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NEUROMUSCULAR ADAPTATIONS OF AN 8-WEEK RECREATIONAL SOCCER PRACTICE AND RUNNING TRAINING IN UNTRAINED WOMEN

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SUMMARY

The aim of the present study was to determine and compare neuromuscular adaptations of an 8-week recreational soccer practice and running training in untrained women. Twenty six healthy women [soccer group (SG): n=17; running group (RG): n=9] performed three weekly 50 min training sessions. After eight weeks, isometric quadriceps peak torque was increased by 7% and 9% in SG and RG, respectively. For muscle power in horizontal jump test, no differences were observed between pre and post-intervention for both groups. In conclusion, soccer and aerobic running training seems to promote similar neuromuscular adaptations in health untrained women.

INTRODUCTION

The benefits of soccer training on physical performance associated with neuromuscular adaptations have been widely reported [1,2]. Authors also have proposed sport-specific exercises (i.e. small-sided games – SSGs) as an alternative mode of aerobic training [3]. On other hand, SSGs include a high proportion of high-intensity actions, such as jumping, kicking, tackling, turning, sprinting, and changing pace [3,4]. Therefore, variations in intensity that occur during a soccer match cause a high recruitment of muscle fibers that can assist with training on muscle strength gain [1,5]. In this way, recreational soccer training has been used to assess health benefits in untrained people [6]. Studies have shown that practice of regular recreational soccer can improve peak jump power, maximal hamstring strength, and volumetric bone mineral density in the distal tibia, suggesting a decreased fracture risk due to stronger bones and a reduced risk of falling [7]. Comparative studies related to the effects of specific training in SSGs versus aerobic interval training have shown improvements in aerobic fitness in both groups. However there are few studies with untrained women demonstrating the effects of soccer training on neuromuscular variables. Thus, the aim of the present study was to determine and compare neuromuscular adaptations of an 8-week recreational soccer practice and running training in untrained women.

METHODS

Subjects: Twenty-six healthy untrained women were separated in two groups: soccer group (SG) and running group (RG), with age 28.8 ± 3.6 years old, body mass, height, body mass index and fat percentage of 63.1 ± 9.5 kg, 164.6 ± 6.1 cm, 23.7 ± 2.9 kg/m^2, 27.2 ± 4.4% and 27.1 ± 4.7 years old, 55.2 ± 4.9 kg, 163.4 ± 5.2 cm, 20.7 ± 1.7 kg/m^2, 27.1 ± 4.3%, respectively. None of the participants were on medication or were smokers, and none had been involved in regular physical activity for at least 3 months before intervention. The subjects were fully informed of the risks and discomforts associated with the experimental procedures. All participants signed an Informed Consent Form in agreement with the Committee of Ethics in Research of the Institution where this study was conducted.

Protocols: Both training intervention groups performed three times per week during eight consecutive and uninterrupted weeks (24 sessions). Throughout the intervention period, each participant attended at least 80% of sessions. The soccer sessions consisted of ordinary eight-a-side matches on a 50 x 30 m artificial grass field. The running aerobic training sessions consisted of continuous and interval training at low intensity (at lactate threshold - LT) and high intensity running (at onset of blood lactate accumulation - OBLA) on a motorized treadmill (Imbramed Millenium Super, Brazil) [8]. On Mondays and Fridays, participants exercised for 50 min at an intensity corresponding to OBLA, for 25 min divided into 5 x 5 min bouts interspersed with 1 min rest periods. The initial and final 10 min were performed continuously at an intensity corresponding to LT. On Wednesdays, participants exercised continuously for 50 min at an intensity corresponding to LT. Every two weeks, individual workload was increased by 5%.

Measurements: All variables of interesting were assessed before (pre) and after (post) the intervention period. *Neuromuscular variables* – All participants performed three horizontal jump tests, with 1 min rest, to measure lower limb muscle power. Force during three knee extension isometric contractions were recorded from right leg using a machine which included a chair (TRG Fitness, Brazil). A

load cell (Primax, BTS model, Brazil), with measuring tension capacity of 200 kgf, was attached to the equipment in order to acquire the force signal using a four channel Miotool 200/400 system (Miotec Biomedical, Brazil). The knee angle was fixed for all subjects at 60º (0º - full extension). Subjects were asked to perform three 5 s maximal voluntary contraction trials, with 2 min rest. Subjects were strongly encouraged, and the best result was used for further analysis.

Statistics procedures: Data are presented as mean ± standard deviation. Normality was assessed by Shapiro Wilk test. Dependent t-test for paired samples was used in order to compare the differences between pre and post intervention. Analyses were carried out using GraphPad Prism software package for Windows (v5.0 GraphPad Prism Software Inc, USA). Statistical significance was set at $p<0.05$ for all analyses.

RESULTS AND DISCUSSION

The major finding in the present study was that two months of regular participation in recreational soccer practice had similar effects to aerobic running training in neuromuscular variables in untrained women. After an 8-week of training, isometric quadriceps peak force was elevated by 7% and 9% in SG and RG, respectively (Table 1). The results are in agreement with previous study with untrained males [10]. Authors observed improvements in isometric quadriceps contraction strength for soccer group after 16 months of training. Increases in peak force can be explained by the high intensity occurring during a soccer game, which involves intense movements in different directions (accelerations, decelerations, jumps and rapid side-cutting movements) [9,10]. Peak force increase observed for RG may be related primarily to the untrained level and also to the high intensity of the training sessions (at OBLA), in which a greater recruitment of type II fibers may occur [11].

For muscle power (i.e. horizontal jump test) no significant differences were observed between pre and post intervention for both groups. Horizontal jump ability has been associated with maximum speed and acceleration [12]. However, no studies have evaluated muscle power of recreational soccer players by means of a horizontal jump test. Helge et al. [7] observed differences for muscle power, evaluated by the vertical jump test, in untrained menopause women after 14 weeks of recreational soccer training, but no changes for continuous running group. Their findings for recreational soccer group could be explained by the fact that the hamstring muscles are heavily activated during rapid accelerations and sprinting, which occur frequently in soccer at all competitive levels [13]. Differences between both studies may be related to the intervention period. Our results suggest that carrying out soccer practice or running training could be a useful way to obtain muscular strength improvements in untrained women.

CONCLUSIONS

Results demonstrated that an 8-week recreational soccer and aerobic running training seems to promote similar neuromuscular adaptations in health untrained women.

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Table 1: Mean and standard deviation values of peak force and horizontal jump test for recreational soccer group (SG) and running training group (RG) between pre and post-intervention.

	Period	**Pre**	**Post**
	Group	**x (SD)**	**x (SD)**
Peak Force (kgf)	SG	88.5 ± 15.6	94.8 ± 22.3*
	RG	68.2 ± 19.0	74.7 ± 21.6*
Horizontal Jump (cm)	SG	159.3 ± 27.3	159.5 ± 26.1
	RG	116.3 ± 14.8	121.5 ± 13.5

* Significant difference between pre and post intervention. $p<0.05$.