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ARTICLE

Management of Overweight with Physical activities and Healthy Nutrition

Agron M. Rexhepi^{1,2}, Behlul Brestovci^{1,2}, Trim Rexhepi², and Nderim Rexhepi²

Abstract

Background: According to the World Health Organization the overweight disorder is defined as the excessive fat accumulation that presents a risk to health. The purpose of this study was to explore the healthy methods of prevention and treatment of overweight through physical activities and professional nutritional advice. **Methods:** 15 morphometric and 5 physiological variables were measured on 62 males of the Kosovo Albanian population aged 12–56 years, during the period May–Nov/2013. To find out the influence of the programmed exercises on body composition and physiological features of the subjects, the measurements have been taken three times: initial measurements, transitive measurements, and final measurements. The morpho-physiological variations of the subjects have been estimated based on the values of body weight, physiological variables, and variables that indicate body composition and daily energy expenditure. The obtained data were analyzed in terms of basic statistical parameters, while the differences among three completed measurements on the same group were analyzed by Paired Samples t-test. **Results:** The results obtained indicate that following a month-long program of adequate programmed exercises have produced significant morpho-functional changes of the body. Apart from the systolic blood pressure, which shows moderate significant change ($p < 0.05$), all other measured morpho-functional variables show high significant changes ($p < 0.01$). **Conclusions:** Results of this research indicate the overweight condition as a preventable and curable condition treated with healthy methods such as physical activities and nutritional advice. **Health & Fitness Journal of Canada 2018;11(3):12-21.**

Keywords: Overweight, Body Composition, Physical Activity, Nutritional advice

From¹Institute of Sports Anthropology, Prishtina, Kosovo;
²Centre for Sport, Fitness & Nutrition "Corpore Sano", Prishtina, Kosovo E-mail: agronmrexhepi@gmail.com

Introduction

The main body weight disorders are the forms of overweight and underweight. According to the World Health Organization (hereafter WHO) overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health (World Health Organization, 2016). So far, studies indicate the significant correlation between the overweight condition of the body and many pathological conditions. Almost world-wide, the overweight disorder is becoming a pandemic condition with huge risks for developing serious pathologies such as diabetes, hypertension, cardiovascular diseases, cancer, osteo-muscular and other diseases (Srikanthan and Karlamangla, 2014). Since 1948 the WHO has considered obesity a disease, which, even though it is influenced by different internal and external factors and represents the second most prevalent cause of death, can be prevented (World Health Organization, 2016; Day and Lissner, 2003; Stern and Osher, 2009; Fair and Montgomery, 2009; Flegal et al., 2013). Unfortunately, today's reality that whereas in some countries people die of starvation in other countries die of overeating" (Rexhepi, 2010).

According to WHO since 1980 the worldwide obesity rate has more than doubled. Meanwhile, the WHO's statistical

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evidence of 2014 shows that more than 1.9 billion adults (aged >18 years) were overweight with BMI=25-29.9, whereas over 650 million of these adults were obese with BMI>30.00 (World Health Organization, 2016).

There are several different methods and indicators according to which body weight can be evaluated. A variety of methods have been developed for the determination of the body composition (bioelectrical impedance analysis, isotopic determination of total body water, hydrostatic weigh, determination of skinfold thickness) (Camarneiro et al., 2013). Even though each of these methods has its advantages and disadvantages, the more practical, economical and informative method is the determination of the percentage of body fat based on the anthropometric measurements of adequate skinfold thickness (Rexhepi, 2009). This method can be used to calculate the body composition and distribution of the body fat, which has its importance in the further treatment of body weight disorders. Accurate determination of the percentage of body fat based on skinfold thickness requires that the equation used for a given person be derived from a similar population (according to age, gender, and physical activity). This fact certainly has led to the derivation of a large number of "equations" which indicates that none of them has 100% accuracy. Attempting to overcome this problem, Jackson and Pollock have derived four generalized sites for skinfold equations that have been validated for various age groups and both athletic and non-athletic populations (Jackson and Pollock, 1985).

As for indicators of body weight, there are some of them which continue to be

widely used by different authors as the relevant indicators: BMI–body mass index, BVI–body volume index, muscular index, waist circumference, waist/hip ratio, index of central obesity, etc.

There are two types of fat distribution in overweight persons (Rexhepi, 2010):

- Android type or central form that is the male pattern of body fat distribution, mainly around the trunk and upper body;
- Gynoid type or peripheral form that is the female pattern of body fat distribution, mainly around hips and bottom.

Vague (1956) whilst studying the differences between body fat distribution has concluded that while the obese android phenotype is associated with different metabolic disorders, the obese gynoid phenotype is mostly associated with mechanical-locomotor complications.

Unwin (2006) has highlighted the clustering of risk factors such as obesity, particularly abdominal obesity, and physical inactivity in relation to the cardiovascular diseases.

Maintenance of the normal body weight always is dictated by the balance between energy intake (energy derived from food) and energy expenditure (the sum of the basal metabolic rate, the thermic effect of food and the energy expended in physical activity). To lose weight, energy expenditure of overweight people must exceed their energy intake, whereas to gain weight energy intake of the underweight people must exceed their energy expenditure (Champagne et al., 2002).

Polikandrioti et al. (2009) have found that the pattern of nourishment is not directly correlated to body mass index, but rather to central obesity.

According to Nedeltcheva et al. (2010), the lack of sufficient sleep may decrease the amount of energy intake and compromise the efficacy of typical dietary interventions for weight loss.

Srikanthan and Karlamangla (2014) in their study have found the significant negative correlation between muscle mass index and mortality. According to them the greater muscle mass in older adults is "associated with lower all-cause mortality".

According to Wiklund (2016), the obesity results from excessive energy intake over a long period of time. By increasing the regular daily physical activity the daily energy expenditure can be increased.

Jakicic (2002) has studied the role of physical activity in the prevention of weight gain in adults and has provided some evidence that "the amount of activity necessary for prevention of weight gain may differ between men and women". Also, according to Jakicic (2002), for preventative purposes physical activities of higher intensity may be more beneficial than less intense physical activities. According to Chaput (2011), the physical activities should be part of any plan to lose weight.

WHO confirms that children today are heavier than children in the past (World Health Organization, 2016). The awareness of parents regarding this pathological condition has increased the necessity for the accurate evaluation of children's fitness levels and compiling of personalized exercise programming. Although many studies have indicated the significant benefits of well-programmed exercises on the well-being of preadolescent and adolescents, the achievement of these goals requires the personal fitness trainers to have adequate

knowledge and skills to accurately assess fitness levels in children and to compile proper fitness programmes (Angel et al., 2018; Blimkie et al., 1996; McAdaragh and Janot, 2006; Morris et al., 1997; Negra et al., 2016; Payne et al., 1997).

According to Gabrielle et al. (2012) the use of mobile methods for tracking physical activities and appropriate diet is associated with increased energy expenditure and decreased energy intake in individuals who are trying to lose weight.

The aim of this study was to diagnose the current weight disorder of the treated subjects and to explore the healthy way of prevention and treatment of overweight. In this study, we have evaluated the changes in the body composition and some physiological parameters under regular programmed physical exercises, accompanied by professional nutritional advice.

Material and methods

The present study, as a part of the project "Management of the body weight disorders" was carried out at the Centre for Sport, Fitness, and Nutrition "Corpore Sano" in Prishtina, Kosovo. Following the protocols of the International Biological Program, 15 morphometric and 5 physiological variables were measured on 62 males of the Kosovo Albanian population aged 12–56 years, during the period May–Nov/2013. Because stature and body weight show diurnal variation the subjects were measured in the morning (08.00–11.00AM).

To find out the influence of the programmed exercises on body composition and physiological features of the treated subjects the measurements were done on three occasions: initial measurements (first day of the

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programme), transitive measurements (after two weeks of implemented physical activities) and final measurements (at the end of the first month of implemented physical activities). Measurements were done by Agron M. Rexhepi, Trim Rexhepi, and Nderim Rexhepi. The examined subjects were overweight people who had been regularly treated with programmed exercises in the CSFN "Corpore Sano". The treatment of these subjects in the duration of a month has been based on three points:

- **Providing basic and specific nutritional advice.** Basic nutritional advice was based on the general education of the participants related to healthy nutrition. Specific advice for the participants had to do with estimation of their energy intake (EI) and energy expenditure (EE), and in this context in the breaking of the balance between these two energies (EI<EE). General and specific nutritional advice was given orally in conversation to each participant, and in printed form, where each one received a brochure with nutritional advice adapted to his nutritional status.
- **Morpho-physiological body measurements** were taken with the intention of finding the body composition and physical fitness of the participants. A rule of this project was that each participant should do these measurements before starting with treatment (initial measurement), and after that to repeat them two times after each second week (transitive measurement), followed by the final measurement.
- **Regular exercises three times per week.** All participants of this project attended the same protocol of the exercises, which was constant in the

proportion of the energetic processes but not related to their intensity. The intensity of the exercises was adjusted according to an individual's physical fitness, as well as on its improvement over time. The protocol of one daily exercise was as follows:

- Duration of each daily exercise was approximately 90 minutes, with the approximately constant proportion of energetic processes (2/3 aerobic; 1/3 aerobic-anaerobic).
- The load of aerobic exercises was adjusted according to the participant's heart rate (65-75% of the maximal heart rate). This zone of physical activities was chosen because the participation of the fats as carburant in the metabolic processes is usually more than 85%.
- The load of aerobic-anaerobic exercises was set taking care that their heart rate was to be between 75-85% of the maximal heart rate. This level of the physical activities has been chosen with the intention to increase muscle mass, while still not losing on the participation of the fats as carburant on metabolic processes.

The physical activities started with riding an ergo-cycle for 20' (aerobic phase).

After that, the next 15'-20' were dedicated to strength exercises (aerobic-anaerobic phase). The first day of the week the participants have did 3x15 repetitions of the first chest exercise, followed by 3x15-30 repetitions (depending upon their physical abilities) of abdominal exercises - upper part. The second chest exercise (3x15 reps) was followed by abdominal exercises - middle part (3x15-30 reps). Exercises for biceps (3x15 reps) were followed by exercises

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for the lowest part of abdominal muscles (3x15-30 reps).

After the aerobic-anaerobic phase the participants were asked for the next 15'-20' to do continual aerobic exercise on a cross-trainer (keeping their heart rate between 65-75% of their maximal heart rate). This aerobic exercise was followed by the next set of aerobic-anaerobic exercises in the duration of approximately 15'-20'. The third kind of chest exercises (3x15 reps) should be followed by the side-abdominal exercises (3x15-30 reps). The fourth kind of chest exercises (3x15 reps) would then be followed by the low-back exercises (3x15-30 reps). And finally, after leg-exercises (3x30 squats) the participants continued with the last phase of aerobic exercises: 15'-20' walking on the treadmill, or riding a stationary bicycle (depending on physical fitness and body weight of the participant), but always taking care that the intensity of this exercise be adjusted according to the subject's heart rate (between 65-75% of their maximal heart rate).

The contents of the first exercise within the week continued to be the same as the contents of the second and third exercises with some exceptions: instead of the exercises for chest and biceps that were common in the first exercise, in the second exercise of the week the participants had to do exercises for the back and triceps, while in the third exercise for shoulders, biceps, and triceps.

Following the definitions of the International Biological Program, the anthropometrical measurements were taken by the classic anthropometrical instruments (anthropometer, metric tape, skinfold calliper) and medical scale (type Seca). Heart rate was measured by heart rate monitor (Polar FT7), while blood

pressure (while resting) was measured by sphygmomanometer. Maximal oxygen uptake (VO_{2max}), as the indicator of cardiorespiratory endurance, was measured based on Astrand-Rhyming Cycle Ergometer submaximal test.

The following variables were measured.

Anthropometrical variables:

- **Stature;**
- **BW-Body Weight;**
- **ACE-Arm circumference in extension;**
- **ACF-Arm circumference in flexion;**
- **ChC-Chest circumference;**
- **AbC-Abdominal circumference;**
- **TC-Thigh circumference;**
- **CC-Calf circumference;**
- **ArS-Arm skinfold;**
- **SS-Subscapular skinfold;**
- **ChS-Chest skinfold;**
- **AbS-Abdominal skinfold;**
- **SICS-Supra-Iliac-Cristal skinfold;**
- **TS-Thigh skinfold;**
- **CS-Calf skinfold.**

Physiological variables:

- **HR-Heart rate (bpm);**
- **Tenssis - The systolic blood pressure (mmHg);**
- **Tensdia - The diastolic blood pressure (mmHg);**
- **$VO_{2maxabs}$ - The absolute value of maximal oxygen uptake (L/min) was calculated using submaximal exercise (Astrand-Rhyming Cycle Ergometer Test) and the Astrand/Dobel equation:**
$$VO_{2max} \text{ (absolute)} = 1.29 * \text{SQRT}(L/fh - 60) * 2.72^{(-0.00884 * T)}$$

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- **VO₂maxrel** – The relative value of maximal aerobic power (mL/kg/min) was estimated by the equation:

$$VO_{2maxabs}(mL)/BW(kg)$$

Variables that indicate body composition:

- **BMI – Body Mass Index** is the measure of relative weight defined as the individual's body mass divided by the square of their stature (kg/m²).
- **BF% – Body Fat Percentage** has been estimated for each measured entity using 4-Site Skinfold Equation of Jackson and Pollock (1985):

$$BF\% = [0.29288x(AbS+ArS+TS+SICS)] - [0.0005x(AbS+ArS+TS+SICS)^2] + (0.15845xage) - 5.76377$$

- **BFM – Body Fat Mass** and **LBM – Lean Body Mass** have been calculated from Body Fat Percentage (BF%).
- **MI – The Muscle Index** has been derived by two variables: Arm circumference

in extension (expressed in mm) and Arm circumference in flexion, using the formula: **MI = (ACE - ACF) x 100 / ACF**

The morpho-physiological variations of the subjects who attended a programme of physical activities have been estimated based on the values of body weight, physiological variables, and variables that indicate body composition and daily energetic expenditure.

The data obtained were analyzed in terms of basic statistical parameters, while the differences between three measurements on the same group were analyzed by Paired Samples t-test.

Results and discussion

The essential descriptive statistical findings (Minimum, Maximum, Mean and Standard Deviation) are shown in Table 1. Analyzing these descriptive data, the systematic differences in all measured variables between three measurements can be noted. Based on the results of this table that indicate the composition of the body (BW, BMI, BF%, BFM, MI), it can be concluded that the tested entities in initial

Table 1: Descriptive Statistic of three measurements (n = 62; Age = 31.1 yr; Stature = 178.6 cm).

	Mean 1 st	Std. Dev.	Mean 2 nd	Std. Dev.	Mean 3 rd	Std. Dev.
BW	93.66	14.24	92.47	13.70	91.09	13.14
BMI	29.30	3.60	28.90	3.43	28.45	3.26
BF%	24.57	5.38	22.15	4.91	20.72	4.39
BFM	23.46	7.83	20.94	6.96	19.23	6.08
LBM	70.20	8.59	71.54	8.22	71.87	8.49
MI	3.45	4.06	4.30	3.81	4.75	3.60
Tenssis	129.71	12.43	127.94	11.02	126.32	10.10
Tensdia	89.12	8.57	85.88	7.23	86.03	8.33
1-HR0'	86.03	13.53	79.39	10.22	77.91	8.23
1-VO _{2max.abs}	3.11	0.33	3.26	0.32	3.33	0.32
1-VO _{2max.rel}	35.03	7.57	37.16	7.83	38.35	7.21

Mean 1st–Mean of first measurement; Mean 2nd–Mean of second measurement; Mean 3rd–Mean of third measurement; Std. Dev.–Standard Deviation.

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phase belong to the category of the overweight population, the excessive accumulation of fat mass (4.57% above the maximum normal value). Meanwhile, based on the normative data of the Cooper Institute, the $VO_{2max,rel}$ value indicates a weaker conditional preparation of the tested participants.

Table 2 shows the systematic differences between the same variables in different measurements. Under the influence of one month of programmed physical activities and adequate nutritional advice, all variables that indicate excessive body weight, body fat mass, arterial blood pressure and heart rate at rest, showed systematic decreased values. Whereas, the variables such as lean body mass, muscle index and, VO_{2max} , increased their values (that means the improvement of the morpho-functional performances). According to Vandervael's equation (Ideal Body Weight $IBW=50+(Stature-150) \times 0.75$), the ideal body weight for the measured population should be $IBW=71.4$ kg. If we compare the body weight from the initial measurement of the measured population and their ideal body weight, we can conclude their overweight of 22.26 kg.

The significance of these systematic differences between each of three

measurements was tested with the Paired Sample t-test. The data of Table 3 show significant morpho-functional changes after one month of programmed physical activities. Except for the variable that measures the maximal oxygen uptake (VO_{2max}), all other variables show a significant decrease in their values. The significantly increased value of VO_{2max} indicates enhanced stamina of the tested subjects.

After the first two weeks under programmed physical activities, the tested subjects showed significant differences in almost all morpho-physiological variables (except the Tensis-systolic blood pressure). Significant changes in the variables between the second and third measurement of the tested subjects were recorded for all variables that determine their body composition and daily energetic requirements. Meanwhile, the physiological variables (Blood Pressure and Heart Rate) show minimal non-significant changes which indicate their stability, relating to the functional adaptation of the body to the programmed physical activities. The same cannot be said for $VO_{2max,abs}$, which even further is showing the significantly increased value. The comparison of the improved morpho-functional results between the first and third measurement indicates the adaptive response of the organism of the tested subjects to one month of programmed physical activities; in all measured variables significant changes ($p=0.00-0.04$) were recorded.

By analyzing the differences between first and second measurements with differences

Table 2: Mean differences between measurements

		1 st :2 nd	2 nd :3 rd	1 st :3 rd
Pair 1	BW	1.19	1.38	2.57
Pair 2	BMI	0.40	0.45	0.85
Pair 3	BF%	2.41	1.43	3.84
Pair 4	BFM	2.53	1.71	4.24
Pair 5	LBM	-1.33	-0.33	-1.66
Pair 6	MI	-0.85	-0.45	-1.30
Pair 7	Tenssis	1.77	1.62	3.38
Pair 8	Tensdia	3.24	-0.15	3.09
Pair 9	HR0'	6.64	1.49	8.12
Pair 10	$VO_{2max,abs}$	-0.14	-0.07	-0.22
Pair 11	$VO_{2max,rel}$	-2.14	-1.18	-3.32

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Table 3: Paired Samples t-test between three measurements.

		1 st :2 nd		2 nd :3 rd		1 st :3 rd	
		t	p	t	p	t	p
Pair 1	BW	6.83	0.00	9.20	0.00	10.12	0.00
Pair 2	BMI	7.09	0.00	9.22	0.00	10.35	0.00
Pair 3	BF%	10.60	0.00	7.21	0.00	13.91	0.00
Pair 4	BFM	10.57	0.00	8.02	0.00	12.60	0.00
Pair 5	LBM	-6.48	0.00	-1.82	0.07	-7.24	0.00
Pair 6	MI	-3.22	0.00	-1.93	0.06	-4.76	0.00
Pair 7	Tenssis	1.02	0.32	1.00	0.33	2.15	0.04
Pair 8	Tensdia	3.01	0.01	-0.15	0.88	2.93	0.01
Pair 9	HR0'	3.53	0.00	1.03	0.31	3.46	0.00
Pair 10	VO2max.abs	-3.80	0.00	-2.12	0.04	-4.38	0.00
Pair 11	VO2max.rel	-4.70	0.00	-3.02	0.01	-6.12	0.00

between second and third measurements it can be concluded that in first two-week period of programmed physical activities higher morpho-functional values have been achieved than in the second two-week period of programmed physical activities (Tables 2, 3). Since the human is a multidimensional being with high adaptive skills these differences between two periods of programmed physical activities can be explained with morpho-functional adaptations of the organism.

Conclusions

The morpho-functional measurements that have been done during this study indicate that overall the tested entities in the first and second measurements belong to the category of the overweight population with accumulated fat mass above normal values. After regular programmed physical activities for the duration of a month plus implementation of adequate nutritional advice, the tested entities within a month have decreased their body weight by approximately 2.57kg (according to the rules of the science of nutrition the normal decrease of the body weight within one month should be between 1-5kg).

Under normal conditions, the nutritionists advise 6-9 months duration of regular programmed physical activities accompanied with adequate nutritional advice.

If in the case of this study the trend of body weight loss will continue to maintain the same value (-

2.57kg) then for the tested subjects with the overweight of 22.26kg to reach their Ideal Body Weight will require continuing to attend regular programmed physical activities and nutritional advice for approximately a period of 9 months.

To maintain for each month, the same trend of the body weight loss, more attention should be paid to implemented regular programmed physical activities, due to the improvement of morpho-functional abilities. So, to maintain the same trend of the body weight loss, or to increase it, the applied physical activities should be changed in three aspects: intensity, frequency, and duration of physical activities.

The results of the present study can be helpful in self-awareness of the population regarding the positive impact that regular physical activities and a healthy nutrition plan have on maintaining the human homeostasis (Conroy et al., 2011). According to Gabriel et al. (2013) these two rules/behaviors are the basic components of behavioral weight loss programs.

Overall as general conclusion may be the fact that obesity is a preventable and curable condition. The professional suggestions of this research are first, that

the prevention and the healing of this pathological condition should be attempted with healthy methods such as physical activities and nutritional advice (reductive diet), and second, avoid to use different unhealthy methods and diets. Of the utmost importance is that the population be educated in relation to a healthy lifestyle: healthy active living and healthy eating.

Although the significant positive results of the present study may be considered as strengths of this scientific paper, the weakness of the paper may be considered to be the short time duration of the study and the wide range of age variability (12-56 yrs.). So, it is recommended the future studies be of longer time duration and the participants be divided into the specific homogenized group-ages. In this way, this will enable the discovery of the appropriate fitness programmes regarding the body weight control and maintain the homeostasis.

Authors' Qualifications

The authors' qualifications are as follows: Agron M. Rexhepi, MD, MSc, PhD, Behlul Brestovci, Full Professor, Trim Rexhepi, MSc, Fitness Instructor, Nderim Rexhepi, MSc, Fitness instructor.

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