## The effects of training on body Composition, cardiovascular variables and physical fitness components of overweight college students in the State of Kuwait

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## Abstract

The aim of this study was to investigate the effect of different training methods over an 8 week period on body Composition, cardiovascular variables and physical fitness components of overweight college students in the State of Kuwait. Thirty overweight students (29.9 years) (body mass index =  $28.6 \text{ kg/m}^2$ ) from College of Basic Education enrolled in physical fitness class in the first semester 2011 were asked to participate in the present study. Subjects were divided into three groups; walking, strength and control. Training intervention consisted of 2 hours once a week for 8 weeks. In pre and post tests results, the body Composition variables of weight, height, body mass index (BMI), waist to hip ratio (WHR) and present body fat were not significant ( $P \le .05$ ). No significant differences ( $P \le .05$ ) were observed for the cardiovascular variables of VO<sub>2</sub>max, RHR and blood pressure. Also, no significant differences were found under different physical fitness components; 1.6 km walk (min.sec), 60m sprint (sec), one minute sit-ups, push-up, agility (sec) and flexibility sit and reach (cm). A one way analysis of variance (ANOVA) revealed that the only significant difference between groups was observed in 1.6 km walk time for control group.

It can be concluded that 2 hours of physical fitness classes once a week for 8 weeks did not improve body Composition, cardiovascular variables and physical fitness components of overweight college students in the State of Kuwait. The author suggests that students must participate in daily physical activities and the college curriculum should be modified to increase the frequency, duration and intensity of physical fitness classes. The content of the physical fitness classes should changed and focused on physical and physiological components were an aerobic and anaerobic activities must be prioritized.

## **Introduction:**

Members of the Gulf Cooperation Council (GCC) including Kuwait has experienced a rapid socioeconomic development which led to a demographic and epidemiological transition of obesity, diabetes and cardiovascular disease becoming the leading causes of morbidity and mortality. High personal income, the availability of convenient restaurant locations as well as the influence of fast food marketing on adolescent health, especially students, contributes greatly to this problem. The increasing prevalence of being overweight, obese and the associated health problems such as cardiovascular and diabetes are well documented and represent a major challenge to public health and the health care systems (4, 23, 40).

Being overweight refers to an individual weighing 10% or more of what is considered to be his recommended healthy weight. Being overweight is known to increase the likelihood of certain diseases and health problems, particularly if other risk factors are present.

The World Health Organization (WHO) defines obesity and being overweight as the abnormal or excessive fat accumulation that may impair health (1). Obesity is a worldwide epidemic that is characterized by excess adipose tissue that contributes to numerous non-communicable diseases such as coronary heart disease, stroke, hypertension and diabetes (2,19,23).

In 2011, The World Health Organization stated in a report regarding country profiles with non-communicable diseases that the Kuwaiti male population was estimated that 78.4% are overweight and 37.5% are obese (1).

In 2011, the WHO stated in a report regarding country profiles with noncommunicable diseases that the estimated rates of obesity and being overweight in the Kuwaiti male population was 37.5% and 78.4% respectively (1).

The results of the study conducted Al-Isa (31) revealed that 38.5% and 11.1% of the college students were overweight and obese respectively. These high percentages are mostly due to the unhealthy daily life styles of Kuwaitis. The high personal income and availability of the restaurants may be a factor contributing to the problem. Fast food marketing has been a major influence in adolescent health especially students and the increasing prevalence of being overweight, obesity and the associated health problems such as excess weight are well documented and represent a major challenge to public health and the health care systems (4).

Kyrolainen et al (30) explained the importance of regular daily physical activity and its role in improving physical fitness components leading to reduction in the risk of obesity and several other metabolic problems (e.g. diabetes mellitus, metabolic syndrome, heart disease) and general improvements in overall health. The importance of development and implementation of physical fitness program to promote healthy eating and physical activity in college students was studied by Ferrara (44). They concluded that exercise and nutrition professionals have an important the role in development and implementation of new policies and programs for college students to promote healthy eating and active lifestyle. Physical activity is considered a major factor in weight loss programs and there are many organizations such as the American College of Sports Medicine (ACSM), the American Heart Association (25), and British Association of Sport and Exercise Sciences (26) that recommend an hour or more of exercise per day to prevent weight gain and promote health (14, 15, 26).

Furthermore, the ACSM recommends adults should exercise in moderateintensity for greater than or equal to 30 minutes a day for 5 days a week totaling 150 minutes a week of cardiorespiratory training. Also, the 30 minutes may be divided into several 10-minute segments. Intensity should be between 50-85% of heart rate maximum (220 - age x .50 to .85). Schmidt et al (52) found that exercise accumulated in several short bouts has similar effects as one continuous bout with regard to aerobic fitness in overweight young women. In addition, Schmidt et al. (52), recommend highintensity cardiorespiratory exercise training for 20 minutes or more 3 days a week.

Resistance training is a specialized method of physical conditioning that involves the progressive use of a wide range of resistive loads from medicine balls to high intensity plyometrics that enhance or maintain muscular fitness (i.e. muscular strength, muscular power, and local muscular endurance). The ACSM recommends 2-3 days a week of resistance training for each of the major muscle groups as well as neuromotor exercises involving balance, agility, and coordination (27).

The College of Basic Education offers two types of physical fitness classes. One for student athletes enrolled in the Physical Education Department and the other for non athlete students enrolled in other departments as part of curriculum requirements. Classes are offered once a week with a duration of 2 hours per class. Taught by the Physical Education Department faculty, each fitness class consists of a practical application component as well as theory behind those components. Practical examples include aerobic, anaerobic and resistance training. Beside the class credit hours earned in academic term by students attending these classes, the main goal is to motivate and educate the students to continue the physical activity afterwards.

There are many physical fitness components that need to be considered in order to accurately access the health of an individual. Some physical fitness components include cardiovascular endurance, muscle strength and endurance, flexibility, and body composition. In particular, maximal oxygen uptake (VO<sub>2 max</sub>) is considered the gold standard to assess cardiovascular endurance fitness. In this study, the author selected and tested several components of physical fitness in order to measure and investigate the effects of different training program on these components.

Therefore, the author decided to investigate the effect of physical fitness classes for an eight week duration (one semester) on physical fitness components and body Composition variables of selected overweight students attending these classes.

#### Methods:

#### Subjects:

Thirty overweight students from College of Basic Education in the State of Kuwait enrolled in physical fitness classes during the first semester from September to December 2011 were asked to participate in the present study. Physical fitness classes were offered as a part of the college curriculum for all students including students enrolled in physical education department and other departments. A total of ten classes were offered once a week lasting 2 hours in duration. The number of students enrolled in each class varied from 17 to 28 with a total of 170-280 students each semester. Health and medical clearance was obtained for all students prior to participation in the present study.

Data for the present study was used only from those students who lead a sedentary life style and do not engage in any physical fitness activities or programs. Based on the results obtained from students' body mass index (BMI) measurements at the beginning of the classes, the subjects were divided into three groups. A normal body mass index was considered when BMI  $\leq 25 \text{ kg/m}^2$ , whereas a BMI  $\geq 25$ -29.9 kg/m<sup>2</sup> was classified as overweight and BMI  $\geq 29.9 \text{ kg/m}^2$  was classified as obesity. Only students with BMI  $\geq 25$  were selected.

Therefore, a total of 30 students in these classes were divided into three groups; aerobic (walking), resistant training (weightlifting) and control. Subjects in the walking group (WG) consisted of 10 overweight students performing 8 weeks of combination exercise training which included walking and jogging for 45 to 60 minutes per class (1 class per week). The resistant training group (RG) consisted of 10 overweight students who participated in circuit training consisting of a combination of body, free and machine weightlifting for 45-60 minutes per class (1 class per week). Finally, the control group (CG), also 10 students, did not receive any training except participate in basic class requirements which focused on the theoretical part of physical fitness.

Physical fitness components such as, speed, strength, agility, flexibility and cardiovascular variables such as  $VO_{2max}$ , resting heart rate (RHR), systolic and diastolic blood pressure were measured. In addition, body Composition variables such as body weight, body mass index (BMI), waist to hip ratio (WHR), percentage body fat were measured in all groups.

The following tests were used in sequence to measure the body composition and fitness level of each student before and after the training intervention. All measurements and tests were performed at the first week of the classes at the following order:

The first hour of the first class consisted of the following tests: Body weight, body height, waist circumference, hip circumference, resting heart rate, blood pressure, three skin-fold, one minute sit-ups, push-ups and flexibility.

The second hour of the class consisted of the following tests; 1.600 m walking, 50 m sprint, and agility.

#### Body Composition assessment

All body Composition measurements were conducted in accordance with the International Standards for Body Composition Assessment (6). All body Composition measurements were taken by the same investigator to ensure reliability and accuracy. All instruments (equipments and balances) were standardized before the examination and zero calibrated.

#### Body height:

Body height (in cm to the nearest 0.1 cm) was measured with the subject standing barefoot in the orthostatic position with the heels together. Position of the head was standardized by asking the subject to stand straight and look straight ahead. Height was taken twice without delay between the measurements. Mean values of each measurement was recorded.

#### Body weight:

Body weight (in kg to the nearest 0.1 kg) was measured with a reliable weighing scale (Seca portable height stadiometer, Leicester, England). The subjects were wearing light clothing and no shoes.

#### Body mass index (BMI):

The BMI was achieved by dividing weight in kilograms by height in meters squared which allowed the classification of the student's degree of being overweight or obesity.

#### Waist circumference (WC):

Despite the availability of more sophisticated methods for the evaluation of abdominal fat, waist circumference (WC) is an easy-to-use, low cost, simple measure of adiposity and an accurate indicator of risk other than BMI in considering associated health risks (2). Waist circumference (in cm), as a measure of central adiposity, was measured twice to the nearest 0.1 cm with a Gulick measuring tape (Fitness Mart, Gay Mills, USA) following the World Health Organization (WHO) protocol. WC was measured mid-point between last floating rib and top of the iliac crest in mid-axillary line at the end of a normal expiration to the nearest 0.1 cm. Two measurements were taken right after each other, without delay and averaged. The World Health Organization classified the normal abdominal adiposity when WC is between 94.0 – 101.9 cm but when the reading is more than 120.0 cm then the person is overweight and obese (2).

#### Hip circumference (HC):

Hip circumference was measured at level of the greatest protrusion of the gluteal muscles to the nearest 0.1 cm. The subject stood with their weight evenly distributed on both feet and legs slightly parted, making sure not tense the gluteal muscles.

#### Waist to hip ratio (WHR):

Waist to- hip ratio (WHR) was determined using waist measurements at the level of the umbilicus and maximum hip circumference. The waist to hip ratio was derived from waist and hip circumferences. The circumferences are given as the mean of the two measurements to the nearest 0.1 cm. WHR was calculated from waist circumference (cm) divided by hip circumference (cm). If the waist/ hip ratio exceeds 1.0, central obesity is identified and can lead to cardiovascular complications.

#### Percent body fat (%BF):

Skin-fold data was obtained using a skin-fold caliper (Beta Technology, Inc., Santa Cruz, California) and recorded to the nearest 0.2 mm. The skin fold thickness was

taken once for the entire three skin-folds sites; chest, abdomen and thigh. Afterwards, the measure were repeated twice more by the same investigator. The average was then recorded.

All measurements were obtained from the right side of the students. The mean of the three measurements was then used for the analysis. The timing of the skin-fold measurements was standardized to ensure reliability. According to American college of sport medicine guidelines, the readings were performed 4 s after applying the caliper. In order to calculate percent body fat, the author used standard equations Jackson-Pollock method (38).

Measurements of the three sites as follows:

Chest: a diagonal fold half the distance between the anterior axillary line (line of armpit) and nipple. The caliper tips were placed perpendicular to the long axis of the skin fold, and the reading on the dial was taken to the nearest 0.1 mm.

Abdomen: a vertical fold at a lateral distance approximately 2 cm (3/4 inch) to the right of the umbilicus (belly button).

Thigh: a vertical fold on the front aspect of the thigh, midway between the top of the knee cap and the hip. A measurement was taken to the nearest 0.1 mm.

The sum of 3 skin folds measurements were added and computed with the Jackson-Pollock method (38) to measure body density:

 $Db = 1.10938 - 0.0008267 (MSF) + 0.0000016 (MSF)^{2} - 0.0002574 (age).$ Were Db = body density MSF= mean skin fold

The following formula was then used to compute % body fat: % Body Fat =  $[(4.95/Db) - 4.5] \times 100$ 

## Physical fitness components:

Speed 60 yard (54.86 meter) sprint:

The running speed test included a 60-m sprint from a standing position. Before the test, a warm-up procedure consisted of a minimum of 10 minutes of easy running, followed by an appropriate stretching regimen especially for the lower extremities and some acceleration sprints to familiarize the subjects with the pacing. The subjects were instructed to run as fast as they could. An outside track and field was used. Running shoes without spikes were used and no starting blocks were allowed. The subjects completed two maximal effort runs separated by a 5 - 10 minute recovery period. A stop watch was used to record the time.

Muscle Strength :

One minute Sit-ups:

To measure abdominal muscle strength and endurance, all subjects started the test in the up position, knees bent, heels flat on the floor, with hands across the chest. The buttocks must remain on the floor with no thrusting of the hips. A partner holds the feet down firmly and will count the number of sit-ups performed. In the up position, the

candidate should touch elbows to knees and then return until the shoulder blades touch the floor. Any resting should be done in the up position. If for any reason you are in the down position and are not able to recover into the up position the testing is finished. The total number of correct sit-ups in 1 minute is recorded as the score.

#### Push-ups:

To measure upper body strength and endurance, the students began in a prone position with their hands on the floor, thumbs shoulder-width apart and elbows fully extended. The students kept their back and body straight, bent the elbows and then extended them fully. If the student did not adhere to these specifications, the repetition was not counted. The test was scored as the number of push-ups performed in 1 minute. Flexibility:

#### Sit and reach test:

Each student was asked to sit on a mat on the floor with legs, no shoes, stretched out straight ahead of a flexibility box (Model 01285, Lafayette Instruments Company, Indiana, U.S).The soles of the feet are placed flat against the box and no bending of both knees. With the palms facing downwards, and the hands side by side, the student was asked to stretch their hands as forward as possible on top of the box. After several attempts and practice, the student reaches out and holds that position for two seconds while the distance covered by the hands was recorded. The score is recorded to the nearest centimeter and the level of the feet at 15 cm was used as the zero mark in the box. This test aimed to measures the flexibility of the lower back and hamstrings.

#### Agility:

#### Illinois Agility Test

The author in this test measured the student's ability to accelerate, decelerate and change direction. Equipments needed are flat non-slip surface, marking cones, measuring tape and stopwatch. The length of the course is 10 meters and the width is 5 meters. Four cones are used to mark the start, finish and the two turning points. Another four cones are placed down the center with 3.3 meters apart. The test started with the student lying in the prone position on the starting line with his chin touching the floor. On the signal of the whistle and stopwatch is started, the student gets up and accelerated towards and around the cones as explained by the tester (author) without knocking the cones over. The time taken to complete the course through the cones was recorded. The student had two attempts with a minimum rest period of 4 minutes between each test. The fastest time was recorded in seconds.

#### Cardiovascular variables:

Test to estimate cardiovascular fitness VO<sub>2max</sub> :

The aim of this test is to complete a 1 mile course in the shortest possible time, while maintaining a constant walking pace the entire distance. A Walking test was used to measure the aerobic capacity of the subject which consisted of walking 1.6 km (4 laps of a 400m track) as fast as possible. The heart rate was recorded immediately upon the completion of the last lap using a Polar heart monitor, model F10. Before each run, participants performed a 20 min standard warm-up (5 min jogging, 10 min stretching, 5 min running drills). At the end of the test, the time was recorded as well as the heart rate

of the student. The cardio respiratory fitness, defined as indirect  $VO_{2 max}$  test, was estimated from the following equation:

Estimated VO<sub>2 max</sub> in mL . kg<sup>-1</sup> . min<sup>-1</sup> = 132.853 – (0.0769 x weight in pound) –(0.3877 x age in years) + (6.315 x gender) – (3.2649 x time in minutes) – (0.1565 x HR at the end of the test) With gender: 1 for men. 1 pound = 0.45 kg 1 kg = 2.2 pound Students were classified as "fit" when they presented indirect VO<sub>2max</sub> > 52

ml/kg/min and "less fit" when they presented indirect  $VO_{2max} \le 52 \text{ ml/kg/min}(34)$ .

#### Resting heart rate (RHR):

Resting heart rate was recorded using polar FT7 with a watch strap and a built in transmitter placed in a belt around the chest. The students were asked to wet the electrode areas of the strap well under running water and attach the connector to the strap. It is important to adjust the strap length to fit tightly but comfortably. Students then tied the strap around their chest, just below the chest muscles. The investigator checked that the wet electrode areas are firmly against the students' skin and that the Polar logo of the connector is in a central and upright position. Several reading attempts should be conducted prior of actual readings.

#### Blood pressure measurement (BP):

Blood pressure was measured before any active test. The students were asked to sit quietly for 5 minutes before the measurement. Three consecutive BP measurements were carried out with students in the sitting position, relaxed with both feet flat on the floor, and their arm resting on the table. The cuff was wrapped around their upper left arm free of clothing so the bottom edge of the cuff was 2-3 cm above the point where the upper arm joins the lower arm. The lower edge of the cuff was at the level of the student's heart. Two minute intervals were taken between each measurement and the mean of these measurements was recorded. The systolic and diastolic blood pressure was reported in millimeters of mercury (mmHg). Based on the reference values of the VII Joint National Committee (JNC-7) report (7), the students were classified as normotensive presented SAP < 120 mmHg and DAP < 80 mmHg, and as prehypertensive those with SAP  $\geq$  120 mmHg and/or DAP  $\geq$  80 mmHg, respectively. The highest value of systolic or diastolic BP establishes the diagnosis. A blood pressure measurement device, National model ZH-858PN, was used for the assessment.

#### Training protocol:

The frequency was set for one class per week with 2 hours duration for each class. The intensity was set with the target heart rate zone (THRZ) between 65–85% of each student's age predicted maximum heart rate reserve. All programs started with general warm up and finished with cool down exercises.

For the walking group (WG), the type of training depended on gradual increases in aerobic endurance level (cardiovascular capabilities) by applying different mode of exercise. For the present study, the author selected a combination of a walking and a slow jogging regime. The duration was set for 15 minutes of slow walking followed by 45 minutes of fast walking. In addition, 15 minutes of jogging was added to the second hour of the fitness class. Heart rate was continually monitored in each student using a polar watch in order to maintain the percentage of maximum heart rate (target heart rate)

For the resistance training group (RG), the weight, sets and repetitions were manipulated to accommodate the subjects' ability. The type of exercise using the students body weight, free weight and machines were used for an hour in each class. Traditionally, resistance training (also referred to as weight training) is based on the use of a variety of equipment such as free-weights and exercise machines. A 20 minute warm up and stretching preceded the training followed by instructions of how to use the machines. The student's performance was monitored and observed for the safety and adherence with training regimes.

The control group (CG) did not receive any training except the class requirements which concentrated on the theoretical part of physical fitness.

Several basic nutritional lectures were given to all subjects at the beginning of the classes in order to control meal time and type of food consumption that may influence the training program. All subjects were advised to drink water and avoid caffeinated drinks in order to recoil from dehydration. In addition, subjects were asked to not consume meals 3 hours prior to training sessions and the testing.

### Statistical analysis

Pre to post training changes (pre- post) were calculated for each of the body Composition and physical measures obtained in the study. The Student t-test for independent samples was used to evaluate the statistical significance of each of the 8 body Composition, 6 physical fitness and 5 cardiovascular variables average changes within groups.

The statistical calculations were carried out using the statistical software Statistical Package for the Social Sciences (SPSS) for Windows, release 10.0. An  $\alpha$ -level of P < 0.05 was considered statistically significant. Descriptive statistic parameters mean and standard deviation were used.

A one way analysis of variance (ANOVA) was used to analyze the pre- and post treatment data for cardiovascular and physical fitness components. Tukey's *post hoc* analyses were used to indicate significant response differences where an interaction was observed between groups.

## Results

Body Composition characteristics of the study participants are summarized in Table 1.

Table 1 Descriptive statistics of the body Composition variables of all overweight students. (n=30)

Variables	Walking		P-	Resisting		P-	Control		P-
	(WG)(n=10)		value	group		value	(CG)		value
				(RG)(n=10)			(n=10)		
	Pre	Post		Pre	Post		Pre	Post	
Age (yrs)	$20.4 \pm 1.00$	$20.6 \pm 1.00$		21.0±.95	21.2±.95		21.0±.99	21.2±.99	
Height	166.3±3.76	166.8±3.76	.182	164.4±4.09	164.5±4.09	.168	163.3±3.76	163.3±3.76	.555
(cm)									
Body	76.3±3.86	76.6±3.54	.156	$75.8 \pm 3.59$	$76.1 \pm 3.15$	.137	78.6±2.53	78.8±2.12	.184
weight (kg)									
BMI	27.7±1.32	$27.8 \pm 1.40$	.364	28.3±1.66	$28.3 \pm 1.50$	.777	$29.8 \pm 1.47$	29.7±1.66	.343
$(kg/m^2)$									
Waist C	$95.4 \pm .96$	95.5±.84	.343	95.4±.96	95.6±.93	.168	95.4±.96	95.7±.69	.215
(cm)									
Hip C (cm)	86.9±1.26	87.1±1.02	.169	86.9±1.26	87.1±1.09	.235	86.9±1.26	87.6±1.42	.229
Waist to-	$1.1 \pm .02$	$1.09 \pm .14$	.343	$1.09 \pm .02$	$1.09 \pm .16$	.343	$1.09 \pm .02$	$1.09 \pm .13$	.496
hip ratio									
Chest	31.21±.55	31.56±.55	.249	31.38±.23	31.79±.62	.117	31.78±.15	32.01±.66	.316
(mm)									
Abdominal	35.27±.45	35.10±.52	.134	35.33±.39	35.13±.26	.085	35.37±.35	35.08±.33	.017*
(mm)									
Thigh	$23.38 \pm .30$	$23.46 \pm .31$	.137	23.41±.23	$23.47 \pm .20$	.217	$23.50 \pm .24$	$23.66 \pm .18$	.029*
(mm)									
Sum of 3	89.87±.84	$90.07 \pm .88$	.607	90.12±.53	90.34±.74	.488	90.64±.56	90.75±.77	.698
skin folds									
(mm)									
%BF	24.7±.22	24.7±.21	.754	24.8±.13	$24.9 \pm .20$	.286	24.9±.13	25.0±.19	.837

Values are mean ± SD.

Abbreviations: %BF, Percent body fat; Waist C, Waist circumference; Hip C, Hip circumference; BMI, Body mass index

\*Significantly different between groups at P < 0.05

Table 1 describes the body Composition variables of all overweight students. The mean age was  $20.5 \pm 1.00$ ,  $21.1 \pm .95$  and  $21.1 \pm .99$  years for walking, strength training and control group, respectively. The mean weight for walking, strength training and control group was 76.5, 75.9 and 78.7 kg respectively. In addition, the mean height for walking, strength and control group was 166.5, 164.5 and 163.3 cm respectively.

Also, in Table 1, an independent t-tests revealed that there is no significant differences between all groups of overweight students in their body Composition variables except for the control group in abdominal and thigh skin fold measurements.

Individuals with a BMI greater than 25 kg/m<sup>2</sup> are considered overweight and a BMI equal or greater than 30 kg/m<sup>2</sup> is considered obese. The students in the present study were overweight due to the average BMI score 28.6 and maintained that score even after 8 weeks of training.

The save value for waist to hip ratio is less than .95 for male population but the current students had an average value of 1.09 which considered high risk for cardiovascular diseases.

Also, the students in the present study showed high percent body fat with an average value of 24.8% which is higher than the values of normal people in the same age category 19-20% (34).

## Table 2

## A one way analysis of variance (ANOVA) for the mean body Composition characteristics of all three overweight college students groups. Means and standard deviations (n=30)

Variables	Sum of Squares	Mean Square	F	Sig.
Weight (kg)	235.675	17.954	2.427	.107
Height (cm)	611.122	28.181	1.372	.271
BMI	118.362	8.237	2.183	.132
Waist C (cm)	34.770	.102	.080	.923
Hip C (cm)	23.103	.012	.014	.986
Waist to- hip ratio	.007	.000	.013	.987
Chest (mm)	92.635	38.886	70.645	.000*
Abdominal (mm)	21.987	5.149	11.893	.000*
Thigh (mm)	23.970	10.208	77.575	.000*
Sum of 3 skin folds (mm)	19.203	.000	.000	1.000
Fat %	33.179	1.862	1.707	.200

\*Significantly different between groups at P≤.05

ANOVA test shows no significant differences between walking, strength and control groups in weight, height, BMI, waist c (cm), hip c (cm), waist to- hip ratio and % body fat for overweight college students. However, when applying Tukey Post Hoc test to determine the differences within groups, there was is a significant difference ( $P \le 05$ ) in the skin fold measurements of the chest, abdomen and thigh.

#### Table 3

	Walking group (WG) (n=10)		P- value	Resisting training group (RG) (n=10)		P- value	Control group (CG) (n=10)		P- value
	Pre	Post		Pre	Post		Pre	Post	
1.6 km walk (min.sec)	17.27±1.29	17.21±.14	.150	17.48±.38	17.33±.33	.039	17.49±.26	18.0±.22	.361
HR at the end	159.0±2.86	157.7±2.00	.082	158.3±1.7	158.2±1.3	.798	159.1±1.3	159.4±1.7	.811
Estimated VO <sub>2 max</sub> (mL.kg- <sup>1</sup> .min- <sup>1</sup> )	36.62±.90	36.98±.91	.072	35.87±1.07	36.25±1.18	.67	33.78±1.24	33.71±1.22	.479
60m sprint (sec)	11.3 ±.88	11.3 ±.88	.343	11.3 ±.84	11.4 ±.83	.177	11.3 ±.88	11.4 ±.88	.155
One minute Sit-ups (no.)	25.5±1.08	25.5±.82	.168	25.7±.82	25.9±.73	.168	25.3±.82	25.5±.53	.443
Push-up (no.)	19.2±1.54	18.9±.87	.168	19.6±1.74	20.2±1.39	.239	18.8±1.04	18.7±.949	.343
Agility (sec)	19.4±.71	19.4±.71	.343	19.4±.69	19.2±.76	.173	19.4±.71	19.6±.65	.173
Sit and Reach (cm)	4.5±1.08	4.7±.82	.168	4.7±.82	4.9±.74	.168	4.3±.82	4.5±.53	.443
RHR (bpm)	74.8±2.4	74.8±2.4	.343	74.6±2.17	75.0±2.3	.343	74.8±2.4	74.3±2.2	.440
SBP (mmHg).	140±5.74	139±4.78	.193	140±5.74	140±5.21	.678	140±5.73	140±4.62	1.00
DBP (mmHg).	90±1.24	89±1.24	.343	90±1.24	89±1.03	.343	90±.92	90±.69	.168

# Descriptive statistics of the fitness components and cardiovascular variables of all overweight students, Means and standard deviations (n=30)

Values are mean  $\pm$  SD.

Abbreviations:  $VO_{2 max}$ , maximum oxygen consumption; RHR, testing heart rate; SBP, systolic heart pressure; DBP, diastolic heart pressure. \*Significantly different between groups at P < 0.05

Significantly different between groups at 1 < 0.05

Table 3 shows the mean score and standard deviation of all three overweight student groups in all the six items of the physical fitness. Independent t -tests revealed that there are no significant differences for body Composition variables within all groups.

It took the students in the present study 17 minutes and 50 seconds to complete a 1600 meter walk test. The average time for normal male subjects ages 20-29 is 13:01 to 13:42 min/ sec. The completion test time of 17:50 min/sec is considered poor in fitness standard. The estimated  $VO_{2 max}$  for all groups of 35.5 mL.kg<sup>-1</sup>.min<sup>-1</sup>,was less than the average 43 mL.kg<sup>-1</sup>.min<sup>-1</sup> for untrained male subjects between 18-22 years of age. The average 60 m sprint time for normal subjects in same age category is 8.3 seconds the students in the present study had very low score of 11.3 seconds in comparison to the normal subjects. The average sit-ups in one minute test was 25.5 attempts which is below the average scores of normal subjects 35-38 attempts. Also, the average attempts for normal subject push-ups is 35-44, these averages greater than the average attempts of 19 scored by the students in the present study. The average agility test time for normal subjects was between 16.2-18.1 seconds but overweight students in the present

study recorded a mean of 19.4 seconds which is considered a very poor effort. Sit and reach test showed that the overweight students in the present study are below average in the flexibility with an average score of 4.5. Average systolic (SBP) and diastolic (DBP) blood pressure for all students were 140 and 90 mmHg respectively. The average resting heart rate for normal subjects in same age category is 72 bpm the students in the present study had slightly higher 74 bpm in comparison to the normal subjects.

Table 4
A one way analysis of variance (ANOVA) for the mean fitness components and
cardiovascular variables of all overweight students. Means and standard deviations
(n-20)

(n=30)							
Variables	Sum of Squares	Mean Square	F	Sig.			
1.6 km walk (min.sec)	287.759	136.614	253.860	.000*			
HR at the end	611.122	28.181	1.372	.271			
Estimated $VO_{2 max}$ (mL.kg- <sup>1</sup> .min- <sup>1</sup> )	118.362	8.237	2.183	.132			
60m sprint (sec)	33.179	1.862	1.707	.200			
One minute Sit-ups (no.)	18.967	.533	.804	.458			
Push-up (no.)	107.867	.033	.008	.992			
Agility (sec)	13.719	.022	.044	.957			
Sit and Reach (cm)	14.300	.400	.800	.460			
RHR (bpm)	145.867	.133	.025	.976			
SBP (mmHg).	51.700	2.233	1.166	.327			
DBP (mmHg).	800.800	1.200	.041	.960			

\*Significantly different between groups at P < 0.05

ANOVA test shows no significant differences between walking, strength and control groups in all physical fitness components and cardiovascular variables for overweight college students. However, when applying Tukey Post Hoc test to determine the differences within groups, the results show a significant difference (P < 0.05) in 1600 meter walking test for control group were they scored more time to complete the test.

## Discussion

The main finding of present study was that 8 weeks of physical fitness classes, as part of collage of basic education curriculum, did not have any significant effects on body Composition variables, physical fitness components and cardiovascular health in overweight college students.

The selected training program (walking and resisting) for 2 hours a week did not improve body composition, aerobic ability and fitness components.

Ng et al (3) reported that Kuwait has one of the highest levels of obesity in the world, and is projected to increase. The Kuwait Ministry of Health's annual report in 2004 (21) revealed that 21.2% and 21% of Kuwaitis aged 10-19 are overweight and obese respectively. Al-Nesf et al (20) in 2006 surveyed 821 male Kuwaitis ages 20 to 64 years and reported that 37.2% are overweight and 36.4% are obese. ) In a recent report,

the Kuwait Ministry of Health (Kuwait Surveillance System 2010) showed that from 2001-2009 that 77.3% and 33.8% of the male population were overweight and obese, respectively (17). Al Rashdan et al (4) confirmed in their recent cross-sectional study with the Kuwait ministry of health report and added that 78% and 39.2% of the Kuwaiti male population is overweight and obese, respectively. Another study in 2011 proposed by Al-Isa et al (5) illustrated that the overall levels of being overweight and obese were 48.5% and 19.8% among Kuwaiti men, respectively. A study by Al-Rethaiaa et al (41) used a total of 357 male students aged 18-24 years who were randomly chosen from College of Health Sciences at Rass, Qassim University, Saudi Arabia and they reported that 21.8% of the students were overweight and 15.7% were obese. The results of the study conducted by Al-Isa (31) revealed that 38.5% and 11.1% of the college students were overweight and obese, respectively.

Mabry et al (22) reviewed studies to examine prevalence among Gulf Cooperation Council (GCC) adults and reported that only 39.0% to 42.1% of men were active. They also added that participation in physical activity in the GCC States is considerably lower than those for many developed countries.

The results of the present study corresponded with the result of a study by Pribis et al (13) who revealed that physical fitness among college students at Andrews University, Berrien Springs, MI is declining and body fatness is increasing. Terry et al (32) reported that most college students are not meeting dietary and physical activity guidelines, suggesting an increased awareness of consequences of being overweight. Also, Cheng, Jen-Son et al (16) suggested that college students who routinely engage in exercise tend to have physical fitness superior to those who do not exercise on a regular basis. However, a study by Meckel et al (47) suggested that the structured PE program and college atmosphere were not sufficient to maintain a students' body weight and fitness level over the three years in college.

A study by Irwin (35) reviewed and analyzed the prevalence of 15,568 university students from a total of 27 countries (Australia, Canada, China, Germany, Nigeria, United States, and 21 European countries) participation in physical activity classes. He reported that more than one-half of university students in the United States and Canada are not active enough to gain health benefits. He added that insufficient activity is a serious health concern among university students and appropriate interventions is necessary to achieve the health benefits of physical fitness components.

Meckel et al (36) reported using data from the National College of Health Assessment (ACHA, 2005) to indicate that physical activity and dietary patterns of many college students do not meet the recommendations of health and fitness experts, and that 29.9% of college students are overweight or obese based on self-reported weight values. This corresponds to data from the 2007 National College Health Assessment which found that 28.1% of college students did not participate in any moderate or vigorous physical activity and another 28.6% only participated in physical activity 1 to 2 days a week (37).

Conversely, several studies confirmed that physical fitness classes can improve the attitude, behavior and fitness component of students (10,12,16,28,33,46). Also, students are willing to continue level of physical activity after taking university physical education courses in Korea (28). Camhi et al (11) reported that physical education classes improved students fitness and the body weight by maintained a normal level. In addition, Ardoy et al (33) suggested an increase is the duration of physical education classes as a sufficient means to improve physical fitness such as aerobic fitness. In addition, Kawabe et al (45) suggested that belonging to a sports clubs resulted in reeducation in the blood pressure, percent body fat, lipid profiles and an overall reduction of cardiovascular risk factors in adolescent males. Claxton and Wells (51) suggested that 30 minutes of physical activity 3 days a week for 12 weeks outside the college curriculum increased college students' levels of physical activity.

Ramadan et al (24) formed a National Physical Activity Committee to implement a National Physical Activity Plan in order to construct an awareness program about the importance of physical activity in health promotion and disease prevention.

Sacheck et al (29) examined 564 college students for anthropometry, physical fitness, serum glucose and lipid levels and found that 16.2% were overweight or obese, whereas 60% had body fat percentages above desirable levels. However, after fitness training increased HDL and decreased triglycerides and serum glucose, they concluded that being physically fit can promote healthy body composition.

Body Composition measurements are widely used popular techniques for estimating body composition; there are many different methods of measurement available. However, for the purpose of this study, only a few are needed such as Body Mass Index (BMI). BMI provides a useful population-level measurement of individuals who are overweight and obese as it is unbiased between sexes and across different age groups. The WHO (1) and Centers for Disease Control and Prevention (18) defined BMI to be an individual's weight in kilograms divided by the square of his height in meters (kg/m<sup>2</sup>) as a method to classify overweight and obesity. A BMI greater than 25 kg/m<sup>2</sup> is considered overweight and a BMI equal or greater than 30 is considered obese. It is important to note that BMI should be considered a rough guide to accessing overweight and obesity in individuals as it does not factor individual differences such as body type. For this reason, the author resorted to additional methods which includes measuring the waist to hip ratio (WHR) and skin-fold thickness to accurately access the level of overweight and obesity in the college students.

The BMI values for age group 15-29 years of several Middle Eastern country reviewed by Ezzati et al (40) were Bahrain 22.9, Islamic Republic of Iran 23.8, Jordan 24.9, Kuwait 26.7, Lebanon 23.5, Saudi Arabia. 23.5 and United Arab Emirates 24.7. A cross sectional survey study conducted by El-Ghazali et al (8) among 320 students of Kuwait University found that the mean BMI was 30.9.

Similarly to the above findings, the results of the present study showed an average BMI value for both training groups and control students before and after 8 weeks was 28.6. A value between 25 - 29.9 is considered overweight by WHO.

In addition, based on World Health Organization cut-off points and risk of metabolic complications, the waist circumference greater than 94 cm is an indication of an increased risk of metabolic complications and when this number increased to more than 102 cm, the rate is substantially broadened. Jackson et al (39) studied a total of 9593 healthy 19 years old from all areas of Kuwait. They reported the mean WC was 81.1 and BMI was 25.0. This finding is inconclusive with the present study, were mean WC was 87.1 and BMI was 28.6 for all groups, this may be due to subject selection were we selected inactive college students with mean age of 21. However, the high value of WC is an indication of future health problems.

When waist-hip ratio equals or exceeds 0.90, the risk of metabolic complications substantially increases (23). The results of the present study showed a value of 1.09 which, again, is considered unhealthy. Chan et al (52) suggested that WC is more beneficial in measuring fat distribution than WHR and BMI. On the contrary, Liu et al (53) reported that BMI, waist circumference and waist-hip ratio values can similarly predict the presence of multiple metabolic risk factors. The mean WHR in the present study was  $0.91\pm.02$  in which adult cut-off points that may define increased risk of cardiovascular disease range from 0.9 to 1.0. This is an indication that students in the present study are at risk of various health problems.

One of the problems associated with using BMI is the inability to distinguish weight as a result of muscle tissue or from adipose tissue. For example, a subject may be overweight due to a heavy muscular build or from excess body fat. Therefore, body fat percentage has been recently recommended as a more accurate measurement of body fatness (50). Hence, skin fold measurements were used to calculate percent body fat, the three overweight students groups recorded a mean of 24.8% which is higher than the values of normal people in the same age category 19-20% (34). Consequently, the results from the body Composition testing of the overweight college students showed that the physical fitness classes and the selected training for all subjects had no benefit

Our findings indicated that the body Compositions values for overweight college students were high prior to the study and did not improve with 8 weeks of selected walking and strength training. In this study, walking and strength training generally did not substantially change a students' body weight.

Ollis et al (10) reported that high-intensity exercise over 7 weeks is an efficient way to improve physical fitness components in adolescent individuals. Whyte et al (12) suggested that 2 weeks of sprint interval training substantially improved metabolic and cardiovascular variables in overweight/obese sedentary men. Also, Kang et al (46) concluded that circuit weight and aerobic exercise for 12-weeks had favorable effects on body composition, physical fitness, and pulse wave velocity in obese collegiate women. Also, Yeh (42) suggested that circuit training for 100 minutes once a week for 4 weeks improved body composition, flexibility, muscular and strength endurance but not cardiovascular endurance. However, Murtagh et al (43) found that brisk walking for 20 minutes 3 days of the week fails to modify cardiovascular disease risk factors in previously sedentary adults.

Consistent with previous research that has included diverse conclusions, our findings suggest that the physical fitness components tested before and after the training

intervention in the present study did not revealed any changes with 8 weeks of aerobic and strength training.

The data collected in the present study regarding cardiovascular variables for overweight college students showed that the estimated maximal oxygen consumption  $(VO_{2 max})$  for all groups was 35.5 mL.kg-<sup>1</sup>.min-<sup>1</sup>, which is less than the average of 43 mL.kg-<sup>1</sup>.min-<sup>1</sup> for untrained male subjects 18-22 years or age. Students were classified as "fit" when they presented indirect  $VO_{2max} > 52$  ml/kg/min and "less fit" when they presented indirect  $VO_{2max} > 52$  ml/kg/min (34). Pribis et al (13) in their study suggested that low  $VO_{2max}$  values are associated with increased % body fat. This finding confirmed the finding of the present study that overweight college students with low  $VO_{2max}$  have high % body fat.

It is important to calculate  $VO_{2max}$  due to the fact that  $VO_{2max}$  measures the students' ability to generate the energy required for endurance activities. Also, it is an indicator of the person cardiovascular fitness and aerobic endurance (50). The 1600 m walking test proved by Weiglein et al (54) to be a valid predictor of  $VO_{2max}$  and can be used as an alternative fitness test to the other running tests. In the present study, neither the walking group nor the strength training group showed any significant improvements in the  $VO_{2max}$  values after 8 weeks of physical fitness classes. Only the control group showed a significant difference where they recorded more time to complete the 1600 meter test.

Resting heart rate is another indicator of basic cardiovascular fitness and generally the lower the RHR is for a person, the healthier they are. The overweight students in the present study had a RHR of 74 bpm in compassion to average RHR which is between 70 bpm for normal subjects in the same age category of 18-25 years. Since the overweight students in the present study were low in cardiovascular variables, it is expected that they have higher a RHR because the heart works harder to pump more blood to all body organs.

Alternatively, both diastolic and systolic blood pressures were higher than normal. Average systolic (SBP) and diastolic (DBP) blood pressure for all students was 140 and 90 mmHg, respectively. This reading is considered to be elevated according to the reference values of the VII Joint National Committee (JNC-7) report (7), were normal students values for SBP < 120 mmHg and DBP < 80 mmHg. The prehypertensive condition sit for students with SBP  $\geq$  120 mmHg and/or DBP  $\geq$  80 mmHg, respectively. However, the acceptable range for DBP is less than 140 and SBP is less than 85. Therefore, overweight college students in the present study are at risk for hypertensive conditions.

Al-Isa (5) suggested behavioral change and/or health education interventions toward factors that contribute to the development of being overweight and obesity in Kuwait. Another study by Al-Isa et al (9) added an increase in the practice of sports and other physical activities in order to control and decrease obesity-related morbidity and mortality. Strategies and coordinated efforts at all levels to reduce obesity and percent body fat while promoting healthy eating habits in college students were addressed (41). Musaiger (48) studied the prevalence and factors that are associated with being overweight and obesity among various age groups in the Eastern Mediterranean Region. Subsequently, he suggested the urgent need for a national plan to conquer obesity and hoping this will reduce the economic and health burden. AlMajed et al (49) proposed more nutritional programs for overweight and obese Kuwaiti college students. El-Ghazali (8) explained that the factors associated with being overweight and obesity can be modified by consuming more fruit and vegetables as well as by increasing physical activity.

The high rate of overweight and obesity among students in the College of Basic Education in the state of Kuwait is very alarming. Inactivity is one of the major risk factors for several diseases. There is a need to increase the class duration and the frequency of the fitness classes in essential to enhance the students' physical fitness components. In addition, the content of these classes must focus on more cardiovascular endurance with at least 75% of maximum heart rate. The college administration must encourage the students by providing the facilities and all the necessary equipments to continue physical activity outside the curriculum. Also, they should provide lectures and classes to enhance the students' knowledge of the importance of physical activity.

## Conclusion

The main finding of this study was that the physical fitness classes offered as a part of selective curriculum for college students is not adequate enough to change any body Composition characteristics, enhance the fitness components or improve cardiovascular variables. Training intervention walking and strength training program for 2 hours once a week for 8 weeks in terms of duration and intensity did not have any positive or beneficial effects.

In conclusion, the author suggests that students must participate in daily physical activities and the college curriculum should be modified to increase the frequency, duration and intensity of physical fitness classes. The content of the physical fitness classes should changed and focused on physical and physiological components were an aerobic and anaerobic activities must be prioritized.

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تأثير برامج تدريبية مقترحة لمقرر اللياقة البدنية

على بعض المتغيرات البدنية والجسمية ومكونات اللياقة البدنية لطلبة الوزن الزائد بكلية التربية الأساسية في دولة الكويت

## \* د. کاظم جابر غلوم

الهدف من الدراسة هو معرفة مدى تأثير البرامج التدريبية المقترحة لطلبة كلية التربية الأساسية الذين يعانون من الوزن الزائد (مؤشر وزن الجسم = 28.6) من خلال تدريس مقرر اللياقة البدنية على بعض المتغيرات البدنية والفسيولوجية ومكونات اللياقة البدنية. وقد أجريت الدراسة في ثماني أسابيع موزعة على ساعتين أسبوعيا. وشملت عينة الدراسة على 30 طالبا, الدراسة في ثماني أسابيع موزعة على ساعتين أسبوعيا. وشملت عينة الدراسة على 30 طالبا, تم تقسيمهم إلى ثلاث مجموعات بحسب البرنامج التدريبي الذي طبق عليهم, كلّ على حده, وذلك معلى النحو الآتي: مجموعات بحسب البرنامج التدريبي الذي طبق عليهم, كلّ على حده, وذلك على الدو الآتي: مجموعات المشي (التحمل الهوائي) وقد طبق عليها برنامج المشي والهرولة على الرياضية, ومجموعة حمل الأتقال (القوة والتحمل العولي) وقد خضعت لحمل الأتقال الثابت الرياضية, ومجموعة حمل الأتقال (القوة والتحمل المعلي) وقد خضعت لحمل الأتقال الثابت الرياضية, ومجموعة حمل الأتقال (القوة والتحمل المعلي) وقد خضعت لحمل الأتقال الثابت المقرر اللياقة البدنية دون الجانب العملي (طرق تدريس وتعليمي). وبينت النائج عدم وجود أي المقرر اللياقة البدنية على المتري الذي التريبي المقرر الثابت النظري التقليدي المقرر اللياقة البدنية دون الجانب العملي (طرق تدريس وتعليمي). وبينت النائج عدم وجود أي المقرر اللياقة البدنية دون الجانب العملي (طرق تدريس وتعليمي). وبينت النائج عدم وجود أي المقرر اللياقة البدنية دون الجانب العملي (طرق تدريس وتعليمي). وبينت النائج عدم وجود أي المقرر اللياقة البدنية دون الجانب العملي (طرق تدريس وتعليمي). وبينت النائج عدم وجود أي المقرر اللياقة البدنية باستثناء نتيجة ليقرر المقرر اللياقة البدنية باستثناء نتيجة المقرر المع وأي أي المقرر اليائة المارين والفل أل مل مون المعموعة الضابطة حيث سجاء ولي المقرر المولي المولي والتقابي المقرر المقرر المقرر المالي أول المقرر المقرور المقرر المقرر المالية على واقد أول المولي وأيضا بينت النائج وجود دولة إحصائية لصالح المجموعة الضابطة في مواقع قياس المختبار وأيضاً بينت النائج وفي المجموعات الثلاثة. ودلالة إحلى المقرو المقرر المالية على مولي إنها والفذ أول المولي وألفي أول المولي المولية المالحمو ما المراطة في مواقع قياس المكمون المرم المالي والفذ أول المولي المجموعات الثلاثة (عا المرية مع الإفرا

وأثبتت نتائج الدراسة عدم جدوى البرامج التدريبية المقترحة لمقرر اللياقة البدنية كجزء من المنهج الدراسي للطلبة لمدة ساعتين في الأسبوع ولمدة 8 أسابيع لأن المدة المقترحة وشدة الحمل البدني لم تحسن من المتغيرات البدنية والفسيولوجية ومكونات اللياقة البدنية للطلبة الذين يعانون من الوزن الزائد, لذا يوصي الباحث بتغيير محتوى المقرر من تعليمي نظري إلى مقرر عملي يتضمن منهجا تدريبيا عن طريق زيادة الفترة الزمنية (الساعات) وعدد وحدات مقرر اللياقة البدنية في الأسبوع مع وضع برنامج تدريبي يهدف على الزيادة في شدة الحمل البدني التحمل الهوائي واللاهوائي) فضلا عن تشجيع الطلبة بالاستمرار في مزاولة النشاط الرياضي اليومي خارج ساعات المقرر.

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