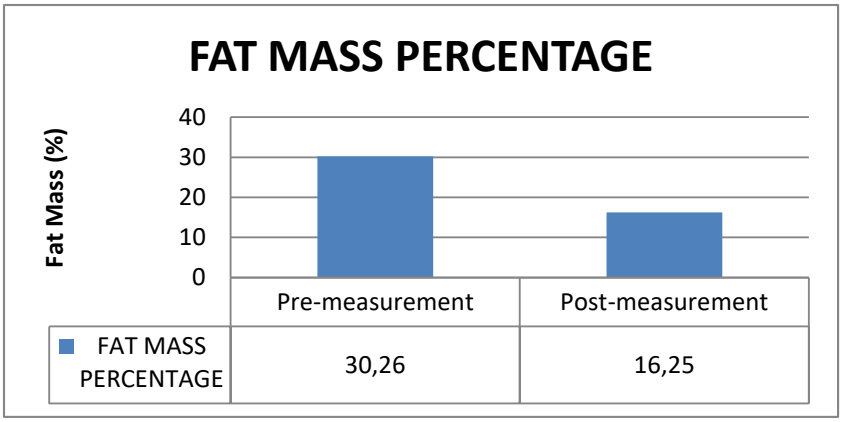


Figure N°5 : Percentage of fat mass between the pre-measurement and post-measurement among student participating in the study

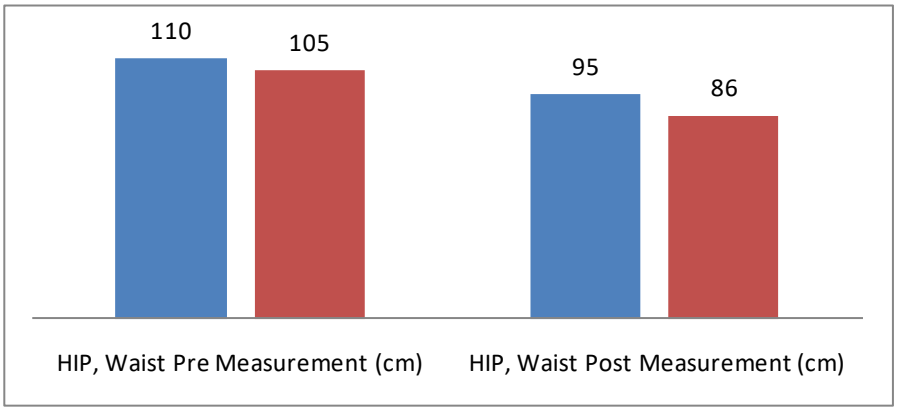
The figure above depicts the Percentage of fat mass relative to total body weight before and after the training program proposed along the students participating in the study. The data indicate that prior to the implementation of the training program, the mean body fat percentage was 30.26%, classifying the participants as obese according to the American Council of Exercise (A.C.E) standards, which define obesity as a body fat percentage exceeding 25%. Upon completion of the training program the mean body fat percentage decreased to 16.25%, thereby categorizing the participants within the « good fitness » range, as defined by A.C.E. classification, which designates body fat percentage between (14%-17%) as indicative of an optimal physical condition.

These findings underscore a substantial reduction in body fat percentage, estimated at approximately 14%, thereby providing empirical evidence of the effectiveness of the prescribed training program in reducing adiposity among individuals initially classified as obese. Furthermore, the results highlight a marked improvement in body composition, as reflected in the participants final body fat percentage of 16%, which aligns with established benchmarks for healthy physical fitness. These outcomes are consistent with existing research, within the range of 14% to 17% is conductive to achieving optimal physiological and functional fitness levels.

Table N°07 : Results of the student t-test between the Pre and Post measurement of Body Mass Index

Body Mass Index	Pre-measurement		Post-measurement		T calculated	T tabular	Level of significance	Significance
	$\bar{X}$	Sd	$\bar{X}$	Sd				
Indicator Fat Mass	29.02	1.22	12.01	1.02	4.102	3.659	0.001	***

The table above presents the results of a paired samples t-test conducted to evaluate the statistical significance of difference in fat mass between pre and post measurements among the study participants. The analysis yielded a calculated t-value of 4.102, which exceeds the critical t-value of 3.659 at the 0.001 significance level. This finding indicates a statistically significant reduction in fat mass following the training program, Consequently we conclude that the observed decrease in body fat mass among the research sample is statistically significant, thereby demonstrating the efficacy of the implemented training regimen.



Figures6 : Results of the Pre and Post Measurement of Waist and Hip circumferences of the study members.

Figure N° 6 presents the pre- and post measurement results of waist and hip circumferences among the study participants. Initially, the mean waist and hip circumference were recorded as 105 cm and 110 cm, respectively-values considered significantly elevated, particularly in the case of waist circumference. According to the world health organization (WHO), a waist circumferenceexceeding 102 cm in adults males constitues a strong predictor of heightened health risks.

Following the complection of the prescribed training program and subsequent reassessment, the mean waist and hip circumferences were

reduced to 86 cm and 95 cm respectively. This substantial decrease suggests a marked reduction in à adipose tissu, particularly in regions predisposed to fat accumulation, such as the abdominal and gluteal areas.

This finding is consistent with existing literature, which highlights the abdomen and buttocks as primary fat storage sites. Additionally, the reduction in waist circumference to below 94 cm. Significantly mitigates potential health risks, aligning with World Health Organization recommendations for improved metabolic and cardiovascular health. These results underscore the effectiveness of the training program in promoting favorable anthropometric health related outcome.

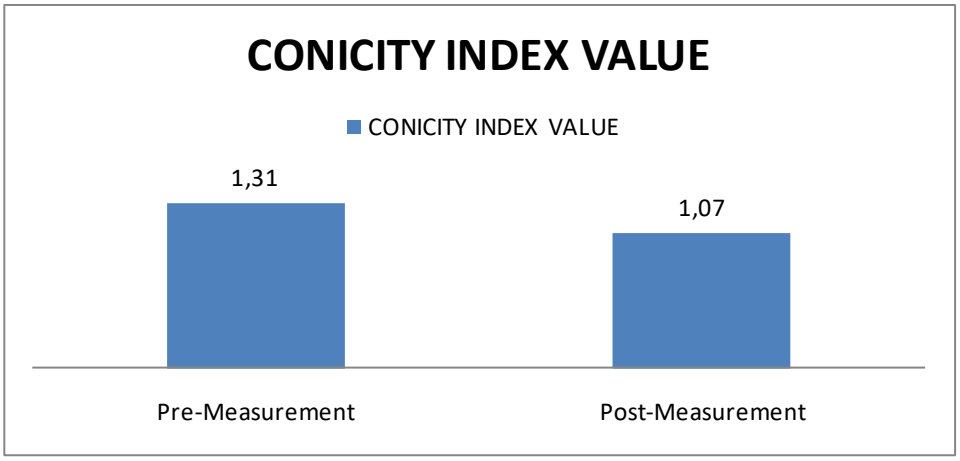


Figure N°7 : Results of the Pre and Post Measurement of Conicity Index among the participants of the study

Figure N°7 illustrates the Pre and Post intervention Conicity Index (CI) values for the study participants. Initially, the mean (CI) was 1.31 a notably elevated figure indicative of pronounced central adiposity and an associated daible-conebody shape. This morphology is characterized by significant fat accumulation in the abdominal region, correlating with increased health risks. (Nkwana M. R., Monyeki K. D. & Lebelo S. L., 2021)

Upon completion of the training program, the mean (CI) decreased to 1.07 aligning with values representative of a cylindrical body shape and suggesting a substantial reduction in central fat depositions. This favorable shift underscores the efficacy of the aerobic exercises and training in ameliorating obesity-related morphological characteristics among the participants.

DISCUSSION

In this research, we addressed the contemporary issue of obesity, a significant health concern affecting numerous countries and societies worldwide since the early twenty first century. Our study aimed to identify pratical solutions for managing obesity among universities students by implementing a structured training program. The program comprised 16 microcycles over 4 months, focusing on aerobic endurance activities such as fast walking, running, cycling and swimming. We conducted the study with a sample of 45 obese students the university in Algeria.

To evaluate the effectiveness of the proposed training regimen, we performed pre- and post- intervention anthropometric assessements, including measurements pertinent to obesity classification, Body Mass Index (BMI), Body Fat Percentage (BFP), Conicity Index (CI) and Waist Circumference. These assessments involved recording Height, Weight, Skinfolds Thikness and Circumferences among other metric.

The findings revelated a significant positive impact of the training program on all morphological variable, notably weight and the conicity index (CI). Participants average body weight decreased from 95.9 Kg to 73.8 Kg over the the four month period, reflecting a total reduction of over 22 Kg, averaging approximately 1.38 Kg per week. This substantial weight loss underscores the efficacy of aerobic endurance exercises in reducing body weight, as these activities engage large muscle groups, particularly in the lower limbs and rely on the aerobic energy system, which enhances fat oxidation during physical exertion.

Our results align with existing littérature emphasizing the role of aerobic exercise in weight management, for instance a meta-analysis of randomized clinical trids demonstrated that engaging in at least 150 minutes of moderate intensity aerobic exercises per week is associated with clinically significant reductions in body weight, waist circumference and body fat among overweight and obese adults (Jayedi & coll, 2024). Similary, research indicates that both light and moderate aerobic activities can improve body composition and serum lipid profiles in obese individuals (Marandi S. M. & coll, 2013).

The necessity of adhering to training principles such as continuity and gradual load progression is paramount to achieving desired adaptations in aerobic energy system and enhancing fat metabolism during exercise. Studies have shown that structured aerobic exersise programs can lead to

significant improvements in body composition and metabolic health markers (Shiu C. H. & coll, 2017).

Therefore, incorporating regular aerobic activity into the life style of obese individuals is a critical strategy for effective weight management and overall health improvement. When classifying the participants according to global obesity indicators such as Body Mass Index (BMI) and Body Fat Percentage (BFP), statistically significant differences were observed between pre- and post- measurements. Regarding BMI, the pre-measyrement value was 33.75 classifying participants as having first degree obesity . However, in the post-measurement the BMI value decreased to 24.43 indicating a reclassification towards the normal weight category. These finding, illustrated in figure N°3 and table N°7, suggest that the study's objective was achieved, as participants effectively mitigated their obesity.

To ensure the accurate attainment of the study's objectives, body fat percentage (BFP) was measured using the classification system established by the American Council of Exercise A.C.E. (Table N°3). Prior the intervention, the participant's BFP was 28%, which falls within the obesity classification range. However, following the completion of the proposed training program , the BFP value decre ased to 16%. According to the ACE classification, this reduction indicates that participants successfully eliminated obesity and attained a physically fit status.

Scientific studies affirm that lipid utilization during exercise is primarily influenced by the duration and the intensity of physical activity. As exercise duration increases, lipid contribution to energy expenditure declines. In comparaison the experimental training program in this study was conducted at moderate intensity (ranging from 50% to 80% of VO2 Max) and sustained over relatively long duration (45 to 70 minutes per session). According to Donovan & Brooks (1983) and Gollnick (1985), endurance training enhances lipid oxidation, leding to shift from carbohydrate reliance to lipid metabolism. This shift is evidenced by a decrease in the respiratory quotient, Glycogen depletion and plasma lactate concentration during exercise.

The findings derived from the dimentional measurements of waist circumference and the conicity index further substantiale the conclusions drawn from the observed reduction in fat mass and fat percentage among the study participants following the completion of the structured training program, specifically, waist circumference exihibited a substantial reduction with an average decreased of 19 cm from 110 cm to (86) cm,

similary the conicity index values declined by an average of 24 degrees from 1.31 to 1.07.

These results provides complling evidence of a significant reduction in body fat percentage, an improvement in body composition, and concomitant decrease in health- related risks. Moreover, the findings indicate enhanced physical fitness levels, all of which can be attributed to the efficacy of the four months training regimen implemented in the study. The observed reductions in waist circumference align with previous research, which has established a strong correlation between targeted exercise interventions and reductions in central adiposity, thereby mitigating the risks associated with metabolic syndromes and cardiovascular dieseases (Ross & coll, 2020 ; Jakicic & coll, 2019). Additionally, the decline in the conicity index further underscores the effectivenessof structured training in promoting favorable anthropometric adapatations, a finding consistent with existing littérature on exercise-indused body composition changes (Heymsfield & coll, 2018).

Additionally, another crucial factor contributing to the observed weight loss was the implementation of nutritional guidelines provided to participants. These guidelines encouraged the consumption of healthy foods such as vegetables, fruits and fish, which likely played a supportive role in reducing overall caloric intake. This dietary intervention indirectly contributed to the participants weight reduction.

Conclusion

Since 1997, the World Health Organization (WHO) has classified obesity as a chronic disease, which over one billion individuals currently affected worldwide. Given the increasing prevalence of obesity and its associated hralth risks, this study aimed to identify pratical and evidence- based strategies for obesity management among university students in Algeria. To thisend, a structured training program was developed based on the methodological principles of a sport training, specifically designed to facilitate weight loss and improve overall physical fitness.

The intervention spanned a continuous 16 weeks period, focusing on the enhancement of aerobic endurance through a diverse regimen of exercises across four sports disciplines : Fast Walking, Running, Swimming and Cycling. Post measurement assessments were conducted to evaluate the impact of the intervention, revealing statistically significant improvements in all measured morphological variables. On average, participantsexperienced a substantial reduction in body weight, with an

average loss exceeding 22 Kg, resulting in a shift in their body mass index (BMI) classification from the obese category 31.75±1.05 to the normal range 24.53±0.56. Additionaly waist circumference decreased by more 19 cm from 110 cm to 86 cm, while the conicity index value decline by over 24 degrees (from 1.31 to 1.07). Furthmore, body fat mass was reduced by more than 17 Kg and body fat percentage (BFP) significantly decreased from 29% to 16%. According to the American Council of Exercise (ACE) obesity classification, this reduction reclassified participants from the oesity category (≥25% BFP) to the good physical fitness level (14%-17% BFP).

These findings underscore the effectiveness of structured training program in managing obesity and over weight conditions among young adults. The study highlights the importance of incorporating systematic exercise interventions to achieve sustainable health benefits. Accordingly, further comprehensive research is recommended to explore obesity management strategies among youth, integrating structured physical training with dietary interventions under the supervision of health nutrition specialists.

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