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ACUTE EFFECT OF CIRCUIT AEROBIC AND TRADITIONAL AEROBIC TRAINING ON HAMSTRING FLEXIBILITY IN SEDENTARY WOMEN

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Abstract:

The aim of this study is investigation of acute effect of circuit aerobic exercise and traditional aerobic exercise on hamstring muscle flexibility in sedentary women. Forty four sedentary women voluntarily participated in this study as subject. Subjects divided two groups as circuit aerobic training group (n=24), and traditional aerobic training group (n=20). For hamstring flexibility, modified sit and reach test was used. The test was applied three times as: before warm-up (T1), after immediately warm-up (T2), and after immediately exercise (T3). For warm-up intervention, 15 min mild running and static stretching were performed. Traditional aerobic exercise intervention consisted of 30 min moderate interval treadmill running. Circuit aerobic exercise intervention consisted of 30 min, 3x4 station (bench-step, jumping rope, cycling, treadmill running), and all station maintained to 3 min load with 2 min rest. Both training intervention performed at 65-75% HRmax that controlled with chest band. For statistical analysis, 2x3 mixed factor ANOVA and Bonferroni correction were used. Hamstring flexibility determined in the traditional aerobic exercise group as T1 by 13.90±4.22 cm, T2 by 19.90±4.55 cm, T3 by 29.45±6.54 cm; in the circuit aerobic exercise group as T1 by 21.20±6.89 cm, T2 by 24.08±6.67 cm, T3 by 25.62±6.67 cm. Differences between the three measurements of both groups were found statistically significant ($p < 0.05$). There were significant differences between T3 and T1-T2; and between T2 and T1 in both groups ($p < 0.05$). Differences in traditional aerobic exercise group were found more significant

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than circuit aerobic exercise group ($p < 0.05$). In summary, it could be said that hamstring flexibility increased after aerobic exercise, and at this point, traditional aerobic exercise has one step ahead of circuit aerobic exercise.

Keywords: circuit, aerobic, hamstring, flexibility, training

1. Introduction

Aerobic energy system covers at least ten minutes exercises. At this point circuit or traditional aerobic exercises included that point (Fox et al., 2012). Recovery, made possible by the high aerobic capacity, is important in sports that a large number of repetitions of a skill is important, or in team sports where there are a large number of running circuits. High aerobic capacity can be positively transferred to the anaerobic capacity. If an athlete improves aerobic capacity, anaerobic capacity will also develop. Because the athlete will be able to function for a long time without getting in the oxygen, cost and will recover in a very short time after entering the oxygen cost (Kuter and Öztürk, 1991).

Circuit training has comparatively low loads and low repetitions per sets for developing aerobic performance (Alcaraz et al., 2008). Circuit training creates positive cardiovascular, metabolic, and hormonal responses (Fleck, 1988; Harber et al., 2004; Kreamer et al., 1993; 1991; 1987).

The aim of the present study is investigation of acute effect of circuit aerobic exercise and traditional aerobic exercise on hamstring muscle flexibility in sedentary women. For this purpose, circuit and traditional aerobic training protocols performed to two groups produce for effects.

2. Method

2.1 Experimental Design

Randomized controlled pre and posttest design was used for the study. Subjects visited two times to the lab. At the first visit, subjects were familiarized to the study protocols. At the second visit subjects performed pre and posttest flexibility values before and after acute exercise program. Subjects participated acute exercise program as traditional aerobic and circuit aerobic. Before and after, they performed hamstring flexibility tests. The test was applied three times as before warm-up, after immediately warm-up, and after immediately acute exercise program.

2.2 Subjects

Forty four sedentary women (Table 1) voluntarily participated in this study as subject. Subjects divided two groups as circuit aerobic training group (n=24), and traditional aerobic training group (n=20). Subjects separated two groups randomly with number table method.

Table 1: Descriptive parameters

	Grup	N	Min.	Max.	Mean	Std. Dev.
Age (years)	Circuit	24	22.00	38.00	30.75	5.07
	Traditional	20	21.00	30.00	25.35	2.96
Weight (kg)	Circuit	24	53.00	77.00	65.25	6.86
	Traditional	20	46.00	74.00	62.65	6.90
Height (cm)	Circuit	24	152.00	172.00	164.38	4.62
	Traditional	20	150.00	175.00	164.40	7.44
BMI (kg/m^2)	Circuit	24	19.49	29.67	24.18	2.69
	Traditional	20	17.97	26.67	23.17	1.90

2.3 Hamstring flexibility test

For hamstring flexibility, modified sit and reach test was used (Hui and Yuen, 2000). The test was applied three times as before warm-up (T1), after immediately warm-up (T2), and after immediately exercises (T3).

2.4 Warm-up protocol

For warm-up intervention, 15 min mild running and static stretching were performed.

2.5 Traditional and circuit aerobic acute program

Traditional aerobic exercise intervention consisted of 30 min moderate interval treadmill running. Circuit aerobic exercise intervention consisted of 30 min, 3x4 station (bench-step, jumping rope, cycling, treadmill running), and all station maintained to 3 min load with 2 min rest. Both training intervention performed at 65-75% HRmax that controlled with chest band.

2.6 Statistical analysis

For statistical analysis, 2x3 mixed factor ANOVA and Bonferroni correction were used. Statistical results were evaluated at $p<0.05$ level.

3. Results

Hamstring flexibility determined in the traditional aerobic exercise group as T1 by 13.90±4.22 cm, T2 by 19.90±4.55 cm, T3 by 29.45±6.54 cm; in the circuit aerobic exercise group as T1 by 21.20±6.89 cm, T2 by 24.08±6.67 cm, T3 by 25.62±6.67 cm (Figure 1). Differences between the three measurements of both groups were found statistically significant ($p < 0.05$). There were significant differences between T3 and T1-T2; and between T2 and T1 in both groups ($p < 0.05$). Differences in traditional aerobic exercise group were found more significant than circuit aerobic exercise group ($p < 0.05$) (Table 2).

Table 2: Hamstring flexibility analysis

	Trial	N	Mean	Std. Dev.	p	
	T1		21.20	6.89		
Circuit Aerobic Training	T2	24	24.08	6.67	0.001	T3-T1. T3-T2 T2-T1
	T3		25.62	6.67		
	T1		13.90	4.22		
Traditional Aerobic Training	T2	20	19.90	4.55	0.001*	T3-T1. T3-T2 T2-T1
	T3		29.45	6.54		

* traditional aerobic training affect significantly when compared with circuit aerobic (0.047)

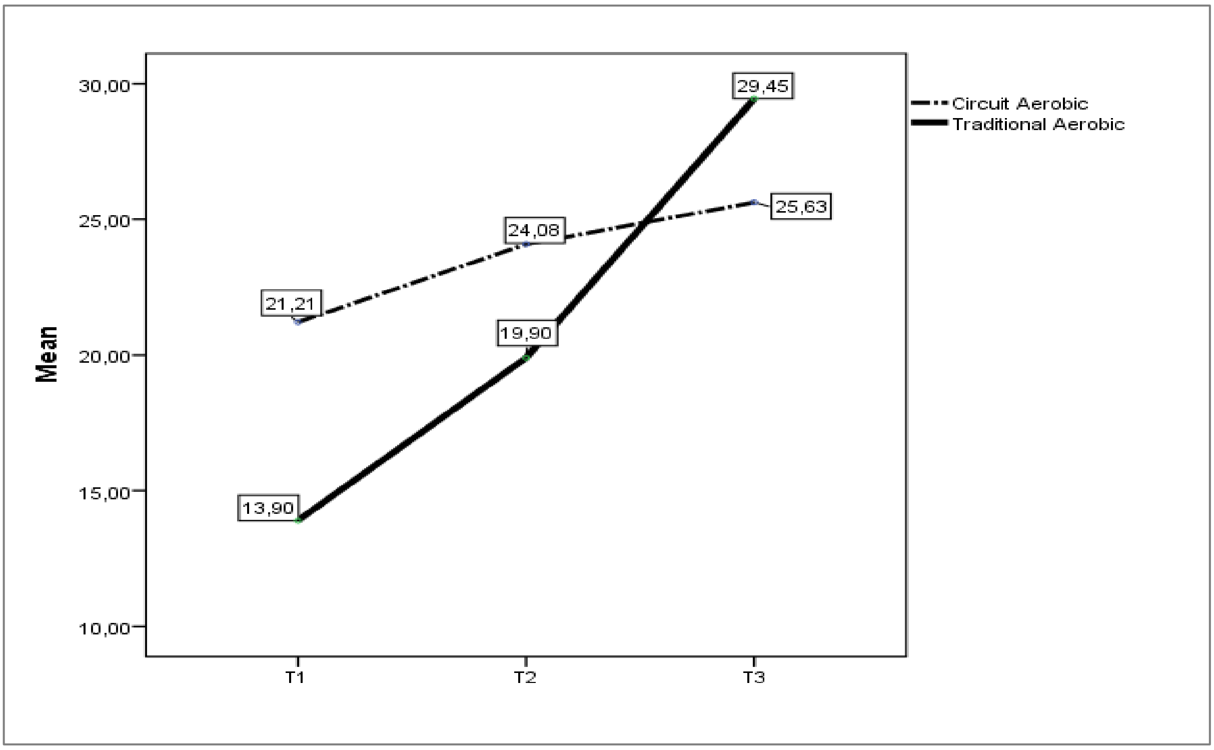

Figure 1: Difference between trials

4. Discussıon

As our result, both general warm up and aerobic exercise flexibility increased. Reason of this results general warm up and aerobic exercise create a load from moderate to severe. Thus, voluntary contractions create improved power output and muscle-nerve functions (Kabadayı, 2005; Faigenbaum et al., 2005; 2006; Gelen, 2002; 2010; Burkett et al., 2005).

It is known that fatigue in lower extremity can be caused increased swing level in anterior-posterior direction. As a result of this, it may be considered that production of efferent signal which required for body stability may be reduced, because transmission of afferent signal may be declined by fatigue (Gribble and Hertel, 2004; Gribble et al, 2004; Nardone et al., 1997; Johnston et al., 1998).

Additionally, muscle fatigue can be caused decrement in proprioceptive and kinesthetic properties in joints. Due to reduced afferent signal transmission following fatigue, the muscle spindle discharge treshold could increase, resulting in a change in joint sensitivity (Rozzi et al., 1999).

These evidences did not show in our study, because in our study increased flexibility performance occurred. Besides increment of temperatures of muscle improve to contractile function, and contracting strength with high power (McConnell et al., 1997).

Our results showed acute aerobic training improves flexibility. Reason of this reduced joint and muscle stiffness (Wright and Johns, 1961), increased nerve transmission speed (Karvonen and Lemon, 1992), improved power-acceleration relation (Febbraio, et al., 1996) and increased glicolis/phosphate catabolism (Proske et al., 1993).

As a result, it could be said that hamstring flexibility increased after aerobic exercise, and at this point, traditional aerobic exercise has one step ahead of circuit aerobic exercise.

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