SPORTS UNIVERSITY OF TIRANA

FACULUTY OF HUMAN MOVEMENT

SUMMARY

DISSERTATION

"The Impact of Force Exercises on VO2max Indicators and Improvement Through Different Exercise Programs in Circuit Trainning of Weight Exercises".

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Abstract

Introduction
Cardio-respiratory endurance has long been known as one of the basic components of physical fitness (Anstrand 1986 and Maughan 1969). The purpose of this scientific paper is to identify if weight exercises affect the improvement of VO2max indicators after intervention with a special training program for a period of 12 weeks at bodybilders, and also to find out whether circular training in weight exercises increase VO2max among bodybuilders.

Methodology
The data was collected by the first group of 20 bodybuilders in Tirana (22 years old SD 3.9), 10 performing the intervention program, while 10 other bodybuilders were the control group who conducted the ordinary training program. Also the data was collected by the second group consisting of 24 randomly selected students of the University of Tirana Sports, where 12 subjects conducted the intervention program and 12 others were the control group being inactive with regard to the implementation of the program training. The ergometer test is used to estimate VO2 Max. The intervention training program lasted 12 weeks in frequency 6 times a week, 60 minutes for each training session. The circus system was used in weight exercises 3 times a week (Monday, Tuesday, Wednesday) with intensity 60% to 80%, two muscle groups per session with 12 exercises, 2-3 circles, 12-20 reps. Once a week (Tuesday) Functional Workout including all 60% to 80% intensity group music, 2-3 circles, 12-20 repetitions. Once a week (Thursday) various games, bicycles, jogging or swimming, 120 min, with intensity 60% to 80%. Once a week (Saturday) Core workout (abdominal & stretching)

Results
The final results on this study for age category comparison show that; for body weight comparison does not represent significant changes (sig = 0.8), body height does not represent significant changes (sig = 0.5), maximum drop-down strength does not represent significant changes (sig = 0.7) the maximum force per kg of drop jump does not represent significant changes (sig = 0.9), the maximum power on drop jump does not represent significant changes (sig = 0.9), the contact time does not represent significant changes (sig = 0.1), time in the air does not represent significant changes (sig = 0.4), the difference in air time and momentum does not represent significant changes (sig = 0.8). The results showed that the mean baseline values for the intervention group were 32.1 ml / kg / min and the control group 37.9 ml / kg / min. After intervention with the strenuous program the results showed that the intervention group had an average value of 37.8 ml / kg / min while the control group was 37.6 ml / kg / min.

Discussion
To conclude data of this study show that there is no significant changes between three age groups for anthropometric parameters and force. In conclusion, the results show significant improvement in VO2 Max in the intervention group (mean dif = 5.7; p = 0.000) and no significant improvement in the control group (mean dif = 0.3, p = 0.276). Finally, data from this study show that exercise exercises influence the optimal level in improving VO2max.

Key words: Strength, cardio respirator fitness, bodybuilder

introduction

Cardiorespiratory endurance has long been recognized as one of the fundamental components of physical fitness. (Anstrand 1986 and Maughan 1969). Thus far only one study has compared trained to untrained individuals under a concurrent training protocol. Hunter and colleagues (Hunter et al., 1987) took trained endurance athletes and untrained individuals and had them perform strength training and endurance exercise simultaneously. Predictably it was found that the endurance trained athletes gained more strength then the untrained individuals. Now this suggests that with training experience you are less prone to the negative effects of concurrent training. However the flaw in this study is that they did not examine these endurance athletes while under resistance training alone conditions. Regardless studies have found that adding endurance training to strengthtraining regimens can result in negative effects in both trained (Hennessy & Watson 1994; Kraemer et al., 1995) and untrained (Dudley & Djamil 1985; Craig et al 1991) individuals. There are a number of hypotheses however that can be applied toward the experience of an individual. With training experience you are likely to become less prone to decrements from cardiovascular training. During competition preparation, fat-free mass did not decrease greatly (–3.9%). The loss in body weight was thus primarily due to loss of body fat as desired. The subject's total body water was relatively stable over the preparation and recovery period and is similar to values previously reported in bodybuilders (Piccoli et al., 2007) . Total body water has been shown to be elevated in bodybuilders compared with untrained individuals, and this is thought to be due to an increase in cytoplasmic volume (MacDougall et al., 1982). In addition, the substantial drop in resting energy expenditure during competition preparation appeared driven more by a decrease in energy intake than by loss of fat-free mass. During recovery, percent body fat increased gradually, not returning to baseline values until 4 months after competition.

Methods

In this study, two groups of randomly selected subjects of bodybuilders were included at study protocol. The data was collected from 23 bodybuilders in Tirana took part in the study (22 years SD 3.9) (12 male performed the intervention program while 11 male were control group that did the usual training program).

Measurement

Ergometer test were used to evaluate the VO2 Max. All bodybuilding athletes have made initial testing on the Ergometric Bicycle to identify the level of Vo2max. In the measured measurements the test protocol was followed as follows:

Maximum oxygen volume (VO2max_ml_kg_min) absolute (l / min) and relative (ml / kg / min), aerobic capacity. The measurements were performed before and after the program. The subject completed a continuous graded exercise test on an electronically braked cycle ergometer to determine maximal oxygen consumption (VO2peak) and the peak power output in watts at VO2peak. The athlete began pedaling at a cadence of 60 to 80 rpm at a workload of 20 W. The workload increased 1 W every 3 seconds (20 W/min) until he was unable to maintain 60 to 80 rpm or until volitional fatigue.

Intervention study protocol

The intervention training program lasted 12 weeks on frequency 6 times per week, 60 minutes for each training session.. It was used circuit weight routine with an intensity between 60% to 80% on 2 group muscles in a session (8 – 10 exercises, 3 – 5 circuits, 12 – 20 reps).

The training program was designed in this way:

Monday, Wednesday, Friday: Exercise exercises with weights according to the circus system. Two muscles for each training session, 8-12 exercises, 3 circles, 12-20 reps for each exercise, with 60-80% of the maximum force on short breaks.

Tuesday functional workout.

Thursday: Cardio drill: jogging on the runway, bicycle or steps, various games (basketball, mini-football, ping-pong, etc.)

Saturday: core training & abdominal,

Statistical analysis

All variables evaluated in this study were tested for normality. The ANOVA (one way) test followed by an in-depth LSD test (post hoc) was used to compare the results of the difference between the control group and the intervention group in the first (pre) and post-intervention measurements. Level $p < 0.05$ (Significant Change) was accepted in this study. All statistical analyzes were performed using SPSS 20.0 software.

Results

Table No.1 provides data by age category. For the category of age -20 years: Body weight (mean = 83) (SD = 10), body length (average = 175) (SD = 5.5), maximum force on drop jump (mean = 3.3) (SD = 1.3). maximum force per kg on drop jump (mean= 40) (SD 11.70), maximum power per kg on drop jump (average = 30) (SD = 10.5), contact time (average = 0.4) (SD = 0.1) , air time (mean = 0.5) (SD = 0.1), time difference in air and peak time (mean = 1.4) (SD = 0.6).

For the age group of 20-25 years: body weight (average = 84 kg) (SD = 9), body length (average = 178) (DS = 2.5), maximum jump force on drop (average = 3.1) (SD = 0.4), the maximum force per kg (mean = 38) (SD = 8.7), maximum power per kg (mean = 30.3) (SD = 6.2), (mean = 0.3) (SD = 0.1), air time (mean = 0.5) (SD = 0.3), time difference in air and peak time (mean = 1.6) (SD = 0.4).

Table 1: Descriptive statistics for comparison by age category

Age_Range		Mean	Std. Deviation
-20 yrs	Body_weight	**82.644**	**9.6746**
	Body_height	**174.667**	**5.4544**
	Force_Drop_Jump_F_max	**3.3122**	**1.27177**
	Force_Drop_Jump_F_max_kg	**40.0422**	**11.74687**
	Force_Drop_Jump_Power_max_kg	**29.6356**	**10.46357**
	Force_Drop_Jump_Contact_Time_tc	**.3959**	**.11034**
	Force_Drop_Jump_Air_Time	**.5019**	**.07070**
	Force_Drop_Jump_Ta_Tc	**1.4000**	**.56332**
	Valid N (listwise)		
20-25 yrs	Body_weight	**83.600**	**8.9605**
	Body_height	**178.333**	**2.5166**
	Force_Drop_Jump_F_max	**3.1567**	**.38837**
	Force_Drop_Jump_F_max_kg	**38.4100**	**8.71950**
	Force_Drop_Jump_Power_max_kg	**30.2733**	**6.21226**
	Force_Drop_Jump_Contact_Time_tc	**.3220**	**.06227**
	Force_Drop_Jump_Air_Time	**.4883**	**.02974**
	Force_Drop_Jump_Ta_Tc	**1.5667**	**.37554**
	Valid N (listwise)		
25+ yrs	Body_weight	**85.557**	**7.8989**

Body_height	**173.286**	**6.7507**
Force_Drop_Jump_F_max	**3.7143**	**1.04334**
Force_Drop_Jump_F_max_kg	**40.4857**	**8.58053**
Force_Drop_Jump_Power_max_kg	**27.8343**	**7.04046**
Force_Drop_Jump_Contact_Time_tc	**.2971**	**.07650**
Force_Drop_Jump_Air_Time	**.4496**	**.08440**
Force_Drop_Jump_Ta_Tc	**1.5629**	**.34999**

For the age category +20 years: body weight (mean = 85.5) (SD = 7.9), body length (mean = 173) (SD = 6.7), the maximum drop jump force (mean = 3.7) (SD = 1), maximum strength per kg (mean = 40.5) (SD = 8.6), maximum power per kg (average = 27) (SD = 7), contact time (average = 0.3) (SD = 0.1), time in the air (mean = 0.4) (SD = 0.1), time difference in the air and peak time (mean = 1.6) (SD = 0.3).

Table 2 gives comparisons for measurements between three age groups. Statistical analyzes are: body weight between groups (sum of square = 33.7, mean square = 16.8 and F = 0.2), body height (sum of square = 53.6, mean square = 26.8 and F = 0.8), the maximum force in drop jump (sum of square = 53.6, mean square = 26.8 and F = 0.8), the maximum strength per kg on drop jump (sum of square = 9.2, mean square = 4.6 and F = 0), the maximum power on drop jump (sum of square = 8.9, mean square = 26.8 and F = 0.1), the time difference in the air (sum of square = 0, mean square = 0 and F = 1), time air (sum of square =0, mean square =0 dhe F= 1), the time difference in the air and the time of the accelerate (sum of square = 0.1, mean square = 0.1 and F = 0.2).

Table 2:Statistics for comparison of variables by age category

		Sum of Squares	Mean Square	F
Body_weight	Between Groups	**33.662**	**16.831**	**.210**
	Within Groups	**1283.719**	**80.232**	
	Total	**1317.381**		
Body_height	Between Groups	**53.589**	**26.794**	**.818**

	Within Groups	**524.095**	**32.756**	
	Total	**577.684**		
Force_Drop_Jump_F_max	Between Groups	**.914**	**.457**	**.370**
	Within Groups	**19.772**	**1.236**	
	Total	**20.686**		
Force_Drop_Jump_F_max_kg	Between Groups	**9.200**	**4.600**	**.043**
	Within Groups	**1697.724**	**106.108**	
	Total	**1706.924**		
Force_Drop_Jump_Power_max_kg	Between Groups	**17.912**	**8.956**	**.115**
	Within Groups	**1250.483**	**78.155**	
	Total	**1268.394**		
Force_Drop_Jump_Contact_Time_tc	Between Groups	**.041**	**.020**	**2.326**
	Within Groups	**.140**	**.009**	
	Total	**.181**		
Force_Drop_Jump_Air_Time	Between Groups	**.011**	**.005**	**1.041**
	Within Groups	**.085**	**.005**	
	Total	**.096**		
Force_Drop_Jump_Ta_Tc	Between Groups	**.127**	**.064**	**.287**
	Within Groups	**3.556**	**.222**	
	Total	**3.683**		

Data for the table 3 shows sigma values for comparing variables for all three age groups.

Table 3: Comparison for variables by age category (P or Sig values)

ANOVA

		Sig.
Body_weight	Between Groups	**0.813**
	Within Groups	

	Total	
Body_height	Between Groups	**0.459**
	Within Groups	
	Total	
Force_Drop_Jump_F_max	Between Groups	**.697**
	Within Groups	
	Total	
Force_Drop_Jump_F_max_kg	Between Groups	**.958**
	Within Groups	
	Total	
Force_Drop_Jump_Power_max_kg	Between Groups	**.892**
	Within Groups	
	Total	
Force_Drop_Jump_Contact_Time_tc	Between Groups	**.130**
	Within Groups	
	Total	
Force_Drop_Jump_Air_Time	Between Groups	**.376**
	Within Groups	
	Total	
Force_Drop_Jump_Ta_Tc	Between Groups	**.754**
	Within Groups	
	Total	

Table 4 shows data for the age group of 20 years for the average indicators and the standard deviation of the maximum two-leg jump force. For the category of age -20 years; the performance indicators by weight, (average = 100.9) (SD = 13.6), maximum action speed (mean = 2.6) (SD = 0.2), jump height / min (average = 0.2) (SD = 0.04), jump height (mean = 0.5) (SD = 0.06), the efficiency of the jump (the power applied to the applied force) (average = 80.5) (SD = 11.2), total maximum force (mean = 2.5) (SD = 0.4), maximum left foot force (mean = 1.2) (SD = 0.2), maximum right foot force (mean = 1.2) (SD = 0.2), the maximum force difference between left and right legs (mean = 6.4) (SD = 5.9), maximum relative strength (mean = 3) (SD = 0.4), the force difference _p_t1_t3 (mean = 6.6) (SD = 4.1), maximum total power (mean = 4.7) (SD = 0.1), maximum left foot power. (mean = 2.3) (DS = 0.5), maximum right foot power (mean = 2.4) (SD = 0.5), power difference between left-right legs (mean = 6) (SD = 4.7), maximum power per kg (mean = 56.4) (SD = 8.1), the ratio between maximum jump and spin (average = 280.4) (SD = 95.2).

Table 4 : Descriptive statistics for test performed on single two leg jump for age -20 yrs

Age_Range		Mean	Std. Deviation
-20 yrs	Single_two_leg_jump_EFI	**100.8889**	**13.58717**
	Single_two_leg_jump_V_max	**2.6111**	**.19310**
	Single_two_leg_jump_Height_min	**-.1767**	**.04690**
	Single_two_leg_jump_Jump_Height	**.4622**	**.06016**
	Single_two_leg_jump_Efficensy	**80.5556**	**11.21507**
	Single_two_leg_jump_Force_max_total	**2.4644**	**.40050**
	Single_two_leg_jump_Force_max_L	**1.2367**	**.21915**
	Single_two_leg_jump_Force_max_R	**1.2389**	**.19141**
	Single_two_leg_jump_diff_F_max	**6.4444**	**5.87859**
	Single_two_leg_jump_Force_max_rel	**3.0444**	**.40057**
	Single_two_leg_jump_Force_Diff_p_t1_t3	**6.6000**	**4.15090**
	Single_two_leg_jump_Power_max_total	**4.7200**	**.99662**
	Single_two_leg_jump_Power_max_L	**2.3500**	**.53068**
	Single_two_leg_jump_Power_max_R	**2.3811**	**.47593**
	Single_two_leg_jump_Power_diff_P_max	**6.0000**	**4.74368**
	Single_two_leg_jump_Power_max_kg	**56.7900**	**8.13498**
	Single_two_leg_jump_Power_h_max_h_min	**280.4222**	**95.16862**

Table 5 gives data for the age group 20-25 years; performance indicator by weight, (mean = 99) (SD = 16.1), maximum action speed (mean = 2.8) (SD = 0.1), jump height / min (average = 0.3) (SD = 0.09), jump height (mean = 0.5) (SD = 0.04), the efficiency of the jump (the power applied to the applied force) (mean = 82) (SD = 2), total maximum force (mean = 2.3) (SD = 0.3), maximum left foot force (mean = 1.1) (SD = 0.2), maximum right foot force (mean = 1.2) (SD = 0.1), the maximum force difference between left and right legs (mean = 12.7) (SD = 6.9), maximum relative strength (mean = 2.9) (SD = 0.5), the force difference _p_t1_t3 (mean = 6.9) (SD = 1.6), maximum total power (mean = 4.7) (SD = 0.5), maximum left foot power. (mean = 2.3) (SD = 0.3), maximum right foot power (mean = 2.4) (SD = 0.3), The power difference between left and right legs (mean = 8.5) (SD = 5.1), maximum power per kg (mean = 58.3) (SD = 8.9), the ratio between maximum jump and spin (average = 203.1) (SD = 70.6).

Table 5: Descriptive statistics for test performed on single two leg jump for age 20- 25 yrs

Age_Range		Mean	Std. Deviation
20-25 yrs	Single_two_leg_jump_EFI	**99.0000**	**16.09348**
	Single_two_leg_jump_V_max	**2.8167**	**.11060**
	Single_two_leg_jump_Height_min	**-.2600**	**.08718**
	Single_two_leg_jump_Jump_Height	**.4900**	**.03606**

	Single_two_leg_jump_Efficensy	**82.0000**	**2.00000**
	Single_two_leg_jump_Force_max_total	**2.2800**	**.31321**
	Single_two_leg_jump_Force_max_L	**1.0667**	**.17926**
	Single_two_leg_jump_Force_max_R	**1.2167**	**.13317**
	Single_two_leg_jump_diff_F_max	**12.7333**	**6.90604**
	Single_two_leg_jump_Force_max_rel	**2.9067**	**.51033**
	Single_two_leg_jump_Force_Diff_p_t1_t3	**6.9667**	**1.55671**
	Single_two_leg_jump_Power_max_total	**4.6533**	**.55175**
	Single_two_leg_jump_Power_max_L	**2.2600**	**.28844**
	Single_two_leg_jump_Power_max_R	**2.4133**	**.29501**
	Single_two_leg_jump_Power_diff_P_max	**8.5333**	**5.10816**
	Single_two_leg_jump_Power_max_kg	**58.2967**	**8.96663**
	Single_two_leg_jump_Power_h_max_h_min	**203.1333**	**70.60611**

Table 6 gives data for the age category +25 years; performance indicator by weight, (average 84 = 4) (SD = 17), maximum action speed (mean = 2.5) (SD = 0.2), jump height / min (average = 0.2) (SD = 0.04), jump height (mean = 0.4) (SD = 0.05), the efficiency of the jump (the power gained for the applied force) (average = 80) (SD = 11.2), total maximum force (average = 2.1) (SD = 0.3), maximum left foot force (mean = 1.1) (SD = 0.1), maximum right foot force (mean = 0.9) (SD = 0.4), the maximum force difference between left and right legs (mean = 2.4) (SD = 3.2), maximum relative strength (mean = 2.5) (SD = 0.2), the force difference _p_t1_t3 (mean = 4.2) (SD = 2.9), maximum total power (mean = 4.2) (SD = 0.9), maximum left foot power. (mean = 2.2) (SD = 0.4), maximum right foot power (mean = 2) (SD = 0.5), the power difference between left and right legs (mean = 5.1) (SD = 6.1), maximum power per kg (mean = 44.2) (SD = 19.9), the ratio between maximum jump and spin (mean = 175.3) (SD = 50.3).

Table 6: Descriptive statistics for test performed on single two leg jump for age 25+ yrs

Age_Range		Mean	Std. Deviation
25+ yrs	Single_two_leg_jump_EFI	**84.4286**	**16.99860**
	Single_two_leg_jump_V_max	**2.5300**	**.24685**
	Single_two_leg_jump_Height_min	**-.2371**	**.04608**
	Single_two_leg_jump_Jump_Height	**.4014**	**.05984**
	Single_two_leg_jump_Efficensy	**80.0000**	**11.19524**
	Single_two_leg_jump_Force_max_total	**2.1186**	**.30765**
	Single_two_leg_jump_Force_max_L	**1.0671**	**.14326**
	Single_two_leg_jump_Force_max_R	**.8891**	**.35124**
	Single_two_leg_jump_diff_F_max	**2.3714**	**3.21803**
	Single_two_leg_jump_Force_max_rel	**2.5171**	**.22677**

Single_two_leg_jump_Force_Diff_p_t1_t3	**4.2286**	**2.18687**
Single_two_leg_jump_Power_max_total	**4.2443**	**.93357**
Single_two_leg_jump_Power_max_L	**2.1757**	**.42003**
Single_two_leg_jump_Power_max_R	**2.0843**	**.50023**
Single_two_leg_jump_Power_diff_P_max	**5.1429**	**6.10133**
Single_two_leg_jump_Power_max_kg	**44.2743**	**19.93489**
Single_two_leg_jump_Power_h_max_h_min	**175.3286**	**50.33242**

Table 7 represents the sigma value of the variables comparison for the three age groups of the parameters measured in the suction test.

Table 7 Comparison data by age category

ANOVA

		Sig.
Single_two_leg_jump_EFI	Between Groups	**.119**
	Within Groups	
	Total	
Single_two_leg_jump_V_max	Between Groups	**.167**
	Within Groups	
	Total	
Single_two_leg_jump_Height_min	Between Groups	**.040**
	Within Groups	
	Total	
Single_two_leg_jump_Jump_Height	Between Groups	**.062**
	Within Groups	
	Total	
Single_two_leg_jump_Efficensy	Between Groups	**.963**
	Within Groups	
	Total	
Single_two_leg_jump_Force_max_total	Between Groups	**.189**
	Within Groups	
	Total	
Single_two_leg_jump_Force_max_L	Between Groups	**.181**
	Within Groups	
	Total	
Single_two_leg_jump_Force_max_R	Between Groups	**.041**
	Within Groups	
	Total	
Single_two_leg_jump_diff_F_max	Between Groups	**.033**
	Within Groups	
	Total	
Single_two_leg_jump_Force_max_rel	Between Groups	**.034**

	Within Groups	
	Total	
Single_two_leg_jump_Force_Diff_p_t1_t3	Between Groups	**.309**
	Within Groups	
	Total	
Single_two_leg_jump_Power_max_total	Between Groups	**.589**
	Within Groups	
	Total	
Single_two_leg_jump_Power_max_L	Between Groups	**.762**
	Within Groups	
	Total	
Single_two_leg_jump_Power_max_R	Between Groups	**.408**

Table 8 gives data on average indicators, standard deviation of VO2max and minimum & maximum oxygen quantity for 22 individuals (N = 22) in T1 & T2 of training group (Intervention Group), who underwent circular exercise with weight.

Also data show average indicators, standard deviation of VO2max and minimum & maximal oxygen quantity for 22 individuals (N = 22) in T1 & T2 (N = 22) of control group (Control Group).

The Intervention Group: the first test (T1), (N = 22), (minimum = 29), (maximum = 34.5), (average = 32.1), (DS = 1.5). The second test (T2), (N = 22), (minimum = 34), (maximum = 43.1), (average = 37.7), (DS = 2.5)

Control Group: The first test (T1), (N = 22), (minimum = 29.1), (maximum = 59.3), (average = 38), (DS = 6.3). The second test (T2), (N = 22), (minimum = 30.2), (maximum = 58.2), (average = 37.7), (DS = 5.9)

Table 8: Average descriptive data, standard deviation of VO2max and minimum & maximum oxygen consumption

Measurement_time		N	Minimum	Maximum	Mean	Std. Deviation
Intervention Group	VO2max_ml_kg_min_T1	**22**	**29.00**	**34.50**	**32.0745**	**1.46998**
	VO2max_ml_kg_min_T2	**22**	**34.00**	**43.06**	**37.7759**	**2.53452**

	Valid N (listwise)	**22**				
Control Group	VO2max_ml_kg_min_T1	**22**	**29.26**	**59.27**	**37.9768**	**6.27924**
	VO2max_ml_kg_min_T2	**22**	**30.20**	**58.22**	**37.6755**	**5.91104**
	Valid N (listwise)	**22**				

Table 9 shows the difference in T1 of VO2max_ml_kg_min between the Intervention Group and the Control Group on the first test (T1)..

The statistical analyzes show: the comparison Intervention and Control Group T1 (sum of square = 383.2), (mean square = 383.2) and (F = 18.4) (Sig= 0.00). Intervention and Control group T2 (sum of square = 0.1), (mean square = 0.1) and (F = 0) (Sig= 0.94).

Table 9: Data on comparison between groups in T1and T2

		Sum of Squares	df	Mean Square	F	Sig
VO2max_ml_kg_min_T1	Between Groups	**383.205**	**1**	**383.205**	**18.428**	**0.00**
	Within Groups	**873.384**	**42**	**20.795**		
	Total	**1256.589**	**43**			
VO2max_ml_kg_min_T2	Between Groups	**.111**	**1**	**.111**	**.005**	**.942**
	Within Groups	**868.649**	**42**	**20.682**		
	Total	**868.760**	**43**			

Table 10 shows average descriptive data, the standard deviation of the maximum amount of oxygen per ml / min (VO2max_ml_kg_min) for the Intervention Group and the Control Group on the T1 & T2 tests.

Training group (Intervention Group) first test (T1) (VO2max_ml_kg_min_T1) (average = 32.1), (N = 22), (DS = 1.5). The second test (T2) (VO2max_ml_kg_min_T2) (average = 37.8), (N = 22), (DS = 2.5). Control Group (T1) (VO2max_ml_kg_min_T1) (average = 37), (N = 22), (DS = 6.3). The second test (T2) (VO2max_ml_kg_min_T2) (average = 37.6), (N = 22), (DS = 5.9).

Table 10 Average descriptive data, standard deviation of VO2max and minimum & maximum oxygen consumption

Paired Samples Statistics

Measurement_time			Mean	N	Std. Deviation
Intervention Group	Pair 1	VO2max_ml_kg_min_T1	**32.0745**	**22**	**1.46998**
		VO2max_ml_kg_min_T2	**37.7759**	**22**	**2.53452**
Control Group	Pair 1	VO2max_ml_kg_min_T1	**37.9768**	**22**	**6.27924**
		VO2max_ml_kg_min_T2	**37.6755**	**22**	**5.91104**

Table 11 gives the comparative data in T1 and T2 of the two groups for maximum oxygen consumption (VO2max_ml_kg_min) on the T1 & T2 tests of the Intervention Group and the Control Group.

The Intervention Group VO2max_ml_kg_min_T1 & T2 (mean = + 5.7), (SD = 2.7). (Average standard = 0.6). Control Group VO2max_ml_kg_min_T1 & T2 (mean = 0.3), (SD = 1.3). (Average Standards = 0.3).

Table11: Comparative data of groups between T1 and T2 of the maximum amount of oxygen

Paired Samples Test

Measurement_time			Paired Differences			
			Mean	Std. Deviation	Std. Error Mean	Sig.(2-tailed)
Intervention Group	Pair 1	VO2max_ml_kg_min_T1 VO2max_ml_kg_min_T2	**-5.7**	**2.7**	**0.59**	**0.000**
Control Group	Pair 1	VO2max_ml_kg_min_T1 VO2max_ml_kg_min_T2	**0.3**	**1.3**	**0.27**	**0.276**

Discussion

The final results on this study for age category comparison show that; for body weight comparison does not represent significant changes (sig = 0.8), body height does not represent significant changes (sig = 0.5), maximum drop-down strength does not represent significant changes (sig = 0.7) the maximum force per kg of drop jump does not represent significant changes (sig = 0.9), the maximum power on drop jump does not represent significant changes (sig = 0.9), the contact time does not represent significant changes (sig = 0.1), time in the air does not represent significant changes (sig = 0.4), the difference in air time and momentum does not represent significant changes (sig = 0.8). To conclude data of this study show that there is no significant changes between three age groups for anthropometric parameters and force.

The author considers that the decline in maximum aerobic strength and muscular strength with age advancement are examples of functional fall in the body that lead to aging, which can severely limit physical performance and are in a negative correlation with all mortality cases (Salvador Romero-Arenas, 2013). As is well known, endurance exercises and resistance exercises can significantly improve physical performance and health factors in older individuals. Based on the resistance training circuit with raising light weights and minimum breaks during the series and repetitions can be a very effective strategy for increasing oxygen consumption, pulmonary ventilation, strength and functional capacity by improving body composition).

The data from the study for comparison between age groups for maximum rate of action do not show significant changes (sig = 0.2), the jump height / min has significant changes (sig = 0.04), the height of the jump did not show significant changes (sig = 0.1), the efficiency of the jump (the power applied to the applied force) does not show significant changes (sig = 0.7), the total of maximum force does not show significant changes (sig = 0.2), the maximum left foot force does not show significant changes (sig = 0.2), the maximum right foot force has significant changes (sig = 0.04), the maximum force difference between left and right legs is significant (sig = 0.03), the maximum relative strength has significant changes (sig = 0.03), the force difference _p_t1_t3 (sig = 0.3), the total of maximum power does not show significant changes (sig = 0.6), the maximum left foot power does not show significant changes (sig = 0.8), the maximum right foot power does not show significant changes (sig = 0.4).

Bodybuilding is a sport in which competitors are judged on muscular appearance. Natural bodybuilders are drug-tested and are banned from the sport if caught using illegal substances. Appropriate preparation for a natural bodybuilding contest generally involves years of strength training followed by a "contest prep" in which the athlete focuses on dramatically reducing body fat to enhance muscular appearance. Thus, changes seen during competition preparation are not due to sudden dramatic elevations in volume, intensity, or frequency of resistance training but, rather, to a self-induced reduction in energy intake and increase in aerobic activity (Lambert et al., 2004). While other sports may involve short-term (eg, 7–21 d) weight-cutting strategies before competition, bodybuilding is unique in that prolonged (12+ wk) caloric restriction and increases in physical activity with physique-oriented goals are placed above fitness and physical-performance goals. Previous research on bodybuilders has mostly focused on the nutritional and body-compositional changes of the athletes. (Heyward et al., 1989; Walberg-Rankin et al., 1993; Brill & Keane 1994; Steen 1999). A few studies have examined other aspects of contest prep such as hormonal changes (Maestu et al., 2010; Maestu et al.,2008) and strength changes (Bamman et al., 1993). They provide valuable contributions to the bodybuilding literature, but much speculation and misinformation still exists. Most currently published case studies on bodybuilders (excepting the work by Steen focus on the well-known negative effects of anabolic steroid use or oil injections, creating an image of all bodybuilders as diseased, obsessed, steroid-injecting individuals. (Thorsteinsdottir et al., 2006; Koopman et al., 2005; Voelcker et al., 2010; Schafer et al., 2011; Mayr et al., 2012; Banke et al., 2012) . We believe there is more to bodybuilding than these profiles suggest. In addition to the physical changes accompanying bodybuilding preparation, little is known about how such a rigorous regimen may affect mood states

The results of this study serve to compare the level of VO2max before and after the application of special training programs with strength exercises adapted to various forms with the aim of improving VO2max in the body. This means that the use of weight exercises increases aerobic performance if we use moderate interval intervals with multiple repeats, which amount to 20. The results showed that the baseline mean values for intervention group was 32.1 ml/kg/min and control group 37.9 ml/kg/min. After the intervention the results showed that intervention group had a mean values 37.8 ml/kg/min while control group 37.6 ml/kg/min. Only 3 out of 17 Ozzaki (2013) studies involving new subjects following weight training have shown significant increases in Vo2max, while six out of nine studies in older adults have reported significant improvements in Vo2max. There is a significant negative correlation between initial Vo2max and weight training that promotes change in Vo2max, because the growth of Vo2max through weight exercises is dependent on the subject's initial Vo2max. To see more clearly the effect of circular exercise exercises with weights, the initial indicators of Vo2max should be below 25 ml / kg / min for subjects younger than 40 ml / kg / min. Thus, young and old subjects with low levels of physical performance are expected to undergo improvement at the same time and within a single way of two components: muscular and cardiovascular (Ozaki, 2013) . Thus, strength in strength not only improves body constituents, but also increases oxygen capability as the main input of a well-developed cardio-vascular system that is efficient for a better quality of life. Aerobic capacity improves more optimally if two exercise systems such as run and weight training are intertwined, because if running increases the oxygen absorption capacity through the lungs, weight training increases the capacity inflammation of the oxygen introduced into the body through well-developed muscle that is only achieved through the exercise of strength. Weight training has the effect on capillary and strengthening the muscle and blood vessels, as well as creating conditions for an intervention in fatty deposits in the body. Study findings support previous research and provide improvements in aerobic capacity variables. Although the purpose of this study was to measure changes in the above variables after a 12-week training program, it is important to understand that there are some published studies that are in line with the results obtained from this study.

According to author Ozaki (2013) in his paper, it is undeniable fact that weight training is a powerful stimulus for muscle hypertrophy and gaining strength, but this is less understandable if weight training can increase aerobic capacity (VO2max). The purpose of this brief review is to discuss whether exercise in the circus exercise system increases Vo2max among young people (20-40 years), while in older subjects (> 60 years) there has been a significant increase in VO2max.

Recent studies have shown that different types of weight training in the circuit system can improve aerobic fitness (Phillip Garrison, NASM Elite Trainer). For aerobic exercise weight training should be quite intense with very short periods of rest between the series and the one-on-one exercise, in order to keep the heartbeats constantly elevated. Studies have shown that short breaks, regular and correct exercise by the weight system circuit system, reduces the heart rhythm in tranquility , increases VO2 max and improves aerobic power, unlike traditional cardiovascular training.

Of note, many of the physiological changes observed including an elevation in cortisol, reduction in testosterone, reduction in immune function, alterations in mood status, and decreases in physical performance and maximal heart rate that occurred during the preparation period are consistent with markers of overtraining. (Cunha et al., 2006; Fry et al., 1998; Fry & Kraemer 1997) While these changes may be considered a negative outcome in many sports judged or scored on physical performance, these outcomes having little bearing on the subjective outcome of a bodybuilding competition. In fact, these alterations may be almost a prerequisite for achieving an optimal physique for bodybuilding. One month after competition, total mood disturbance improved while aerobic performance began to increase. Two months after competition, strength and anaerobic performance began to recover while the hormonal profile returned to prepreparation (baseline) levels within 3 months of the competition. In contrast to the physical changes that occurred before the bodybuilding competition, preparation for other competitions that do not cause such reductions in body fat may also not elicit changes in either strength or aerobic fitness and may actually enhance anaerobic capabilities.

In conclusion of our study the results show significant improvement on VO2 Max on intervention group (mean diff=5.7 ; p= 0.000) and no significant improvement on control group (mean diff=0.3; p= 0.276). Finally it was found out that strength exercises affect the optimal level in improving VO2max. Our study confirms Nul's hypothesis that weight exercises designed according to circular program software affect the improvement of VO2max indicators and cardiovascular system and respirator.

Impact of the study

The results of this study serve to change the concept that force training after applying special training programs with moderate interval intensity and multiple repetitions under the circus exercises with weight can improve the VO2max and aerobic performance levels. Strength only improves bodily constituents, but increases oxygen capability as the main input of a well-developed cardio-vascular system. Taking into account all these positive effects on the body, this study suggests that training fitness training programs is always room for improvement by applying different weight training methods for this purpose, as discussed above.

Strengths and Limitations

Although randomized controlled trials are the norm in scientific literature, it has been satirically and accurately demonstrated that they are not always the best source of information (Smith & Pell 2003). We believe that our sample size is thus a strength of our study, as it enabled us to frequently perform a plethora of measurements for a full year in a difficult-to-study subject population. We are of the opinion that not many bodybuilders preparing for a competition would agree to regular fasted testing, maximal cycling tests, and maximal-strength assessments.

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