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The Effect of Static Stretching in the Initial Part of the Attack Spike Movement in High Level Female Volleyball Players

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ABSTRACT

The purpose of this study was to investigate the effect of static stretching on kinematics characteristics of female volleyball players during the initial part of the movement of the attack spike from the back row defense, in position 1. Twelve female volleyball players (age 18-21, training age 6-10 years, height 178.17 ± 3.15 cm and weight 65.90 ± 5.80 kg), volunteered as participants and they were randomly divided into two groups of 6 players. The exercise protocol involved a 5 minutes general warm-up, followed by the initial attack spike. After the first measurement, participants execute static stretching of the upper limbs and the final spike. Kinematic characteristics of the players during the initial and final spike, divided into 2 times (T) and 1 phase, were evaluated by a three-dimensional (3D) vinteoanalysis APAS. Paired t-test and Wilcoxon analysis showed significant difference and increase after the static stretching, of the right wrist displacement (DRWr) at the T 2 and 4 (p=0.014, p=0.039), of the left wrist displacement (DLWr) at the T 3 (p=0.012) and of the right wrist range of motion (RomRWr) at the first phase (p=0.037). Significant difference and reduction, after the static stretching, was found of the left shoulder angular velocity (VLSh) at T 4 (p = 0.024) and of the right wrist (VRKarp) at T 4 (p = 0.008, p = 0.017). No difference was observed on the kinematics characteristics of the lower limbs, on the total displacement (D) and the velocity of the center of body mass (CM), on the jump height and the speed of the ball. It is concluded that the volleyball players should avoid static stretching before the competition.

KEYWORDS : static stretching, kinematic analysis, kinematics characteristics, volleyball.

INTRODUCTION

There have been several investigations until now, about the effect of static stretching on performance, but the results are conflicting. The most common finding seems to be that it is is often part of the warm-up routine (Unick et al. 2005; Young et al., 2006), however, few studies has reported beneficial effects of stretching on performance (Pacheco et al., 2011; Sandberg et al., 2012) Existing literature offers varied conclusions on the influence of static stretching.

Improvements in concentric and eccentric isokinetic strength at low and high angular velocities, and Isometric strength of the anterior and posterior thigh muscles mentioned and Handel et al. (1997) after stretching program type PNF (proprioceptive neuromuscular facilitation) lasting eight weeks. In contrast to the results of these investigations Bazett-Jones, Gibson and Mcbride (2008) found no change in performance in the sprint and vertical jump after applying stretching six weeks in track and field athletes.

In sports especially volleyball during the warm up even today static stretching inserted between the general and specific part (Young &Behm, 2002), because the static stretching is considered a key component improving flexibility (Harvey, Herbert, &Crosbie, 2002, Knudson, Magnusson, & McHugh, 2000), performance (Worrell, Smith, &Winegardner, 1994), the prevention of muscle injury (Safran, Seaber, & Garrett, 1989), and the reduction of muscle injury (Smith, 1994). These improvements contribute to flexibility the performance of game movements with biomechanical precision providing production of maximum forces across the range of kinematic joints (Van Gyn, 1986).

Many studies refer to the benefits resulting from the application of static stretching however recent studies indicate negative performance in the sprints, jumps and power of the lower limbs. While, i.e., the majority of studies focused on the effect of static stretching of the lower ends and fewer listed in the upper extremities.

METHODS

Participants

Twelve female volleyball players (age 18-21, training age 6-10 years, height 178.17 ± 3.15 cm and weight 65.90 ± 5.80 kg), volunteered as participants and they were randomly divided into two groups of 6 players

SAMPLE NUMBER	(N = 12)
AGE (years)	19,75 ± 0,7
COACHING AGE (years)	7,33 ± 1,6

HEIGHT centimeters (cm)	178,17 ± 3,15
Kg WEIGHT (Kg)	65,90 ± 5,80

3D kinematic analysis

For the kinematic analysis of the attack spike was used the three-dimensional (3D) video analysis, Ariel Performance Analysis Systems (APAS). This program is a traffic analysis carried out by the computer / PC for measurement, analysis and presentation of execution of movement. H three-dimensional motion analysis consisted of three phases, which were: 1) the motion capture, 2) digitization, and 3) the calculation of the data.

Procedure

Athletes were divided randomly into two groups of six people in the volleyball court for the execution of the exercise protocol. This included: a general warm-up 5 minutes (1), the initial implementation of the attacking movement of the spike (2), static stretching (3), and final execution of the aggressive movement of the spike (4).

1) General warm-up consisted of running 5 minutes with low intensity around the volleyball, lateral movements of the body and running in different directions.

2) Athletes arrive in random order on one side of the field in attack and one to execute the attacking movement of the spike. An assistant from position 5 gave the ball to the setter, who was near the net in position 3 the setter passes the ball to the athlete by pass behind the head. The athlete execute a spike to the predetermined area of attack measures dimensions 4X3. The landing of the ball after the spike was on the opposite side of the field the predetermined region of size 9x3 meters. The athletes performed three consecutive attacks and evaluated the best. As best effort was evaluated, in which the ball was faster after hitting. The fixed seating in the territory identified with adhesive tape.

3) The players performing static stretching duration 15 seconds, alternating between the upper ends of each muscle group, which was repeated four times (4x15). The muscle groups they claim was the serratus anterior, deltoid, the pectoralis major, triceps brachial, the latissimus dorsi, the teres major, the subscapularis (Dupuis & Tourny-Chollet, 2003) and forearm. The total duration of stretching was 10 minutes. The players felt the great elongation of muscle maintains, without muscle pain.

Stretching

Picture 1 stretching exercises pectoralis major and subscapularis muscle

Picture 2 stretching exercises triceps, deltoid, teres major and latissimus dorsi muscle

Picture 3 stretching exercises latissimus dorsi, brachial triceps, subscapularis, teres major and serratus anterior muscle

Picture 4 stretching exercises of the wrist extensor muscles

Picture 5 Exercise distension abdominal flexor muscle of wrist

4) The final implementation of the spike was like the second part.

Variables

This investigation determined the kinematic characteristics for the following time points were

1) The time (X.S) 1, by pressing the two legs in the approach phase

Figure 1. Timing (X.S) 1

2) The time (X.S) 2, take off from the ground (Figure 3)

Figure 2. The time (X.S) 2

3) The time (X.S) 3, in which the beating arm is in the final position to the spike (Figure 4)

Figure 3. Time (CH.S)

The variables were evaluated for the above three times was

1), the velocity of the center of body mass (K.M.S) in horizontal, vertical axis (x, y, respectively).

2) the amplitude (D) and angular velocities (V) of the joints

Statistical analysis

For statistical data analysis used the statistical package SPSS 18 (Statistical Package for the Social Sciences) and was analyzed paired t-test (initial-final measurement). To control the regularity of the data distribution test was used Shapiro-Wilk, for samples with less than 50 people. Where the normal distribution (bell-shaped distribution) prices was not fulfilled, used the non-parametric Wilcoxon. The level of significance was set at $p < 0.05$.

RESULTS

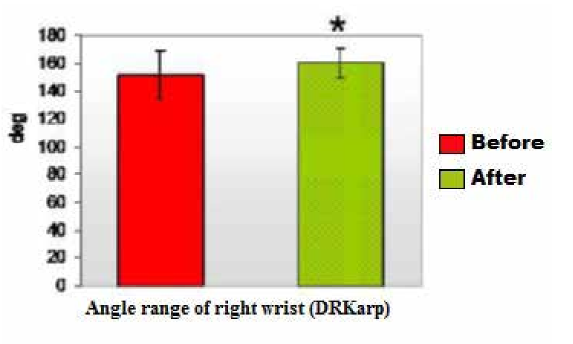

Table 2. Range of angle right wrist (DRKarp), before and after static stretch [(time (CH.S) 2] (* = statistically significant at the level p <.05)

Table 3. Range of angle left wrist (DLKarp), before and after static stretch [(time (X.S) 3] (* = statistically significant at the level p <.05)

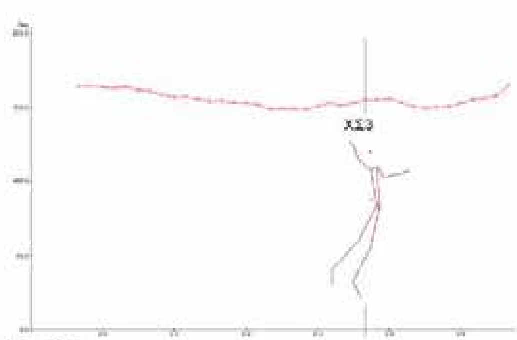

Figure 4. Graph of the amplitude angle of the left wrist (DLKarp) before the static stretching [time (CH.S) 3]

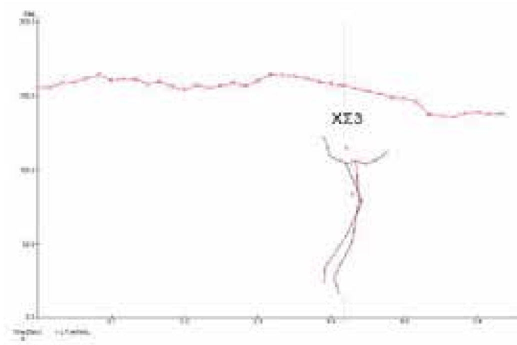

Figure 5. Graph of the amplitude angle of the left wrist (DLKarp) after static stretching [time (CH.S) 3]

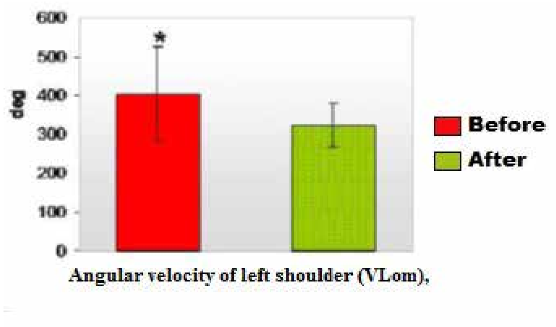

Table 3. Angular left shoulder speed (VLom), before and after static stretch [time (CH.S) 2] (* = statistically significant at the level p <.05)

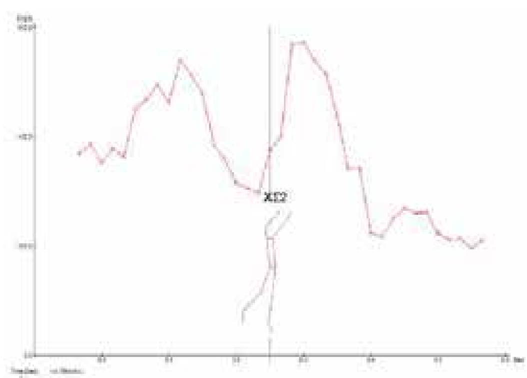

Figure 6. Graph of the angular speed of the left shoulder (VLom) before the static stretching [time (CH.S) 2]

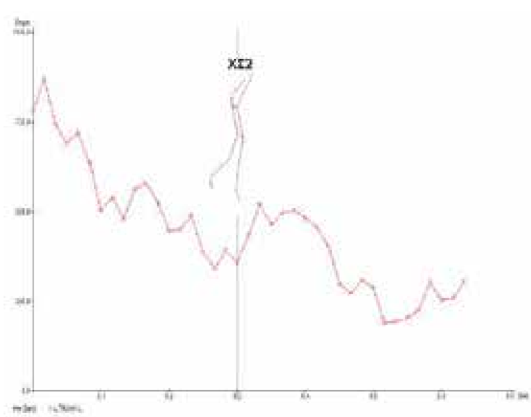

Figure 7. Graph of the angular velocity of the left shoulder (VLom) after static stretch [time (CH.S) 2]

DISCUSSION

The results of this study demonstrated an increase of the width of the joints of the right wrist at the time of two off the body center of mass (K.M.S) and at time 3, wherein the arm was in the cocking position to the nail.

Furthermore, unfortunately a reduction in the angular velocity of the left shoulder at take-off (time 2), after application of a static strain in accordance with the protocol applied, confirming the first research hypothesis.

Our results are in agreement with the corresponding results of other researchers (Kokkonen, et al., 1998, Fletcher & Jones, 2004, Cornwell, et al., 2001, Noffal et al., 2004), who found negative effects on the ability of maximum power in sprints, jumps and throws,

Decreases in isokinetic strength of the elbow flexors at low and high angular speeds in untrained women found and Evetovich, et al. (2003) after the static stretching a total duration of 120 seconds, performed four times for 30 seconds (4CH30).

In this investigation, the static stretching had a total duration of 60 seconds and performed four times for 15 seconds (4x15). The reductions observed after static stretching relating the angular velocity of the left shoulder at time 2

From the above results it is concluded that it is possible to static stretching affects more articulation performed with higher angular velocities. Analysis of the data showed that an static distension positively affect the joint range of motion. Since the change in the motion of a joint range is associated with a change in technique, we could conclude that most motor range may affect the technical execution of the aggressive movement of the nail.

Unlike the above researchers Molacek, et al. (2010), they found no decreases nor increases in muscular players power after static stretch at the upper ends a total duration of 40 seconds, performed twice for 20 seconds (2x20) and 150 seconds was carried out five times for 30 seconds (5x30).

Similar results were seen in the study Torres et al. (2008) performed in athletics athletes at maximum power and dropping after static stretching a total duration of 30 seconds in the upper limbs, performed twice for 15 seconds (2x15) as the Haag, et al. (2010) in the ball throwing velocity in baseball, after static stretch 30 seconds in the upper limbs, performed once and Knudson, et al. (2004) to serve in tennis after static stretching 30 seconds, performed twice for 15 seconds (2x15).

The conflicting results may be due to different methodological approach. In this study the static stretching had a total duration of 60 seconds and performed four times for 15 seconds (4x15), and in research of Torres et al. (2008), Haag, et al. (2010) and Knudson, et al. (2004) was shorter (30 seconds). While the Molacek, et al. (2010) were smaller and longer duration of 60 seconds of this investigation.

The reduction in performance after static stretch probably due to neurological factors (Avela, Finni, Liikavainio, Niemela & Komi, 2004, Avela, Kyrolainen & Komi, 1999), reducing muscle hardness, which may reduce the transmission of force the musculature in skeletal (Wilson, Murphy & Pryor, 1994), to reduce the blood flow during the elongation (Poole, Musch, & Kindig, 1997), to increase the level of calcium ions which cause repeated stretching (Westerbland, Burton, Allen, Lannergren, 2000). The reduction in performance after static stretch may be due to the destruction of muscle tissue. The Smith, Brunetz, Chenier, McCammon, Houmard, Franklin and Israel (1993) found an increase in creatine kinase after long duration static stretching.

REFERENCES

1. Dupuis, C., & Tourny-Chollet, C. (2003). Increasing Explosive Power of the Shoulder in Volleyball Players. National Strength & Conditioning Association, 25(6), 7-11.
2. Fletcher, I.M., & Jones, B. (2004). The effect of different warm-up stretch protocols on 20 meter spring performance in trained rugby union players. Journal of Strength and Conditioning Research, 18, 885-888.69
3. Haag, SJ., Wright, G.A., Gillette, C.M., & Greany, JF. (2010). Effects of acute static stretching of the throwing shoulder on pitching performance of National Collegiate Athletic Association Division III baseball players. Journal of Strength and Conditioning Research, 24(2), 452-457.
4. Handel, M., Horstmann, T. Dickbuth H., & Guich R., W. (1997). Effects of contract relax stretching training on muscle performance in athletes. European Journal of Applied Physiology, 76, 400-408.
5. Harvey, L., Herbert, R., & Crosbie, J. (2002). Does stretching induce lasting increases in joint rom? A systematic review. Physiotherapy Research International, 7, 1-13.
6. Knudson, D., Magnusson, P., & McHugh, M. (2000). Current issues in flexibility fitness. President's Council on Physical Fitness and Sports Research Digest, 3(9), 1-8.
7. Knudson, D., Noffal, GJ, Bahamonde, RE, Bauer, JA, & Blackwell, JR. (2004). Stretching has no effect on tennis serve performance. Journal of Strength and Conditioning Research, 18, 654-656.
8. Kokkonen, J., & Lauritzen, S. (1995). Isotonic strength and endurance gains through PNF stretching. Medicine and Science in Sports and Exercise, 27(5), Supple abstract 127.
9. Kokkonen, J., Nelson, A.G., & Cornwell, A. (1998). Acute muscle stretching inhibits maximal strength performance. Research Quarterly for Exercise and Sport, 69, 411-415.
10. Molacek, Z. D ., Conley, D. S., Evetovich, T.K., & Hinnerichs, **K**.R. (2010). Effects of low- and high-volume stretching on bench press performance in collegiate Football players. Journal of Strength and Conditioning Research, 24(3), 711-716.
11. Noffal, G. J., Knudson, D., & Brown, L. (2004). Effects of stretching the upper limb on throwing speed and isokinetic shoulder torques. Medicine and Science in Sports and Exercise, 36(5), Supple abstract 937.70
12. Safran, M., Seaber, A., & Garrett, W. (1989). Warm-up and muscular injury prevention: an update. Sports Medicine, 8, 239-249.
13. Smith, C. A. (1994). The warm up procedure: To stretch or not to stretch. A brief review. Journal of Orthopaedic and Sports Physical Therapy, 19, 12 – 17.
14. Torres, EM., Kraemer, WJ., Vingren, JL., Volek, JS., Hatfield, DL., Spiering, BA., Ho, JY., Fragala, MS., Thomas, GA., Anderson, JM., Hakkinen, K., & Maresh, CM. (2008). Effects of stretching on upper-body muscular performance. Journal of Strength and Conditioning Research, 22, 1279- 1285.
15. Unick J, Kieffer HS, Cheesman W, Feeney A. The acute effects of static and ballistic stretching on vertical jump performance in trained women. J Strength Cond Res. 2005;19:206-212.
16. Van Gyn, G.H. (1986). Contemporary stretching techniques: Theory and application. Olympic Scientific Congress, 1984. In C. Shell (ed.), The dancer as athlete. Human kinetics publisher, inc. Champaign.
17. Winchester, J.B., Nelson, A.G., & Kokkonen, J. (2009). A single 30-s Stretch is Sufficient to Inhibit Maximal Voluntary Strength. Research Quarterly for Exercise and Sport, 80 (2), 257-261.
18. Worrell, T., Smith, T., & Winegardner, J. (1994). Effect of hamstring stretching on hamstring muscle performance. Journal of Orthopaedic and Sports Physical Therapy, 20, 154-159.
19. Young, W., & Behm, D. (2002). Should static stretching be used during a warm-up forstrength and power activities? Journal of Strength and Conditioning Research, 24, 33–37.
20. Young W, Elias G, Power J. Effects of static stretching volume and intensity on plantar fl exor explosive force production and range of motion. J Sports Med Phys Fitness. 2006;46:403-411.
21. Pacheco L, Balius R, Aliste L, Pujol M, Pedret C. The acute effects of different stretching exercises on jump performance. J Strength Cond Res. 2011;25(11):2991-2998.
22. Sandberg JB, Wagner DR, Willardson JM, Smith GA. Acute effects of antagonist stretching on jump height, torque, and electromyography of agonist musculature. J Strength Cond Res. 2012;26(5):1249- 1256.