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# POWER OUTPUT DIFFERENCES IN THE CONTEXT OF DYNAMIC STRETCHING IN YOUNG MALE ATHLETES

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**ABSTRACT.** ***Introduction.*** Static stretching is generally performed in sport and clinical settings, although dynamic stretching is increasingly being used before exercise and competition. There is strong evidence that a decrease in muscle strength can be the result of longer durations of static stretching, a phenomenon called stretching-induced force deficit. ***Objectives.*** The aim of this paper was to determine the jumping power output differences before and after dynamic stretching in young male athletes. ***Materials and Methods.*** The participants in this study were young male athletes (N = 18), aged from 14 to 16 years old that underwent two measurements on the MGM-15 carpet. ***Results.*** There was a significant statistical difference in the scores between the control and after dynamic stretching conditions. This means that the dynamic stretching had an influence over the power output of the subjects. ***Conclusion.*** The results revealed that the power output was significantly improved (increased) after dynamic stretching compared to control measurement. Furthermore, dynamic stretching should be performed in order to increase the power output performances of jumping.

***Keywords:*** *dynamic stretching, power output, male, athletes, jumping*

**REZUMAT.** ***Diferenţele de putere în contextul stretchingului dinamic la tinerii sportivi.*** **Introducere.** Stretchingul static este folosit de obicei în activităţi sportive şi în recuperare dar stretchingul dinamic este folosit din ce în ce mai mult în încălzire şi în competiţii. Există probe că poate exista o scădere a forţei ca urmare a unor perioade lungi de stretching static. **Obiective.** Scopul lucrării este de a determina diferenţele de putere în săritură înainte şi după stretchingul dinamic la sportivi tineri. **Materiale şi metode.** Participanţii au fost sportivi tineri (N=18), cu vârstele între 14 şi 16 ani care au fost măsuraţi cu covorul MGM-15. **Rezultate.** S-a constatat o diferenţă statistică semnificativă

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în scorurile între cele două situaţii experimentale fapt ce ne face sa constatăm că stretchingul dinamic are efect. **Concluzii.** Rezultatele au arătat ca puterea a fost semnificativ mai mare după stretchingul dinamic. Mai mult stretchingul dinamic ar trebui sa fie utilizat pentru creşterea puterii în sărituri.

***Cuvinte cheie:*** *stretching dinamic, putere, sportivi băieţi, sărituri.*

## Background

The power capabilities of lower limbs have been assessed and trained through the use of maximum vertical jump (Markovic, 2007). Therefore, the effect of different loading styles during training on production of the maximal power output in jumping has been a constant research topic (Bevan et al., 2010). Loading spectrum used, the methods used for load determination, different kinetic and kinematic variables evaluated and the influence of body size on the calculated power have been related to failure to reach an optimal loading to maximize the power output in vertical jumping (Cormie et al., 2007).

Static stretching is generally performed in sport and clinical settings, although dynamic stretching is increasingly being used before exercise and competition (Takeuchi et al., 2019). Increases in the range of motion and decrease muscle stiffness have been shown to be the result of static stretching (Ryan et al., 2008). Moreover, there is strong evidence that a decrease in muscle strength can be the result of longer durations of static stretching, a phenomenon called stretching-induced force deficit (Kay and Blazevich, 2012; Simic et al., 2013). Therefore, it is recommended that the longer duration during warm-up should be avoided generally to this deficit (Behm et al., 2016; Behm and Chaouachi, 2011; Kay and Blazevich, 2012; Simic et al., 2013). The two primary factors of stretching-induced force deficit that explain it have been considered to be: neural factors (altered motor control strategies or reflex sensitivity) and mechanical factors (changes in muscle stiffness) (Cramer et al., 2007).

## Objectives

The aim of this paper was to determine if dynamic stretching influences the power output during jumping of young male athletes.

## Methods

*Subjects*

The participants in this study were young male athletes (N = 18), aged from 14 to 16 years old that underwent two measurements on the MGM-15 carpet: the power output test before and after 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 Average Unit of Power.

P.U. (Average Unit of Power) – it is measured during the jumps on both legs and offers data regarding: (a) the level of conditional training in sport performance; (b) information regarding the relation between force and speed.

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 power output for each of the subjects for control and dynamic stretching measurement

| Subject | Power_Control | Power_Dynamic |
|---|---|---|
| 1 | 3.20 | 3.87 |
| 2 | 2.85 | 3.05 |
| 3 | 4.18 | 4.57 |
| 4 | 1.77 | 2.63 |
| 5 | 4.69 | 5.06 |
| 6 | 3.79 | 4.04 |
| 7 | 4.32 | 4.68 |

| Subject | Power_Control | Power_Dynamic |
|---|---|---|
| 8 | 5.34 | 5.69 |
| 9 | 4.20 | 4.48 |
| 10 | 3.89 | 4.16 |
| 11 | 5.11 | 5.33 |
| 12 | 2.78 | 3.32 |
| 13 | 2.99 | 3.80 |
| 14 | 3.15 | 3.98 |
| 15 | 3.78 | 4.15 |
| 16 | 1.90 | 2.53 |
| 17 | 5.60 | 6.22 |
| 18 | 4.23 | 4.80 |

**Table 2.** Descriptive statistics for the control and dynamic stretching measurement of the power output

| Paired Samples Statistics | | | | | |
|---|---|---|---|---|---|
| | | Mean | N | Std. Deviation | Std. Error Mean |
| Pair 1 | Power_Control | 3.7650 | 18 | 1.08407 | .25552 |
| | Power_Dynamic | 4.2422 | 18 | .99375 | .23423 |

**Table 3**. Correlation between the control and dynamic stretching measurement of the power output

| Paired Samples Correlations | | | | | |
|---|---|---|---|---|---|
| | | | N | Correlation | Sig. |
| Pair 1 | Power_Control & Power_Dynamic | | 18 | .982 | .000 |

**Table 4**. Paired sample t test for the measurements (control and dynamic stretching) for the tested variable: power output

| Paired Samples Test | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Differences | | | | | | | |
| | | | | | 95% Confidence Interval of the Difference | | | | |
| | | Mean | Std. Deviation | Std. Error Mean | Lower | Upper | | | |
| Pair 1 | Power_Control - Power Dynamic | -.47722 | .21857 | .05152 | -.58592 | -.36853 | -9.263 | 17 | .000 |

A paired-samples t-test was conducted (Tabel 4) to compare the power output before and after using dynamic stretching. There was a significant statistical difference in the scores between the control (M=3.765, SD=1.084) and after dynamic stretching (M=4.242, SD=0.993) conditions; t (17)=-9.263, p = 0.000. This means that the dynamic stretching had an influence over the power output of the subjects as recorded by the MGM-15 Jumping Carpet.

## Conclusion

The aim of this study is to examine the power output during anaerobic jumping in two distinct scenarios: before and after dynamic stretching. The results revealed that the power output was significantly improved (increased) after dynamic stretching compared to control measurement.

This study examined the effects of dynamic stretching method on power output performance in young male athletes. This study showed that dynamic stretching may improve performance in regards to power output. According to our results, coaches and sport scientists should take into account selecting stretching type after the warm-up session. Furthermore, dynamic stretching should be performed in order to increase the power output performances of jumping. Based on these results, as shown in many studies in the literature, dynamic stretching exercises should be select in order to create a positive effect on the performance.

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