Turkish Journal of Sport and Exercise /
Türk Spor ve Egzersiz Dergisi
http://dergipark.gov.tr/tsed
Year: 2021 - Volume: 23 - Issue: 3 - Pages: 339-344
DOI: 10.15314/tsed.982755

Turkish Journal of Sport and Exercise
Türk Spor ve Egzersiz Dergisi
ISSN: 2147-5652
https://dergipark.org.tr/tr/pub/tsed

The Effect Of Different Flexibility Studies On Performance Of Taekwondo

Duygu SEVİNÇ YILMAZ[1A]

[1] *Department of Physical Education and Sport, Faculty of Sport Sciences, Erzincan Binali Yıldırım University, Erzincan, Turkey*
Address Correspondence to D.S. YILMAZ: e-mail: 24duygusevinc24@gmail.com

(Received): 14/08/2021/ (Accepted): 30.12.2021

A:Orcid ID: 0000-0002-7737-564X

Abstract

In order to be successful in Taekwondo, the athlete must have optimum flexibility in order to maintain his strength and speed, to attack and defend, to apply a combined technique, to minimize the injury rate and to recover quickly afterwards. Muscle groups that are not sufficiently flexible can affect performance negatively. Flexibility exercises have become indispensable for training programs not only for athletes in taekwondo, but also for athletes of all levels and branches. The athlete must have a comprehensive ROM to be able to perform taekwondo-specific techniques efficiently. In addition to benefiting athletic performance, flexibility also has general health-improving effects. According to the existing literature, in order for flexibility studies to be beneficial, the working method and performance status should be well determined. In parallel, we can say that adjusting the number of set-repeats, the auxiliary materials used, the variety of movements according to the characteristics of the sample group and the motoric feature that is desired to be developed can be beneficial for performance development.

Keywords: Flexibility, taekwondo, static, dynamic, PNF

INTRODUCTION

The word meaning of Tae in Taekwondo is: manual techniques, Kwon: techniques with feet and Do: means path, method, philosophy (1). Taekwondo branch became an Olympic branch in 1994 (2). Today, approximately 70 million people from 208 countries participate in this branch (3) and it is among the most popular combat sports in the world (4).

Taekwondo training is long-term, innovative and requires starting from a young age (2). Due to its structure, Taekwondo involves versatile movements (mid-level and high-level kicks, rotary kicks). In taekwondo, where technical diversity is high, long-term training is required for making technical combinations and applying these techniques in the form of attacks and counterattacks.

Since Taekwondo is an innovative branch, it maintains its popularity by making changes in the protective equipment, competition systems and competition rules used by the athletes in competitions (2). In the competitions, the athletes compete with a system called the manual system, where the referees evaluate the athletes by scoring. Nowadays, competitions are organized with a system called electronic scoring system and the protective equipment used by the athletes. Thanks to this system, athletes are no longer evaluated by the judgment of a referee. In this system, the athletes compete with the electronic body protector (seugard) they wear on their bodies, the electronic

foot protectors they wear on their feet, and the electronic head protectors (helmets) they wear on their heads. In this system, where the hit intensities of the athletes are adjusted according to their weight and age categories, the athletes score points with the correct technique and the techniques they use on the body protector or the helmet in the head area with appropriate pressure. When a hit is made with the right technique and sufficient pressure intensity, the score is reflected on the scoreboard via the electronic system. In addition, the changes include the scoring of the techniques. The point values of the techniques applied to the head area and the technical rotary hits have increased. For example; while hits to the head area were evaluated with 1 point in the previous rules, these hits are evaluated as 4 points and rotary hits are evaluated as 5 points in the current rules. Parallel to this, this rule change encourages athletes to be more technical and flexible.

Taekwondo requires great flexibility in the lower extremities due to technical-tactical application and competition rules (5,6). Furthermore, the athletes must have both dynamic and static flexibility to apply attack-counterattack techniques and to recover quickly after technical application (7). Effective flexibility is very important for taekwondo. Adequate joint flexibility is required to maximize performance. Flexibility is also an important component in talent selection and screening for the taekwondo branch.

RESEARCH METHOD

This study covers the literature studies conducted to investigate the effect of flexibility exercises on the performance of taekwondo players spread over a wide period covering the years 1970-2020, mainly in the 2000s. In this study, the micro-analysis method, compiled from literature research that covers information and interpretation of results, by comparison, was used. EBSCOhost, PubMed and Google Scholar databases were used in the literature search.

Flexibility (Mobility)

It is defined as the wide range of motion of a joint or joint group (8). According to Akandere (9), flexibility is the ability of a joint to reach its maximum range of motion. According to another definition, it is the ability to apply movements in different directions and wide angles as much as the joints allow (10). According to Chandler et al. (11), the athlete can move a joint through a normal range of motion without undue stress on the muscle-tendon unit.

The American College of Sports Medicine (12) identifies flexibility as the fourth important element of physical fitness. Nieman (13) also accepts flexibility as an important parameter of physical fitness. Flexibility is considered important in neuromuscular tensions and therapy work (14,15).

Although flexibility is one of the basic motor features, it is a feature that should be started to be trained in childhood. It is accepted as an important feature for increasing performance in sports (16). Flexibility is the basic element of training programs, while it is also important to have high-level motor skills (17). If flexibility is not developed well, it becomes difficult to learn branch-specific movements and the injury risk increases. At the same time, the movement angle is negatively affected and causes a decrease in quality in the application of combined movements. The flexibility level is at its best between the ages of 3-7, despite no training. Between the ages of 7-13, it is in good condition, between the ages of 12-15 it is in poor condition.

Although flexibility is one of the main factors in determining performance and athletic abilities, it should be included in training programs. Flexibility is the only physical feature that reaches its maximum in childhood and deteriorates in parallel with increasing age (18).

Flexibility exercises have many benefits in terms of athlete performance (19-21). These are;

It decreases the rate and severity of the injury.

It helps to delay fatigue.

It increases mobility and skill level.

It helps to extend the sports life of an athlete.

It helps an athlete to feel mentally good.

It is effective in preventing and delaying muscular pains (22,23).

Increased muscle flexibility helps to perform a movement more efficiently, prevent or minimize injuries and increase performance (24-27)

Flexibility Development Methods

Effective flexibility studies can be considered as one of the basic tools to maximize performance. However, the right flexibility development methods must be used to positively affect the performance.

Before starting to work, it is important to warm up, do stretching before-during-post-exercise, and comply with the stretching-waiting periods by the procedure.

The primary target of a flexibility exercise is the connective tissue. Effective procedures require controlling sensory mechanisms by inhibiting muscle spindle receptors and stimulating golgi tendon organs, resulting in less resistance to soft tissue stretching (28). The following methods are widely used for effective flexibility development (29).

Active Method

Static method

Ballistic method

Passive Method

PNF (Combined) Method

1. Active Method

This method is the ability of an athlete to maximize a joint through muscular activities. This method expresses both the bending-loosening of the agonists and the force generation of the antagonists. In the static method, the sub-title of the active method, the individual must bring the two parts of the body closer to each other and wait for 6-12 seconds. According to M.Alter, static stretching is to stretch a muscle (or muscle group) to its furthest point and then maintain this position. Static stretching can reduce electrical activity and help significantly reduce muscle pain (22,30). In the ballistic method, which is another sub-title, first one section and then the other section becomes active. In this method, body parts are operated through oscillations and rapid movements (31). Most athletes and trainers use the static method more, considering that the ballistic method causes muscle contractions (18,29).

Ballistic stretching has 4 disadvantages. These are;

It exceeds the stretching limits of tissues (32).

The energy need is higher (32).

It increases the risk of pain in the muscles and may cause shortening of the muscle length (31,32).

It initiates the stretch reflex and can cause small tears in the connective tissues (33).

2. Passive Method

It is a method of stretching by supporting a position taken by the individual with another part of the body, an apparatus, the help of a partner or the use of weights. For example, raising his/her leg and keeping that position with his/her hand (32). This method can be applied to the ankle, hip, shoulders and wrist joints. The use of weights is not recommended for the hips and spine. However, it is recommended to adjust the amount of weight and gradually increase it to be applied for ankle, knee and shoulder joints (33).

3. PNF (Combined) Method

The PNF method (Proprioceptive Neuromuscular Facilitation) includes specific stretching techniques that utilize reflexes and neuromuscular principles to relax tensed muscles. It is known to be one of the fastest and most effective methods currently known to increase static-passive flexibility. In this method, passive stretching and isometric stretching techniques are combined to achieve maximum static flexibility. PNF refers to any of the techniques where the muscle group is passively stretched, then contracted isometrically against resistance while in the stretched position, and then passively stretched again through the resulting range of motion. This method usually requires the assistance of a partner to resist isometric contraction and then passively hold the joint through its increased range of motion. The PNF method is not recommended for children and people whose bones continue to grow. PNF stretching helps strengthen muscles. It is an ideal method to increase passive flexibility as well as active flexibility. PNF stretching is a very strenuous exercise and it is recommended not to do more than once a day for a particular muscle group (32).

Issues To Be Considered In Flexibility Studies

There are some points athletes and coaches should pay attention to for planning or implementing flexibility exercises. Some of these are as follows (34):

Flexibility exercises should be focused on the main muscle groups that are actively used in sports.

In general, results can be obtained from training programs, but individual flexibility studies should be given importance.

Flexibility exercises should be done in 10-20 minutes.

Except for extremely flexible athletes, daily optimum flexibility exercises should be given importance to other athletes.

Flexibility exercises should be included before and after training.

Excessively flexible athletes should not try to increase their flexibility levels further.

The dosage of flexibility exercises should be increased gradually and the athlete should be mentally prepared for this situation.

Flexibility exercises should include more static stretching exercises.

Jumping and sudden movements should be avoided in flexibility exercises.

In flexibility exercises, both directions (right-left) should be exercised equally.

While the exercising area is in a tense position, it should be released slowly.

Flexibility exercises should be continued on an ongoing basis (season or off-season).

For the body to be integrated into flexibility exercises, the exercises must be carefully placed in the training program (30).

DISCUSSION AND RESULT

In this section, the types of exercises, the number of repetitions, the materials used in the study, the scope of the study, the sample group and the results of the studies on the relationship between flexibility exercises and performance are given.

In 2012, Rashad Khalil (35) investigated whether static and PNF stretching exercises on 20 female taekwondo players aged 17-18 years had an effect on taekwondo-specific techniques on a range of motion and physical skills. As a result, the PNF stretching method showed a significantly more significant difference than the static stretching method on physical skills and range of motion variables.

In his research, Choi (36) examined how 8-week static and PNF stretching exercises affect flexibility and jumping performance. 28 (n=14 static stretching group, n=14 PNF stretching group) taekwondo players studying at the university participated in the study. In the study, while knee joint range differed significantly in both groups in two stretching types, jump performance also differed within the group ($p<.05$). In the comparison between the static stretching group and the PNF group, a significant difference was found only in jumping performance. As a result, both static stretching and PNF stretching help improve performance.

Taekwondo athletes may not be able to perform strong and targeted strokes without adequately developing the flexibility of the body, shoulder and leg joints. Good flexibility is required for adequate optimization of the leg, abdomen, shoulder and waist muscles (37). Based on this, Paramitha et al. (38) conducted a study to examine the effect of flexibility training on the dollyo chagi (a technique performed with the head to the foot) technique. 8 men and 8 women actively participating in competitions were included in this study. In the study, 16 training sessions were performed by including static-dynamic stretching, and active-passive warm-up. Data were analyzed using a video analysis application with kinovea and a 120 FPS handheld camera. According to the results of the analysis, it has been reported that the study has an effect of 15.4% on the flexibility of the Dollyo Chagi technique. In addition to this, the researchers found that static stretching, one of the stretching techniques used in the study, was the most effective method for increasing flexibility.

In a study conducted to examine the contribution of increasing flexibility to performance in taekwondo, it was reported that short-term static and PNF stretching exercises can increase flexibility without reducing performance. On the other hand, they found that long-term dynamic stretching exercises also improve flexibility without contributing to performance. For taekwondo, it is recommended that an appropriate warm-up in aerobic type followed by short-term (6-10 sec) static and PNF stretching 3-5 days a week is appropriate. Performing these practices in the warm-up and separate flexibility training sessions can make taekwondo-specific techniques more efficient and stronger (1).

Alemdaroğlu et al. (39) investigated the acute effects of different stretching types on sprint performance in taekwondo players. 12 male athletes were included in the study. Athletes were given ballistic, static and PNF stretching exercises every 3 days. Before and after the stretching exercises, the athletes were made to do two 20 m sprints with maximal loading. According to the types of stretching, after the sprint performance, the static and PNF stretch values returned to normal after 15

minutes, and the ballistic stretch value returned to normal after 5 minutes. According to the results of the study, it was concluded that the acute effects of PNF and static stretching may negatively affect sprint performance, while ballistic stretching affects less. Therefore, it is recommended not to do PNF or static stretching just before the sprint performance.

In his study, Kok (40), examined whether dynamic and PNF stretching affected the flexibility and technical hitting skills of athletes aged 18-25 (n=45) who have just started taekwondo. Athletes were divided into 3 groups as PNF stretching group (n=15), dynamic stretching group (n=15) and control group (n=15). In the pre-test results of PNF, dynamic stretching and control groups, no significant difference was found in terms of flexibility and technical striking skills scores of all tests. According to the post-test results of the PNF stretching group, a significant difference was found between the dynamic stretching group and the control group on technical striking skills, but no significant difference was found for the flexibility test. In the dynamic stretching group post-test results, significant differences were reported on flexibility and technical striking skills.

Aksoy (41) used Whole Body Vibration, a modern exercise technique, in his study to examine whether it affects some physical parameters (strength, flexibility and agility) of taekwondo players. 23 athletes (n=11 control group, n=12 whole-body vibration training group) with an age average of 22.12±1.93 years voluntarily participated in the study. Before starting the training, a sit-reach test was applied to both groups. Whole-body vibration training was given to the training group for 10 weeks as 3 days a week. No training was given to the control group. Statistically significant differences were reported in the training group flexibility parameter in the group comparisons made at the end of the study.

14 athletes in the 14-17 age range voluntarily participated in the study, in which the effect of static and dynamic stretching exercises on vertical jump performance was investigated. Different stretching protocols developed by Gelen (42) were used. Jumping (each athlete made 3 attempts) tests were applied 4-5 minutes after each stretching exercise. There was no significant difference in the parameters of the squat jump, drop jump and front jump after stretching exercises performed by the athletes (43).

Yarım et al., (44) investigated the effect of different warm-up methods and static stretching exercises performed with these warm-up methods on isokinetic strength in the lower extremity. 26 female taekwondo athletes with an average age of 20 were included in the study. In the study, three different warm-up protocols were applied to the participants. Firstly, 10-minute running protocol, secondly dynamic warm-up, and thirdly dynamic warm-up and static stretching exercise protocol were applied. As a result of the study, it was concluded that the dynamic warm-up and stretching exercise protocol was the method that greatly affected the performance among these three protocols applied to the participants.

As a result of the studies, it is recommended to apply different flexibility methods regularly. However, it is recommended to apply some flexibility methods before and after the competition, taking into account the factors such as positive and negative effects on different parameters, and how much they affect performance. It has been determined that short-term static and PNF stretching exercises contribute positively to flexibility without reducing performance. In conclusion, the findings of the present review found that all methods contributed positively to overall flexibility. In addition, it is thought that the results of this research can be used as basic data in the development of effective exercise programs to improve the athletic performance of athletes.

REFERENCES.

1. Behm D, Haddad M. Stretching during the Warm-up and to increase Flexibility for Taekwondo. Performance Optimization in Taekwondo: From Laboratory to Field, 2015; 94-105.
2. Pieter W, Heijmans J. Scientific coaching for olympic Taekwondo (2nd ed.). Aachen: Meyer and Meyer Sport,2000.
3. WTF.WTF rules and regulations 2009. http://www.wtf.org/wtf_eng/site/ rules/file/20090203_Rules_and_Regulations_of_the_WTF_as_ of_February_3_ 2009.pdf WTF Web Accessed May 1 2021.
4. Park YH, Park YH, Gerrard J. Tae Kwon Do: The ultimate reference guide to the world's most popular martial art. London: Ward Lock.,1989:16
5. Wasik J. Structure of movement of a turning technique used in the event of special techniques in Taekwon-do ITF. Archives of Budo, 2009; 5: 111-115.
6. Pion J, Fransen J, Lenoir M, Segers V. The value of non-sport specific characteristics for talent orientation in young male judo, karate and taekwondo athletes. Archives of Budo, 2014; 10: 147-150.
7. Thompson WR, Vinueza C. Physiologic profile of tae kwon do black belts. Research in Sports Medicine: An International Journal, 1991; 3(1): 49-53.

8. Sands WA. Physiology. In: Scientific Aspects of Women's Gymnastics, W. A. Sands DJ. Caine, and J. Borms (Eds.). Basel: Switzerland: Karger, 2002;141.
9. Akandere M. 17-22 Yaş Grubu Kız Sporcularının Esnekliklerinin Geliştirilmesinde Etkisi. Doktora Tezi, Selçuk Üniversitesi, Konya, 1993.
10. Zorba E, Saygın Ö. Fiziksel Aktivite ve Fiziksel Uygunluk, İstanbul: Bedray Yayın Dağıtım Tur. ve İnş. San. Tic. Ltd. Şti, 2007.
11. Chandler TJ, Kibler WB, Uhl TL, Wooten B, Kiser A, Stone E. Flexibility comparisons of junior elite tennis players to other athletes. The American journal of sports medicine, 1990;18(2): 134-136
12. American College of Sports Medicine. ACSM's guidelines for exercise testing and prescription. Lippincott Williams, Wilkins, 2013.
13. Nieman DC, Ikeda M, Barbanti VJ. Exercício e saúde: como se prevenir de doenças usando o exercício como seu medicamento, São Paulo: Manole, 1999;105-118.
14. Badley EM, Wood PH. The why and the wherefore of measuring joint movement. Clinics in rheumatic diseases, 1982; 8(3):533-544.
15. Suzuki N, Endo SA. Quantitative study of trunk muscle strength and fatigability in the low-back-pain syndrome. Spine, 1983; 8(1): 69-74.
16. Hubley-kozey CL. Testing flexibility. In: Physiological Testing of the High-Performance Athlete, J. Duncan MacDougall, H. A. Wenger, and H. J. Green (Eds.). Champaign, IL: Human Kinetics, 1991;309–359.
17. Sevim Y. Antrenman Bilgisi, Tutibay Ltd. Şti Ankara, 1997.
18. Günay M, Tamer K, Cicioğlu H, Şıktar E. Spor fizyolojisi ve performans ölçüm testleri. 2019; 285,292
19. Keith L. Exercise — Some new options. Sports Illustrated,1977.
20. Weiss D, Help prevent arm-injuries with stretching exercises. Athletic J Dec. 1976; 57: 50-54.
21. Holland G. The Physiology of flexibility: A Review of the Literature Kinesiology Review, 1968; 49-62.
22. De Vries H. Prevention of Muscular distress after exercise, Res Quart May, 1961; 32:177-185.
23. De Vries H. Physiology o f Exercise for Physical Education and Athletics,1966.
24. Agre JC. Hamstring injuries. Sports medicine, 1985; 2(1), 21-33.
25. Anderson B, Burke ER. Scientific, medical, and practical aspects of stretching. Clinics in sports medicine, 1991; 10(1): 63-86.
26. Ciullo JV, Zarins B. Biomechanics of the musculotendinous unit: relation to athletic performance and injury. Clinics in sports medicine, 1983; 2(1): 71-86.
27. Jonhagen S, Nemeth G, Eriksson E. Hamstring injuries in sprinters: the role of concentric and eccentric hamstring muscle strength and flexibility. The American journal of sports medicine, 1994; 22(2): 262-266.
28. Cornelius WL. PNF and Other Flexibility Technique, 1984.
29. Bompa, T. O. Antrenman Kuramı ve Yöntemi. Bağırgan Yayınevi, 1998; 447-448
30. Siff MC. Training routines: Flexibility in sport. South African Journal of Sports Medicine, 2007; 19(1): 2-6.
31. McAtee RE, Charland J. Facilitated Stretching, Human Kinetics, USA, 2007.
32. Appleton B. Stretching and Flexibility Everything you never wanted to know. World, 1998; 68.
33. Zorba E, Saygın Ö. Fiziksel Aktivite ve Fiziksel Uygunluk. (4. Baskı). Ankara: Perspektif, 2017; 143.
34. Beaulieu J. Stretching for all sports, 1980; 36-57.
35. Rashad Khalil E. The Effect of Two Different Stretching Programs on Some Physical Variables of Taekwondo Female Players. Journal of Applied Sports Science, 2012; 2(3):56-64.
36. Choi GJ. The Effcts of Static and PNF Stretching on Range of Motion and Jump Performance in the Taekwondo Player. The Journal of the Korea institute of electronic communication sciences, 2013; 8(11): 1771-1776.
37. Mailapalli DR, Benton J, Woodward TW. Biomechanics of the taekwondo axe kick: a review. Journal of Human Sport and Exercise, 2015; 10(1): 141-149.
38. Paramitha ST, Rosadi TY, Ramadhan MG, Suwanta DM. The Influence of Flexibility Training on the Accuracy of the Dollyo Chagi Kick in Taekwondo Martial Arts. In 4th International Conference on Sport Science, Health, and Physical Education (ICSSHPE 2019) Atlantis Press, 2020; 317-320.
39. Alemdaroğlu U, Köklü Y, Koz M. The acute effect of different stretching methods on sprint performance in taekwondo practitioners. The Journal of sports medicine and physical fitness, 2016; 57(9): 1104-1110.
40. Kok SQ. Effect of PNF and Dynamic Stretching on Kicking Techniques Among Taekwondo Beginners (Doctoral dissertation, Tunku Abdul Rahman University College), 2018.
41. Aksoy D. Effects of 10-Week Whole Body Vibration Training on Strength, Flexibility and Agility in Taekwondo Athletes. Journal of Education and Learning, 2019; 8(2): 213-222.
42. Gelen E, Saygın Ö, Karacabey K, Kılınç F. Acute Effects of Static Stretching on Vertical Jump Performance in Children, International Journal of Human Sciences, 2008; 5(1).
43. Güler D, Günay M. Investigation Into The Effects of Static and Dynamic Stretching on Vertical Jump Performance of Taekwondo Athletes. European Journal of Physical Education and Sport Science, 2019.
44. Yarım İ, Orhan Ö, Çetin E. The Effect of Different Warm up Protocols on Isokinetic Leg Strength in Female Taekwondo Athletes. International Journal of Applied Exercise Physiology, 2020; 9(3): 1-8.