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EFFECTS OF TWO TYPES OF TRAINING SESSION ON PHYSIOLOGICAL AND NEUROMUSCULAR PARAMETERS OF ROLLER FIGURE SKATERS

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INTRODUCTION

There are few studies in the literature investigating figure skating [1,2]. Of these, most assess the biomechanical characteristics of some jumps [1], but none were found that analyze acute responses of training sessions. This kind of information is important so coaches can plan and determine the type and prescription of training to be applied to athletes. Therefore, the aim of this study was to evaluate acute responses of median frequency and height of squat jump (SJ) and counter movement jump (CMJ) after a conventional training session (CONV) and to compare these responses to those obtained after a systematized training session (SYST).

METHODS

Nine female athletes volunteered to take part in the present study (mean ± SD – age: 17.7 ± 2.9 years; height: 158.9 ± 6.3 cm; body mass: 52.3 ± 7.9 kg; training experience: 8.4 ± 4.6 years). The median frequency of Rectus Femoris (RF), Biceps Femoris (BF), Tibialis Anterior (Ti) and Medial Gastrocnemius (Ga) muscles and the height of SJ and CMJ were evaluated before and after (immediately after, 30 min after, 24 h after, 48 h after and 72 h after) two types of figure skating training session: CONV – the training session normally performed by the athletes, without any influence of the researchers, in which their coach determined number of jumps and intervals – and SYST – a training session with 96 jumps divided in three series of four repetitions of eight cycles, with each cycle composed by a period of acceleration, a jump and a period of active recovery, totalizing 15 s. Between each repetition was observed an interval of 3 min and between series, 5 min. Both training sessions had the duration of 60 min.

Before each session, electrodes were placed at the belly of the muscles of interest and the first collection of height and median frequency during the jumps were performed with a force plate (OR6-WP, AMTI; Watertown, USA) and an electromyograph (Miotool 400, MIOTEC, Porto Alegre, Brazil). All of the data collection was performed without skates and the subjects always used the same shoes. For calculations of the height of the jumps we used the formula proposed by Bosco et al. [3].

For data analysis we have considered the highest value of jump height for each type of jump and the concentric phase of the highest jumps to obtain the corresponding value of median frequency. Descriptive statistics were used to analyze the collected data, with the data presented as the mean ± SD. Paired T Test was used for the comparison between sessions at the different time points (α=0.05).

RESULTS AND DISCUSSION

Regarding jump height, we observed differences between sessions in the 72 h moment for SJ and CMJ with significantly higher values for CONV (Table 1). Also, it is possible to observe that the pattern is the same within the different time points, although not significantly different. Literature usually shows a reduction of height as acute response after strength or power training [4], which is inconsistent with our observations. It is possible that this is due to a potentiation mechanism of the jumps, causing the maintenance of height immediately after the sessions and, according to Komi [5], moderate fatigue of the stretch-shortening cycle, which could have happened in the present study, can result in a slight force potentiation caused by the stretch-reflex of this mechanism, present in the jumps.

Results concerning RF, BF, Ti and Ga median frequency (Table 2) showed statistically significant differences between sessions at the moment 24 h after for BF and 48 h after for Ti during SJ, with higher values observed after SYST for both muscles. These findings are not in line with literature findings of an increase in the median frequency values, which could indicate a change of the motor unit pattern of activation with greater recruitment of fast motor units or reduced values, indicating fast twitch fiber fatigue [6] and greater reliance on slow fibers [7] to continue activity.

Many similarities observed, both in height and in median frequency, are most likely related to the stimulus provided by the sessions, suggesting that the intensity was very similar, although the CONV had more jumps than the SYST (CONV: 139 ± 31.2 jumps; SYST: 96 jumps).

Table 1: Heights of Counter Movement Jump (CMJ) and Squat Jump (SJ) at time points before (BE), immediately after (IA), 30 min after (30 min), 24 h after (24 h), 48 h after (48 h) and 72 h after (72 h) training sessions.

		CONV	SYST
		Mean ± DP (m)	Mean ± DP (m)
CMJ	**BE**	0.21 ± 0.04	0.21 ± 0.06
	IA	0.20 ± 0.04	0.20 ± 0.06
	30 min	0.20 ± 0.04	0.20 ± 0.05
	24 h	0.20 ± 0.05	0.19 ± 0.06
	48 h	0.21 ± 0.05	0.20 ± 0.06
	72 h	0.21 ± 0.06	0.20 ± 0.06*
SJ	**BE**	0.18 ± 0.04	0.17 ± 0.05
	IA	0.18 ± 0.04	0.20 ± 0.05
	30 min	0.17 ± 0.04	0.19 ± 0.04
	24 h	0.19 ± 0.06	0.18 ± 0.05
	48 h	0.19 ± 0.05	0.19 ± 0.04
	72 h	0.20 ± 0.06	0.18 ± 0.06*

* indicates significant difference between sessions ($p<0.05$).

CONCLUSIONS

Based on our findings it can be concluded that SYST could be used as an alternative to expose athletes to less amount of impact while still getting the same acute results of a CONV. Moreover, we suggest that SYST be used in a precompetitive period to refine athlete's moves, while the CONV be used in the skill learning period.

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Table 2 - Median frequency of Rectus Femoris (RF), Biceps Femoris (BF), Tibialis Anterior (Ti) and Medial Gastrocnemius (Ga) during Counter Movement Jump (CMJ) and Squat Jump (SJ) at time points before (BE), immediately after (IA), 30 min after (30 min), 24 h after (24 h), 48 h after (48 h) and 72 h after (72 h) training sessions.

		RF		BF		Ti		Ga	
		CONV	SYST	CONV	SYST	CONV	SYST	CONV	SYST
		Mean ± DP (Hz)	Mean ± DP (Hz)	Mean ± DP (Hz)	Mean ± DP (Hz)	Mean ± DP (Hz)	Mean ± DP (Hz)	Mean ± DP (Hz)	Mean ± DP (Hz)
CMJ	**BE**	105.9±17.35	105.9±16.4	81.7±10.6	78.9±10.5	112.9±22.7	118.3±25.95	98.7±20.9	100.2±15.7
	IP	111.1±19	102.9±21.4	82.8±18.4	86.8±11	117.8±27.4	119.1±32	105.4±17.2	103±13.5
	30 min	110.3±18.4	111±18.4	79.2±15.4	87.7±13	115.9±26.4	119.8±30.9	102.2±12.6	98.7±14.5
	24 h	101.3±18.85	98.8±13.7	85.55±14.7	91.3±16.9	110.9±22	115.4±31.8	97.7±12.1	99.1±11.3
	48 h	99.1±16.7	99.8±18.35	74.5±16	80.8±12.6	108.2±28.1	119±32.3	97.9±13.1	98.05±10
	72 h	109.4±17	95.2±23.3	91.25±25.3	82.7±16.5	110.8±24.6	116±26.6	94.6±22.5	98.9±19.2
SJ	**BE**	111.7±21.05	106.6±19.6	80.1±22.5	83.1±7.4	126.3±35.8	125.6±38.2	105.4±16.95	98.2±12.7
	IP	113.6±21.4	114.45±21.35	82.3±18.6	85.6±10.1	127±30.6	127.05±35.9	107.9±17.9	106.5±17.2
	30 min	112.9±21	112 ±19.15	82.6±16.7	86.6±10.2	124.8±25.7	128.8±35.1	104.2±13.7	103.1±13.6
	24 h	109±17.5	107±20.7	75.5±10.9	101.1±18.5*	124.3±35.1	112.7±29	102.3±14.9	98.8±16.1
	48 h	111.45±10	100.7±19.8	91.7±32.7	84.5±9.7	114.8±26.6	126.95±34.2*	104.9±18.8	95.2±9.1
	72 h	110.1±24.4	109.7±16.75	92.8±28.9	88.3±15.5	121.2±33.6	124.2±33.1	95.1±22.1	98.4±15.3

* indicates significant difference between sessions ($p<0.05$).