

EFFECT OF DIFFERENT STRETCHING PROTOCOLS ON VERTICAL JUMP PERFORMANCE

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A Çalışma Deseni (Study Design)

B Verilerin Toplanması (Data Collection)

C Veri Analizi (Statistical Analysis)

D Makalenin Hazırlanması (Manuscript Preparation)

E Maddi İmkanların Sağlanması (Funds Collection)



Abstract: This study aimed to examine the effect of different stretching exercises on vertical jump performance. A total of 14 national male athletes sporting in the elite level took part in the study. The age average of the participants was 20.25 ± 1.03 year, the average height was 1.80 ± 0.08 m, the average body weight was 77.14 ± 18.91 kg, average of sporting age was 9.87 ± 3.31 year and the average number of participation in international games was 10.0 ± 3.31 . As stretching protocol: Method 1 (5 minutes of jogging and 2 minutes of active rest) followed by Method 2 (static stretching for 4 different muscle groups 3 repetitions for 15 seconds of static stretching, rest for 10 seconds between groups) and then consecutively, Method 3 (Dynamic stretching exercises with 3 repetitions for 15 seconds and 10 seconds rest between different muscle groups) were applied in the study. The vertical jump performance before and after different stretching exercises of the participants was determined by means of the vertical jump test using the smart speed lite system. Before and after the training of all athletes, HR was recorded with a heart rate monitor (RS 800, Polar Vantage NV, Polar Electro Oy, Finland) with 5 seconds intervals. Before the study, the chest band of the heart rate monitor was placed on the chest of the athlete and the HR was recorded from the monitor. SPSS 15.0 statistical package program was used for evaluation and calculation of the data. In this study in addition to descriptive statistics (mean and standard deviation) paired samples t-test was used to determine the difference between the vertical jump performance of the participants before and after different stretching exercises. As a result, this study showed that; applying the dynamic and static stretching exercises consecutively affected the vertical jump performance 4.5 cm positively ($p < .05$). It is suggested that different dynamic and static stretching exercises should be included in the vertical jump.

Keywords: Training; Training, Dynamic stretching, Static stretching, Vertical jump

1. INTRODUCTION

A vertical jump is called a double-foot jump event by standing or running to a certain target. Three chances of trials are granted and the best score of the subject is recorded. 8-10 cm higher performance is observed in jumping by running compared to jumping by standing. In general, male high-level athletes reach 90-105 cm and female high-level athletes reach 70-80 cm in height (Muratlı and Sevim, 1977). The difference between the height level at which the athlete can reach by standing and the height level he can reach by jumping is measured in terms of the meter (m). The anaerobic capacity is calculated by performing the following formula: Anaerobic Power = $(4.9 \times (\text{Weight}) \times \text{distance of Vertical Jump (m)})$ (Sevim, 2002). In a study to determine the effect of the vertical jump capacities of the athletes in the basketball branch on the performance of the competition, variables of the physical characteristics of the athletes and the vertical jump values were compared among the groups and according to their physical characteristics, the vertical jump ability was found to differ among the groups (Okur et al., 2013). In a study conducted in order to investigate the effect of 6 weekly plyometric exercises added to basketball training on maximum 1 set-squat, vertical jump and 30 m speed performance, it was concluded that the 6-week plyometric training has a positive effect on vertical jump. It was also stated that the 6-week plyometric exercises added to the seasonal basketball technical training could be used as an effective method to improve the motor features of athletes (Bavlı, 2012). In a study to determine the vertical jump performance of 8-15-year-old athletes and the effect of 8-week plyometric training on some physiological and physical parameters of basketball players, a significant increase was found in the vertical jump, horizontal jump and anaerobic power values of the group participating in the training (Cicioğlu et al., 1997). In the study, the effect of circular speed-strength training on some motor skills of 16-18-year-old male table tennis players was examined. And as a result a significant increase in anaerobic power and vertical jump parameters was noted as a result of circular speed-strength training (Çimen and Günay, 1996).

To increase the athletes' performance and their stretching ability, performing stretching exercises are important. These exercises are supposed to be performed regularly both during warm-ups and training. In many studies debating the effect of stretching exercises on performance and prevention of injury risk, it has been concluded that stretching exercises in the pre-activity process as important (McNeal and Sands 2003; Gelen et al., 2008; Turan and Çilli 2016,). The warm-up exercises make the athlete ready for the competition and reduce the risk of injuries to the muscles and joints with the exercises applied. Warm-up exercises are usually started at a low level and gradually increased. Static stretching exercises are performed after these economic conditions with low intensity. However recent studies have shown that these exercises prevent athletes from the actual performance to be presented (Turan and Çilli, 2016). Besides, in some studies; they suggested that pre-training dynamic exercises improved

performance and provided preparation for the performance (Behm et al., 2006, Fletcher et al., 2007; Turan and Çilli, 2016). According to information given above, this study aimed to examine whether the different stretching methods on the vertical jump have a positive effect on performance.

2. MATERIAL AND METHOD

Study Group: A total of 14 national male athletes sporting in the elite level took part in the study. The age average of the participants was 20.25 ± 1.03 year, height was 1.80 ± 0.08 m, the average of body weight was 77.14 ± 18.91 kg, sporting age average was 9.87 ± 3.31 year and the average number of participation in international games was $10. \pm 3.31$. The study was carried out in the field of Selçuk University School of Physical Education and Sport. The height (m) and body weight (kg) of the athletes participating in the study were measured by using an electronic scale (Professional Sports Technologies, Sports Expert).

Collection of Data: The study was based on three different methods of applying the light tempo jogging, protocols of static and dynamic stretching. The athletes participating in the study were informed about stretching techniques and how to apply these techniques. The different stretching exercises were applied to the athletes consecutively and immediately afterward the jumping performances were observed.

Protocol: The athletes were applied jogging for 5 minutes. Immediately afterward 2 minutes of active resting was applied in the form of only walking. Then, to 4 different parts; arm, shoulder, back, leg static stretching exercises; 15 seconds stretching, 3-set, 10 seconds rest intervals were applied after each section. Afterward, to four different parts (arm, shoulder, back, leg) different types of dynamic stretching exercises were applied in 3-set for 15 seconds, with intervals of 10 seconds between sections.

Table-1 Summary of the protocol applied

<u>Method1</u>	<u>Method 2</u> Static Stretching	<u>Method 3</u> Dynamic Stretching	<u>Set Number /</u> <u>Duration of exercise /</u> <u>Duration of rest (s)*</u>
Jogging	<u>Arm</u> Opens arms in shoulder position, palms rest in the backward position	<u>Arm</u> Move arms from elbow to chest and back to the former position	3set. / 15 s* / 10 s*
5 min.	<u>Shoulder</u> Hands are combined on the head and elbows are pulled back and stand still.	<u>Shoulder</u> Shoulders are moved in the circle	3set. / 15 s* / 10 s*
Active rest 2 min.	<u>Back</u> Combines arms at the back in hugging position	<u>Back</u> The arms are shoulder-to-shoulder opened and	3set. / 15 s* / 10 s*

		combined	
In the form of walking	<u>Leg</u> Keeps toes in a long sitting position	<u>Leg</u> While walking, tries pulling the knee up and touches the elbow knee at the position where the knee and the elbow crosses	3set. / 15 s* / 10 s*

Vertical Jump Test: The vertical jump performance of the athletes was measured by the electronic smart speed lite system. The athletes jumped to the highest point where they could jump when they felt ready. The athletes landed on the mat again. The jumping distances of the athletes were measured electronically in the form of cm and the best of 3 trials was recorded (Serin and Taskin, 2016).



Figure-1 Vertical Jump Test

Measurement of Heart Rate: Before and after different warm-up exercises, athletes' HR was recorded with a heart rate monitor (RS 800, Polar Vantage NV, Polar Electro Oy, Finland) at intervals of 5 seconds. Before the study, the chest band of the heart monitor was placed in the chest of the athlete and the heart rate was recorded from the monitor.

Statistical analysis: SPSS 15.0 statistical package program was used for evaluation and calculation of data gathered. The data gathered were summarized by mean and standard deviation. In this study, Paired-Samples 't' test was performed to measure the difference between before and after warm-up awareness, and how the same group of subjects reacted in different situations.

3. RESULTS

Table-2 Descriptive statistics of the athletes participating in the study

Variables	N=	Average	Standart Deviation
Age (year)	14	20.25	1.03
Height (m)	14	1.80	0.08
Body Weight (kg)	14	77.14	18.91
Sporting Age (year)	14	9.87	3.31
Number of participation in international games (number)	14	10.00	4.89

When Table 2 was examined, the average age of the athletes participating in the study was found to be as 20.25 ± 1.03 years, the average of the height was $1.80 \pm .08$ meters, the average of the body weight was 77.14 ± 18.91 kg, the average of the sporting ages was 9.87 ± 3.31 years, and the average number of participation in international games was $10. \pm 4.89$.

Table-3 Physiological values before and after different warm-up methods for the athletes participating in the study

Variables	N	Average	Standart Deviation
Vertical jump before warm-up (cm)	14	41.64	6.18
Vertical jump after warm-up (cm)	14	45.94	6.18
heart rate in resting (rate/min)	14	77.12	12.66
Heart rate after different stretching (rate/min)	14	114.50	10.12

When Table 3 was examined, the average vertical jump values of the athletes participating in the study were determined as 41.64 ± 6.18 cm and the vertical jump values after warming were 45.94 ± 6.18 cm. The rest heart rate average was 77.12 ± 12.66 beats / min, heart rate after warm-up was 114.5 ± 10.12 beats / min. ($p < .05$). According to findings, there was a difference of 4.50 cm between pre-warming and post-warming vertical jump performance ($p < .05$). The dynamic and static stretching exercises applied after the starting stages of light tempo aerobic exercise increase the vertical jump performance.

4. DISCUSSION

In this study, the effect of different stretching methods on the vertical jump performance was investigated, it was determined that different stretching methods affected the vertical jumping positively ($p < .05$). It was observed that vertical jump performance increased 4.5 cm at the end of dynamic and static stretching exercises. Vertical jump is important for the athletes to outperform their competitors and to achieve maximum

performance, and a performance increase is achieved with different stretching methods. This study is parallel with this concept. It was found that different stretching methods improve the vertical jump performance. When the literature was examined, it was determined that there were studies that were parallel with this study. In a study of the effects of three different elasticity training on vertical jump performance by Kırmızıgil regardless of ability to generate flexibility and power, when the whole group was evaluated, it was found that stretching exercises increased performance compared to warm-up values, besides, PNF + static stretching compared to ballistic stretching, while PNF + static stretching was found to be significantly decreased in vertical jump performance compared to PNF + ballistic stretching (Kırmızıgil, 2012). In a similar study exploring the effect of plyometric training on vertical jump power applied to 12-14 age group basketball players; a significant difference was found in the vertical jump values before and after training of the experimental group at the end of eight weeks of training. The difference between the vertical jump values of the experimental group and the control group also became statistically significant after the training period (Uluçay, 2009). In a study about the anthropometric characteristics of elite male handball team players on the vertical and horizontal jump distance, body height, body fat percentage, chest circumference, thigh circumference, calf circumference, biceps diameter, wrist diameter, thigh length, calf length, leg strength and elasticity it was found that anthropometric characteristics of male handball players were found to be statistically significant factors in the vertical jump distances. It was also seen that age, body weight, shoulder circumference, forearm circumference, waist circumference, femur bicondylar diameter, chest depth diameter and all arm lengths of the handball players had an effect on the vertical jump distance. Accordingly, it was determined that the anthropometric characteristics of the individual influence the performance and it is considered that coaches and athletes should take the knowledge into consideration (Yıldırım, 2009). In another study; Pazarözyurt and İnce (2009) found the vertical jump height averages the athletes' as 47.38 ± 3.23 in the setters, as 47.43 ± 7.02 in the strikers and as 43.57 ± 3.90 in the pivots. But there was no statistically significant difference according to playing positions of the basketball players.

When the literature examined there are studies with different results with the present study (Siatras et al., 2003; Turan and Çilli 2016). In the studies exploring the acute effects on the speed performance of different warm-up protocols has led to the conclusion that dynamic stretching before activities requiring power, such as speeding, may be beneficial in terms of achieving efficiency (Gelen et al., 2010; Turan and Çilli 2016).

5. CONCLUSION

As a conclusion, all the athletes have to do these exercises before the training, but even professional athletes ignore them before they start training or competition, these

exercises are complementary in terms of their full performance. It was seen that different stretching exercises, which have an important place in terms of prevention of injuries and preparation for performance, have a positive impact on vertical jump performance. Because the stretching protocol was applied successively to different muscle groups in the study, duration of stretching was kept at 15 seconds. The subjects were national athletes whose initial measurements were determined as initial conditions and an increase in jumping performances as a result of correct stretching exercises. Especially in sports branches requiring jumping performance, the static and dynamic stretching exercises instead of warm-up exercises of athletes and coaches is suggested according to the study we have performed.

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