9 - IMPACT OF 12 WEEKS OF CIRCUIT TRAINING ON BODY COMPOSITION INDICATORS

RICELLI ENDRIGO RUPPEL DA ROCHA
UNIVERSIDADE DO CONTESTADO (UNV) - CAÇADOR - SC.
regis_rodrigo@terra.com.br

1.0 PRESENTATION

The adolescence is one of the periods that the greatest changes happen on the body of a person, characterizing it as one of the first phases of the human being development. This period is marked by biological, psychological and social transformation, therefore, it is one phase of transition that physics, mental and emotional modifications happen, becoming important, mainly because it's about the transition between the childhood and the adulthood (POZZOBON et al., 2003).

Few researches have been done about the circuit training on girls that are in the adolescence, because this moment would be perfect for the development of one active lifestyle that would influence on the adulthood. When people get older, a decrease on the average of the daily energetic expense occurs by means of less physics activity (LAZZOLI et al., 1998). This happens basically because of environmental and social factors as the increase of appointments of students and professionals. An active way of life is associated with a reduction of the incidence of several chronical-degenerative diseases as well a reduction of the cardiovascular mortality in general. On children and teenagers, a bigger level of the physical activity contributes to improve the lipidic and metabolic profiles and to reduce the prevalence of the obesity (LAZZOLI et al., 1998).

The body composition is one of the five components of the physical fitness related to health and it's frequently evaluated as one indicative of the fitness and health of the people. Also, the body composition is used to verify the changes that happen in the before and after training period in weight training programs (WARNER et al., 2004). The American College of Sports Medicine (2001) says that the resistance training is a powerful stimulus on the increase of the fat free mass and muscular strength. Pereira et al., (2003) mentions that the biggest consensus related to the weight training are found among the body composition indicators, independently of the age group, sex, athlete or not athlete. Several researchers have observed an increase on the thin body mass as well the decrease on the contents of the subcutaneous fat after weight training.

The circuit training that uses loads (barbells, bars, winding frame, workout equipment) for the muscular and osseous development on teenagers, seems to be very useful, with a kind of physics activity that improves the component parts of the body composition. The answers of the circuit training using exercises against-resistance are similar on people of different age groups, influencing directly on the muscular hypertrophy, on the fat mass and on the whole corporal weight (MARCHAND, 2003). Then, the goal of the present study was to verify the possible changes on the body composition, after 12 weeks of sistematizated weight training circuit, on girls pospubescent and not trained.

2. PEOPLE AND METHODS

2.1 SUBJECTS

Six female teenagers (16 ± 0,89 years old) pospubescent that attend Transpiração Fitness Center in Caçador - SC were selected for the research. The maturational stage of the female teenagers was identified by the secondary sexual characters by TANNER (1962). None of the participants mentioned that they have been participated of some kind of physical exercise in the last six months that anteceded the beginning of the experiment. Beyond this, none of the teenagers have presented any kind of metabolic problem or disease in the last months. The teenagers underwent a circuit training systematized with the same number of series, repetition, exercises and intervals of time between one exercise and the other. During the experience the teenagers didn't receive orientation of a nutritionist but were recommended to control the ingestion of carbhoydrates, grease and proteins by the researcher.

All the teenagers after being informed about the suggestions of the research and procedures that they were submitted, agreed to participate of the research.

2.2 ANTHROPOMETRY AND THE BODY COMPOSITION

The corporeal weight was gotten on a weighing-machine FILIZOLA, with exactness of 100g and all the teenagers were weighed, barefoot, wearing only bathing suits. The body composition was evaluated by the technical of thickness of the subcutaneous tissue. Three measures were taken in each point, in row, of the right side of the body, being registered the average value. The following skinfolds by DEURENBERG et al. (1990) were verified: biceps, triceps, subscapular and suprailiac. For the equation of the prediction of the fat percentual (%GC), was used the equation suggested by SLAUGHTER et al. (1988), using measures of reference by standard components.

All the measures were evaluated by just one avaluer, with one scientific adipomethry - Cescorf, with constant pressure of 10g/mm² on the contact surface and exactness of 0,1 mm. The coefficient test-retest exceeded 0,95 for each one of the anatomic points with measure error of, at maximum ± 1,00 mm.

2.3 TRAINING PROGRAM

The circuit training program was performed during 12 weeks in row, comprehending two weekly sections in alternated days. At about 24 sections of training were executed with 100% of attendance of the participants. Previously to the beginning of the study, the teenagers were undergo by a period of two weeks of adaptation to the circuit training program , with the purpose of learning the motor tasks and familiarization with the technical aspects (execution movements speed, the counting of the repetitions, intervals of recuperation during the exercises), characterizing four sections in this period.

The circuit training consisted of ten exercises, done in three series of 12 repetitions and with intervals of recuperation, being the change of one exercise to another. The exercises that composed the program were the following: sitting paddled (back muscle), inclined crucifix (pectoral muscle), biceps thread with barbells (biceps), pulley triceps (triceps), extensor table (quadriceps), flexor table (ishqmus-tibial), abductor and adducer table (adducers and abductors of the thigh), frontal lifting with barbells (deltoids) and previously flexion of the body in dorsal decubitus with equipment (abdomen). The training protocol used during the experiment period was 70% of 1 RM for the achievement of the training of loads and the number of suggested repetitions. During the experiment, the weights were periodically set, corresponding to the additional gains of strength, keeping the intensity of the training.

2.4 STASTICS TREATMENT

The descriptive analysis and the inferential statistics of all rates were conducted by the program SPSS 10.0. For the changes that happened on the before and after training periods, the test "t" by Student to compare samples was used. The signifying level used for all compilations was p<0, 05.

3.0 RESULTS

The obtained results the before and after experiment are presented on the Tables 1 and 2. The changes happened among these two moments are expressed in perceptual values Ä%. The results in the body composition reveled a signified statistically difference from the pre-period to the post-period on the fat percentual (-11,01%), on the fat mass (-9,41%) and on the lean mass (4,72%), being p<0,05. Relationed to the whole body mass, occurred an increasing of 1,82% not occurring signified statistics difference (p>0,05).

Table 1: Manner of the body composition indicators of the female group before and after 12 weeks of circuit training.

	TRAINING PERIOD			
	Pre-test	Post-test	Δ%	Valor de P
Body Mass Kg)	48,3±4,98	49,76±4,44	1,82±2,33	P>0,121
Fat (%)	21,42±4,76	19,19±4,70	-11,01±4,53	P<0,000
Fat Mass (Kg)	10,34±2,74	9,32±2,48	-9,41±4,15	P<0,008
Lean Mass (Kg)	38,31±2,76	40,11±2,93	4,72±2,22	P<0,003

** Significative effect from the before period to the after period experiment (p<0,05)

The results of the skinfolds in the Table 2 presented statiscally differences and the triceps skinfolds (-10,77%) and subscapular (-13,77%), being p<0,05. The biceps skinfolds (-12,71%) and the suprailiac (-25,79) didn't suffer significant statiscally changes from the before period to the after period experiment (p>0,05).

Table 2: Manner of the deposits of subcutaneous fat in different anatomic points before and after 12 weeks of circuit training.

SKINFOLDS	Training Period			
	Before-test (mm)	After-test (mm)	Δ%	Value of p
Bíceps	7,56 ± 2,24	6,71 ± 1,49	-12,71 ± 20,30	P>0,212
Tríceps**	14,98 ± 4,27	13,73 ± 4,68	-10,77 ± 6,63	P<0,007
Subscapular**	13,68 ± 3,45	12,21 ± 3,47	-13,77 ± 8,13	P<0,000
Suprailiac	10,98 ± 2,86	8,68 ± 1,75	-25,79 ± 18,22	P<0,019

** Significative effect from the before period to the after period experiment (p<0,05)

4.0 DISCUSSION

The results reveled in this research are going to the meeting of some investigations about the impact of weight training circuit on the body composition indicators, mainly on the increments on the lean mass and on the significative results on the fat mass and on the fat percentual. Few researches have been demonstrated this effect on children and teenagers mainly of the female sex, by the way, the manner of the whole body mass still continues being aim of many studies.

FUKANAGA apud FONTOURA (1992, p. 30) in a research with boys and girls among 15 to 18 years old that carried out a period of 12 weeks of weight training, observed increases on the muscle mass, through the ultra-some, earning the same results on the lean mass of this research.

HOFFMAN e KLAFELD (1998) with 28 women over 18 years old, did a weight training program during 10 weeks, they obtained results statistically significative on the percentual of fat (pretraining 27,3% to postraining 25,2%) and relationed to the whole body mass there was an increase of the pretest from 55 kg to 57,6kg on the postest, these results are according to the results that are found in this research.

In a research done by HASS et al. (1999) with12 men and 30 women from 20 to 50 years old, using a weight training circuit during 13 weeks, 3 times a week, divided into two groups: one group trained just one series and the other group trained multiple series. The results obtained reveled mainly in the group that trained multiple series an increase of the lean mass and a decrease of the fat percentual.

MARX et al. (2000) accomplished a circuit training during 24 weeks with 34 untrained women (22,6 years old), dividing them into three groups: circuit with low volume and unique series, circuit with high volume, periodized and with multiple series and the control group without training. The results showned a decrease on the fat percentual from 26,5% to 19,8% and an increase on the lean mass from 42,3kg to 45,6kg in the trained group with multiple series and periodized, this information is with the results obtained in this research.

In a study of nine months of weight training accomplished by KRAEMER et al (2002) with 30 tennis players (19 ± 1 year old), using a training group with periodized weights, another group without periodization of the weight training and the control group without training, it was shown an increase on the fat free mass form 46,5kg to 49,8kg, a decrease on the fat percentual from 22,9% to 19,1 and an increase on the whole body mass from 60,5kg for 61,6kg on the periodized groups an without periodization of the training, therefore, obtaining results similar to that ones found in this research.

5.0 CONCLUSION

The largeness of the changes in the body composition apparently depends on a lot of factors, directly or indirectly, relationed to the physics training. Then, a lot of the differences observed in the comparison among the few available studies at the literature, that have investigated the practice of exercises in circuit and with weights, can be leashed to the period of duration of the study, to the different training protocols, to the intensity and to the volume applied, to the sample group used, to the sex and to

the age group, and to the existence or not of nutritional control, among the others.

In spite of these limitations, the changes observed at the present study, above all on the lean mass (+4,72%), on the fat mass (-9,41%) and on the fat percentual (-11,01%) of the teenagers, they have shown the efficient of the weight training on the development of the indicators of the body composition. Although, just the weight training circuit, isolated, without nutritional orientation, doesn't seem to be sufficient for the reduction of the body weight.

BIBLIOGRAPHY

AMERICAN COLLEGE OF SPORTS MEDICINE. **Position Stand on the Appropriate Intervention Strategies for Weight Loss and Prevention of Weight Regain for Adults.** Med. Sci. Sports Exer. v. 33, n. 12, p. 2145-2156, 2001.

FONTOURA, A.S. **The Effect of Training and of Detraining on Muscular Strenght of Prepubescent Boys**. 2001. 77f. Dissertação (Mestrado em Ciências do Movimento Humano) - Universidade Federal do Rio Grande do Sul.

HASS, C.J et al. **Single versus Multiple sets in Long-Term Recreational Weightlifters**. Med. Sci. Sports Exerc., v. 32, n. 1, p. 235-242, 2000.

HOFFMAN, J.R; KLAFELD, S. **The Effect of Resistance on Injury Rate and Performance in a Self-Defense Instructors Course for Women**. Journal Strenght and Cond. Res. 1998.

KRAEMER, W.J et al. **Physiological Changes with Periodized Resistance Training im Women Tennis Player**. Med. Sci. Sports Exerc. v. 35, n.1, p. 157-168, 2003.

LAZZOLI, J.K et al. **Physical Activity and Health in Childhood and Adolescence**. Rev. Bras. Med. Esporte, v. 4, n. 4, Jul/Ago. 1998.

MARCHAND, E.A.A. **Aspects to be Considered in Resistance Training.** Revista Digital, ano 7, n. 43, 2001. Disponível em: http://www.efdeports.com/. Acesso em Agosto de 2006.

MARX, J.O et al. **Low-Volume Circuit versus High-Volume Periodized Resistance Training in Women**. Med. Sci. Sports Exerc., vol. 33, n. 4, p. 635-643, 2001.

PEREIRA, J.L; SOUZA, E.F; MAZZUCO M.A. **Physiological Adaptations on the Resistance Training .** FIEP Bulletin, Foz do Iguaçu, v. 73, p.316-319, 2003.

POZZOBON, M.E; TREVISAN S. Growth**, Body Composition and Physical Fitness of Maturate and not Maturate Girls**. Revista Digital, Buenos Aires, ano 9, n. 64, September 2003. Disponível em: http://www.efdeports.com/. Acesso em Agosto de 2006.

SANTOS, C.F. **Effect of 10 Weeks of Weight Training on Body Composition Indicators**. Rev. Bras. Ciên. e Mov. Brasília, v. 10, n. 2, p. 79-84, Abril 2002.

TANNER, J.M. **Growth at Adolescence**. 2nd ed. Oxiford, Blackwell, 1962.

WILMORE, J.H; COSTILL, D.L. **Physiology of Sport and Exercise**. 2 ed. São Paulo: Manole, 1999. p. 518-540.

Ricelli E. R. Da Rocha.

Av. Santa Catarina, 581, ap. 04, Centro.
CEP: 89500-000 - Caçador - SC
(49)3567-2274 ou 9122-7670
E-mail: regis_rodrigo@terra.com.br

IMPACT OF 12 WEEKS OF CIRCUIT TRAINING ON BODY COMPOSITION INDICATORS

SUMMARY

The present study had as goal to evaluate the impact of 12 weeks of weight training circuit on body composition indicators. Six sedentary girls pospubescent but apparently healthy at Transpiração Fitness Center in Caçador - SC, were chosen for the study. The circuit training occurred during 12 weeks (2 sections a week in two alternated days). Ten exercises composed the circuit training program, each one was realized in 3 series of 12 maximum repetitions (70% of 1 RM) and with an interval of recuperation being, the change from one exercise to another exercise. Skinfolds measures were collected before and after the period of intervention. The results through the Student test "t" compared revealed significant statistically difference on the percentual of fat (-11,01%), on the fat mass (-9,41%) and an increase on the lean mass (+4,72%) from the pre-period training to the post-period training ($p<0,05$). On the whole body mass there was an increase of 1,72%, not occurring significant statistical differences ($p>0,05$). The results suggest that the weight training circuit have significant answers on the percentual of fat, fat mass and lean mass in pospubescent girls, however only the circuit training seems to be insufficient for the loss of the whole body mass on female teenagers. Researches with more duration and samples must be done to observe the results of the circuit training on the whole body mass, indicating if the circuit training can keep or control the body weight.

KEY-WORDS: Circuit Training, Skinfolds, Body Composition.

L`IMPACT DE DOUZE SEMAINES D`ENTRAîNEMENT EN CIRCUIT SUR D`INDICATEURS DE LA COMPOSITION CORPORALLE.

RESUMÉ

La presente étude a eu par objetif évaluer l`impact de douze (12) semaines d`entraînement en circuit avec poids sur les indicadeurs de la composition corporalle. Six jeunes filles pos-pubères (16 +- 0,89 annes), sédentaires, mas aparentement salutaires de l`Academie Transpiração de Caçador - SC, ont eté selecionées pour cette étude. L` entraînement arrive pendant douze (12) semaines (deux sessions par semaine, alternativement). Dix exercices ont composé au programme d`entraînement en circuit, chacun réalisé en trois séries de douze (12) repetitions maximales (70% de 1 RM) et accompagné d`espaces de recuperation, que a eté le passage d`un exercice à un autre. Mesures de plis cutanées ont été colectées avant et après le période d`intervetion. Les results par l`intemédiaire du teste "t" ont revelé différences statistiquement significatives sur la pourcentage de graisse (-11.01%), sur la masse grosse (-9,41%) et l`accroissement de la masse maigre (+4,72%) pendant le période « pre » et « pos- entraînement ($p<0,05$). Sur la masse corporalle totale a eu un augmentation de 1,72%, pas arrivé a différences statistiquement significatives ($p>0,05$). Les résultat sugerent que l`entraînement en circuit donne de réponses significatives sur la pourcentage de graisse, masse grosse et masse maigre sur jeunes filles pos-pubères, em contrapatie, seulement l´entraînement en circuit, apparemment est suffisant pour perdre la masse corporalle totale de jeunes filles adolescentes. Une recherche de longue longueur et des échantillons doivent être réaliser pour observer les résultats de l`entraînement en circuit sur la masse corporalle totale, en indiquant que si l`entraînement en cicuit peux maintenir ou controler le poids corporal.

MOTS CLEFS : L`Entraînement en circuit, Les Plis cutanées, La Composition Corporalle.

IMPACTO DE DOCE SEMANAS DE ENTRENAMIENTO EN CIRCUITO SOBRE INDICADORES DE LA COMPOSICIÓN CORPORAL.

RESUMEN

El presente estudio tubo como objetivo evaluar el impacto de doce (12) semanas de entrenamiento en circuito con pesos sobre los indicadores de la composición corporal. Seis adolescentes pos- púberes (16 +- 0,89 años) sedentarias, pero aparentemente saludables de la Academia Transpiração de Caçador - SC, fueron escogidas para este estudio. El entrenamiento ocurre durante doce (12) semanas (dos sesiones por semana, en días alternados). Diez ejercicios compusieron el programa de entrenamiento en circuito, cada cual realizado en tres series de doce (12) repeticiones máximas (70% de 1 RM) y con intervalos de recuperación, siendo el pasaje de un ejercicio a otro. Medidas de doblas cutáneas fueron colectadas antes y después del periodo de intervención. Los resultados a través del teste "t" pareado revelaron diferencias estadísticamente significativas en el porcentaje de grasa (-11.01%), en la masa gorda (-9,41%) y el incremento de la masa flaca (+4,72%) del periodo "pre" para el "pos"-entrenamiento ($p<0,05$). En la masa corporal total hubo un aumento de 1,72%, no ocurriendo diferencias estadísticas significativas ($p>0,05$). Los resultados sugieren que el entrenamiento en circuito tiene respuestas significativas en el porcentaje de grasa, masa gorda y masa flaca en adolescentes pos-púberes, en contrapartida, solamente el entrenamiento en circuito parece ser insuficiente para la perdida de masa corporal total en adolescentes. Investigaciones con mayor duración y muestras deben ser realizadas para observar los resultaos del entrenamiento en circuito en masa corporal total, indicando si el entrenamiento puede mantener o controlar el peso corporal.

PALABRAS LLAVES: Entrenamiento en circuito, Doblas cutáneas , Composición Corporal.

IMPACTO DE 12 SEMANAS DE TREINAMENTO EM CIRCUITO SOBRE INDICADORES DA COMPOSIÇÃO CORPORAL.

RESUMO

O presente estudo teve como objetivo avaliar o impacto de 12 semanas de treinamento em circuito com pesos sobre os indicadores da composição corporal. Seis meninas pós-púberes (16 ± 0,89 anos) sedentárias, mas aparentemente saudáveis da Academia Transpiração de Caçador - SC foram escolhidas para o estudo. O treinamento em circuito ocorreu durante 12 semanas (duas sessões por semana, em dias alternados). Dez exercícios compuseram o programa de treinamento em circuito, cada qual realizado em três séries de 12 repetições máximas (70% de 1 RM) e com intervalo de recuperação sendo, a passagem de um exercício a outro exercício. Medidas de dobras cutâneas foram coletadas antes e após o período de intervenção. Os resultados através do teste "t" pareado revelaram diferença estatisticamente significativa no percentual de gordura (-11,01%), na massa gorda (-9,41%) e um incremento da massa magra (+4,72%) do período pré para o pós-treinamento ($p<0,05$). Na massa corporal total houve um aumento de 1,72%, não ocorrendo diferenças estatisticamente significativa ($p>0,05$). Os resultados sugerem que o treinamento em circuito tem respostas significativas no percentual de gordura, massa gorda e massa magra em meninas pós-púberes, em contrapartida, somente o treinamento em circuito parece ser insuficiente para perda de massa corporal total em meninas adolescente. Pesquisas com maior duração e amostras devem ser feitas para observar os resultados do treinamento em circuito na massa corporal total, indicando se o treinamento em circuito pode manter ou controlar o peso corporal.

PALAVRAS-CHAVES: Treinamento em Circuito, Dobras Cutâneas, Composição Corporal.