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EFFECTS OF DYNAMIC STRETCHING ON NEUROMUSCULAR REACTION TIME OF YOUNG FEMALE ATHLETES

COSMIN MIHAI MOCA[1*], **DAN MIHAI GHERŢOIU**[2]

ABSTRACT. ***Introduction.*** Reaction time is the ability to perform a single (non repeated) movement in the shortest time and it is a crucial skill in sports. It has been shown that using different warm-up strategies can improve performance output. Recently it has been discovered that static stretching may temporarily decrease the muscle's ability to perform. ***Objectives.*** The aim of this paper was to determine if the neuromuscular reaction time during jumping is influenced by dynamic stretching. ***Materials and Methods.*** The participants in this study were young female basketball players (N = 22), ages from 16 to 18 years old that underwent two measurements using the MGM-15 carpet in two situations: without doing dynamic stretching and after doing dynamic stretching. ***Results.*** There was a significant statistical difference in the scores between the control and after dynamic stretching measurements. This means that the dynamic stretching had an influence over the reaction time. ***Conclusion.*** The results of the present research demonstrated that local neuromuscular reaction time increased significantly after dynamic stretching compared to the baseline condition.

Keywords: *dynamic stretching, reaction time, female, athletes, neuromuscular*

REZUMAT. ***Efectele stretchingului dinamic asupra timpului de reacţie neuromuscular la tinere sportive.*** **Introducere.** Timpul de reacţie este abilitatea de a performa o singura mişcare în cel mai scurt timp posibil şi este crucial în sport. S-a demonstrat că folosind diferite rutine de încălzire se poate îmbunătăţi performanta. Recent s-a demonstrat că stretchingul static poate scădea temporar performanta musculară. **Obiective.** Scopul lucrării este de a determina dacă timpul de reacţie în săritură este influenţat de stretchingul dinamic. **Materiale şi metode.** Participanţii în studiu au fost baschetbaliste (N=22) cu vârsta între 16 şi 18 ani care au fost măsurate în două situaţii

[1] *Sport Games Department, Faculty of Physical Education and Sport, Babeş-Bolyai University, Cluj-Napoca, Romania*
[2] *Kinetotherapy and Theoretical Disciplines Department, Faculty of Physical Education and Sport, Babeş-Bolyai University, Cluj-Napoca, Romania*
[*] *Correponding author: cosmin.moca@gmail.com*

experimentale: fără stretching și cu stretching dinamic, folosind covorul MGM-15. **Rezultate.** S-a observat o diferență statistică semnificativă între condițiile experimentale fapt ce demonstrează influenta stretchingului dinamic asupra timpului de reacție. **Concluzie.** Rezultatele au demonstrat că timpul de reacție neuromuscular a crescut semnificativ în urma stretchingului dinamic.

Cuvinte cheie: *stretching dinamic, timp de reacție, sportive, neuromuscular.*

Background

It has been shown that using different warm-up strategies can improve performance output. Widely regarded as an integral part of sport conditioning programs and warm-up routines static stretching can reduce muscle soreness and improve athletic performance while decreasing the risk of injury (Walsh, 2017). Recently it has been discovered that static stretching may temporarily decrease the muscle's ability to perform (Costa et al., 2009). Other forms of stretching have been proposed to be used during warm up to avoid this loss (Galazoulas, 2017). Considering that most of these studies have investigated the loss in muscle strength and power output in the context of stretching of biomechanical parameters, it is therefore interesting to examine the effects of dynamic stretching on neuromuscular reaction time.

Cognitive abilities and efficient awareness processes considerably saturate technical performance in sports by ensuring quick and correct responses to external stimuli and allowing more time for preparation and organization of motor behavior (Mori et al., 2002; Kim & Petrakis, 1998; Scott et al., 1993; Williams & Elliot, 1999; Fontani et al., 2006). Therefore, to achieve a high quality performance of sport techniques, reaction time is crucial (Mori et al., 2002; Kim & Petrakis, 1998). Little is known about the effects of dynamic fatigue on neuromuscular reaction time, even though it has been recently shown that reaction time was affected by some factors such as age, gender and number of stimuli (Magill & Anderson, 2016; Chang et al., 2012).

Reaction time is the ability to perform a single (non repeated) movement in the shortest time and it is a crucial skill in sports. Quantifying the performance of professional athletes during lateral plyometric exercises has been done recently (Wong et.al., 2012), as an effective way to evaluate athletes' acyclic rapidity through the analysis of contact times.

Dexterity creates the optimal environment to learn complex movements in a relatively rapid way (Atan and Akyol, 2014). It is composed of movement control and other regulation processes. Moreover, coordinative abilities are crucial in many sports, allowing for an easier control of motor actions.

High performance of the physical and motor skills translates into a higher probability for an athlete to be successful in sport events. Reaction time is one of the parameters that may empower an athlete to have such performance (Koç et. al., 2006). The time that elapses between a stimulus and the reaction given to it is defined as reaction time. There are a lot of factors and variables that influence reaction time such as age, gender, fitness, training (Colakoglu et. al., 1993).

Objectives

The aim of this paper was to determine if dynamic stretching influences the neuromuscular reaction time of young female athletes.

Methods

Subjects

The participants in this study were young female basketball players (N = 22), ages from 16 to 18 years old that underwent two measurements using the MGM-15 carpet in two situations: without doing dynamic stretching and after doing dynamic stretching.

Methods and the Steps of the Research

We used the MGM-15 Jumping Carpet for test. The test consists of 15 jumps on both legs that must not be bent during the execution. The software from the MGM-15 Jumping Carpet laid out, among others, one measurement for each subject named Reaction Time (R.T.).

R.T. (Average reaction time) – it is measured during the jumps on both legs and offers data regarding the overall average reaction time the subject had.

For dynamic stretching, each participant assumed a standing upright position and began to perform the exercises under the verbal guidance of the experimenter. The exercises were performed in the following order: plantar flexors, hip extensors, hamstrings, hip flexors, and quadriceps femoris. Each stretching session was performed by repetitively bouncing the stretched muscle to its limit of motion range with 15 repetitions, each lasting 2 s. The procedure was performed on the right leg and subsequently the left leg. There was a 10–15 s rest period taken between exercises while the total time of the session was 7 ± 1 min.

Results

Table 1. Average values of neuromuscular reaction time for each of the subjects for both the control measurement and the one preceded by dynamic stretching

Subject	React_Time_Dynamic	React_Time_Control
1	0.325	0.410
2	0.458	0.530
3	0.390	0.470
4	0.452	0.510
5	0.332	0.410
6	0.377	0.460
7	0.489	0.560
8	0.462	0.530
9	0.401	0.450
10	0.385	0.450
11	0.490	0.540
12	0.442	0.520
13	0.311	0.380
14	0.372	0.420
15	0.313	0.390
16	0.436	0.530
17	0.374	0.450
18	0.430	0.520
19	0.320	0.410
20	0.363	0.410
21	0.461	0.520
22	0.436	0.490

Table 2. Descriptive statistics for the control and dynamic stretching measurement of the reaction time

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	React_Time_Dynamic	.4009	22	.05803	.01237
	React_Time_Control	.4709	22	.05605	.01195

Table 3. Correlation between the control and dynamic stretching measurement of the reaction time

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	React_Time_Dynamic & React_Time_Control	22	.968	.000

Table 4. Paired sample t test for the measurements (control and dynamic stretching) for the tested variable: reaction time

Paired Samples Test									
		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	React_Time_ Dynamic - React_Time_ Control	-.070045	.014627	.003118	-.076531	-.063560	-22.461	21	.000

A paired-samples t-test was conducted (Tabel 4) to compare the reaction time before and after using dynamic stretching. There was a significant statistical difference in the scores between the control (M=0.4709, SD=0.056) and after dynamic stretching (M=0.4009, SD=0.058) conditions; t (21)=-22.461, p = 0.000. This means that the dynamic stretching had an influence over the reaction time of the subjects as recorded by the MGM-15 Jumping Carpet.

Conclusion

The aim of this study is to examine the acute effect of dynamic stretching on the local neuromuscular reaction time during a series of anaerobic jumps. The results revealed that the reaction times were significantly improved (decreased) after dynamic stretching compared to control measurement. A significant increase was shown with the large effect size in all subjects. Previous studies on the effects of dynamic stretching on the performance have primarily focused on neurophysiological aspects such as strength and power performance.

The results of the present research demonstrated that local neuromuscular reaction time increased significantly after dynamic stretching compared to the baseline condition.

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