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INVESTIGATION INTO THE EFFECTS OF STATIC AND DYNAMIC STRETCHING ON VERTICAL JUMP PERFORMANCE OF TAEKWONDO ATHLETES[i]

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Abstract:
This study has sought to illuminate the effect of static and dynamic stretching exercises on the vertical jump performance of taekwondo players. 14 volunteer players were solicited to take part in this study. The participants who were 14-17 age range are licensed players of Amasya Tekhan Sports Club. The protocol employed by Gelen (2008) so as to investigate into the effects of different stretching protocols on the vertical jumping was utilised for tests. Vertical jump tests were conducted on participants three times following each stretching activity in 4-5 min and the best results were noted. Height, body weight and means of BMI, standart deviation, minimum and maximum values of the athletes were measured. A one-way variance analysis in repeated measures (ANOVA) was employed to analyze the data. Findings clearly indicate that neither static nor dynamic stretching exercises have an effect on jumping performance. Correspondingly, this finding may have caused from the physical and psyhological traits of taekwondo players. In summation, based on the analysis in this study, it can be concluded that static and dynamic stretching exercises done after slow aerobic runnings before jumping had no significant effect on front jumping (FJ), squat jumping (SJ) and drop jumping (DJ) performance.

Keywords: static stretching, dynamic stretching, jump performance, taekwondo athlete

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1. Introduction

Taekwondo is a kind of sport based on pyhsical power and flexibility along with activating all muscles and joints, namely all body system. A line of research has found that there have been minor differences between children taking part in taekwondo activities and who don't in terms of agility, flexibility, respiration parameters and physical fitness levels even though the analyses have revealed that there are significant differences on their muscle power and endurance levels. It has also been found that taekwondo players have better physical and physiological test results when compared to sedantery individuals (Tel, 2008).

A growing body of research has indicated that stretching exercises before the activity sometimes affect some performance parameters in a negative way. Those studies included different stretching exercises and their effect on explosive actions have been examined. The findings in the literature have clearly suggested that static stretching and Proprioceptive Neuromuscular Facilitation (PNF) strecthing exercises affect some performance parameters in a negative way (Alemdaroglu & Koz, 2009; Alemdaroglu et al. 2012; Bradley et al. 2007; Cramer et al. 2007; Fletcher & Anness, 2007; Maisettia et al. 2007; McBride et al. 2007; McNeal & Sands, 2003).

A review of the literature indicates that ballistic stretching exercise before the activity increases the values of jumping, just as dynamic stretching ones enhance performance values needed explosive power (Alemdaroglu et al. 2012; Fletcher & Anness, 2007, Woolstenhultme et al. 2006; Yamaguchi et al. 2007). It has been expected that players show better performances when they exercise stretching activities. Strecthing activities are included a great number of training programmes so as to enhance sportive performance and flexibility of the players. There have been some debates on stretching activities despite their extensive utilisation in trainings. Several scholars have revealed that acute stretching activities adversely affect running speed, vertical jump, power etc. (Gelen, 2008; Gelen et al. 2007; Gelen et al. 2008; McNeal & Sands, 2003).

In this regard, this study has sought to illuminate the effect of static and dynamic stretching exercises on the vertical jump performance of athletes.

2. Material and Method

The information on methodology of the research is explained below:

2.1. Study Group

14 volunteer players with average height 169,6 ±9,8 cm and body weight 59 ±11,7 kg were solicited to take part in this study. The participants who were 14-17 age range are licensed players of Amasya Tekhan Sports Club.

2.2. Data Collection

In this present study, we used the protocol employed by Gelen (2008) so as to investigate into the effects of different stretching protocols on the vertical jumping. Two days before conducting the study, all members of research group were informed about stretching protocols and jumping tests and were allowed to try.

Each stretching activity was conducted on different days but at the same time of the day (5 p.m.). In this regard, FJ (Front Jumping), SJ (Squat Jump), DJ (Drop Jumping) tests were conducted. In order to follow the data easily each test was assigned a code, respectively X, Y and Z. Athletes were subjected to three different stretching protocols in different days. Stretching protocols:

- Method X included 5 static stretching exercises with 2 repetitions for 15 seconds at 12 seconds intervals after low intense aerobic running for 5 min (heart beat (HB) 140/min). Following this, stretching exercises were conducted for lower extremity calve in lower extremity, quadriceps femoris, adductor, hamstringler amd hip rotator muscles.
- Method Y included 12 dynamic stretching exercises with 2 repetitions for 15 seconds at 10 seconds intervals after low intense aerobic running for 5 min (heart beat (HB) 140/min) and walking for 2 minutes. Following this, dynamic stretching exercises were conducted through quadriceps stretches, heel beats and foot beats and jumpings.
- Method Z included only low intense aerobic running for 5 min (heart beat (HB) 140/min) and walking for 2 minutes.

Vertical jump tests were conducted on participants three times following each stretching activity in 4-5 min and the best results were noted. The participants were asked to do a trial vertical jump before the test. They did jumping movements as their hands were on their waists. The knee-hip angle was fixed as 110 degree by measuring standart ganiometer in SJ. The participants were asked to jump the highest point from falling 40 cm height in DJ. All jumpings were measured via a vertical jump meter that is a measure of how high an individual or athlete can elevate off the ground from a standstill (Tamer, 2000).

2.3. Data Analysis

Height, body weight and means of BMI, standart deviation, minimum and maximum values of the athletes were measured. A one-way variance analysis in repeated measures (ANOVA) was employed to analyze the data.

3. Findings

Based on the data analysis, findings on physical traits and different stretching protocols are presented in Table 1 and Table 2.

Table 1: Physical Profiles of Taekwondo Players

Variables	n	X±Sd	Minimum	Maximum
Height (m)	14	1,70 ±9,8	1,50	1,87
Body Weight (kg)	14	59,00 ±11,7	45,00	83,00
BMI (kg/m²)	14	20,40 ±2,1	17,50	24,90

The data on physical traits of the taekwondo athletes are as follows: the average height 1,0±9,8 m, body weight 59,00±11,7 kg and BMI (Body Mass Index) 20,40±2,1 kg/m² (Table 1).

Table 2: Statistics on Vertical Jump Performances in Terms of Different Stretching Protocols

Stretching Variables	Jumping Variables		
	Front Jumping (cm)	Squat Jump (cm)	Drop Jump (cm.)
Method X (Static Stretching)	47,50±7,6	45,07±6,5	45,29±7,6
Method Y (Dynamic Stretching)	46,64±7,0	45,50±5,6	45,57±8,9
Method Z (Running-Walking)	47,43±7,5	43,86±7,9	44,71±9,8

*p<0.05, **p<0. 01

As shown in Table 2, in terms of Front Jumping (FJ) the statistical analyses on Method X (47,50 cm) and Method Y (46,64 cm), Method X (47,50 cm) and Method Z (47,43 cm) as well as Method Y (46,64 cm) and Method Z (47,43 cm) didn't show significant differences (p>0.05). Additionally, no significant differences were found between Method X (45,07 cm) and Method Y (45,50 cm), Method X (45,07 cm) and Method Z (43,86 cm) and Method Y (45,50 cm) and Method Z (43,86 cm) in terms of Squat Jumping (SJ) and Method X (45,29 cm) and Method Y (45,57 cm), Method X (45,29 cm) and Method Z (44,71 cm) and Method Y (45,57 cm) and Method Z (44,71 cm) in terms of Drop Jumping (DJ) (p>0.05).

4. Discussion and Result

When the jumping technique is examined, it can be noted that an extension occurs in tendon and muscles in the front stretching part of the technique and acute elastic energy accumulates. The accumulated energy which occurs in the eccentric phase of the jumping technique affect the vertical jumping performance following the movement at concentric phase, combining the accumulated energy (Bosco et al. 1982; Gelen, 2008).

In a study conducted by Gelen (2008) in order to investigate of the effect of different stretching techniques on jumping performance, it was found that dynamic stretching exercises are more effective on producing power than static stretching and was suggested that dynamic stretching exercises should be conducted for muscles which produce power before the competition so as to obtain achievements in sports based on maximum power rather than static stretching. MnNeal and Sands (2011) conducted a study focusing on effect of static stretching on gymnasts and concluded that static stretching exercises reduce the jumping scores. Gelen et al. (2007) also obtained compelling evidence indicating that acute static stretching exercises decrease the agility performance of the athletes. Additionally, Cornwell et al. (2001) noted that

static stretching exercises adversely affected the vertical jumping test scores. Gelen et al. (2008) investigated the effect of static stretching exercises in children on the vertical jump performance and found that static stretching exercises lower the performance of vertical jump. Knudson et al. (2001) examined the effect of stretching exercises on vertical jumping and found that static stretching activities affect vertical jump performance in a negative way. In another study on the effect of static stretching exercise for gastrognemius muscle on vertical jump performance in terms of surface electromyography, it was found that vertical jumping performance was affected in a negative way after 3 repeated statis stretching exercise for 30 seconds (Wallman et al. 2005). On the other hand, in a study on the acute effects of static and PNF stretchings and maximal voluntary contractions on explosive power and jumping performance, it was found that static stretching had more negative effects than others in vertical jumping performance (Young ve Eliot 2001). Kuba et al. (2001) concluded that static muscle strecthing causes some delayments in muscle activation, reducing the power production and some changes in the muscle structure. On the other hand, in another study on different stretching exercises on fitness performances, it was concluded that dynamic and static stretchings positively affected the vertical jumping performance and throwing the medicine ball. In a similar study conducted by Thompsen et al. (2007), it was suggested that dynamic stretching exercises during warm-up activities had a positive effect on vertical jump performances of women athletes when compared to static and cycling stretching exercises. Rosenbaum and Henning (1995) also attempted to investigate the effect of warm-up and stretching exercises on Achilles tendon reflex and concluded that the reduction in maximum power followinfg static stretching exercises may have caused from neuromuscular factors.

Based on the analysis in this present study, in terms of Front Jumping (FJ) the statistical analyses on Method X (47,50 cm) and Method Y (46,64 cm), Method X (47,50 cm) and Method Z (47,43 cm) as well as Method Y (46,64 cm) and Method Z (47,43 cm) didn't show significant differences ($p>0.05$). Additionally, no significant differences were found between Method X (45,07 cm) and Method Y (45,50 cm), Method X (45,07 cm) and Method Z (43,86 cm) and Method Y (45,50 cm) and Method Z (43,86 cm) in terms of Squat Jumping (SJ) and Method X (45,29 cm) and Method Y (45,57 cm), Method X (45,29 cm) and Method Z (44,71 cm) and Method Y (45,57 cm) and Method Z (44,71 cm) in terms of Drop Jumping (DJ) ($p>0.05$) (Table 2).

Static and dynamic stretching exercises didn't affect jumping performances of the participants either negatively or positively. In the existing literature, static stretching exercises have been generally examined in terms of acute effects of jumping performances, but very few researchers have focused on its effect along with other types of stretching exercises. A line of research has revealed that ballistic and dynamic stretching exercises increase jumping performances or they have been found to less negative when compared to static and PNF exercises. These findings shed light on that dynamic stretching exercises are more convenient before the jumping exercises as it has been noted by (Alemdaroğlu et al. 2012). In this regard, it can be noted that the findings

of this present study are in condradiction with the findings of the previous studies. In the literature, it has been concluded that static stretching exercises adverselt affect speed, jumping and power of the athletes, while dynamic (ballistic) exercises can be more effective. However, in this study, it has been found that neither static nor dynamic stretching exercises have an effect on jumping performance. Correspondingly, this finding may have caused from the physical and psyhological traits of taekwondo players.

In summation, based on the analysis in this study, it can be concluded that static and dynamic stretching exercises done after slow aerobic runnings before jumping had no significant effect on FJ, SJ, DJ performance.

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