

The Effect of Different Dynamic Stretching Exercise Durations on Different Agility Performances in Judokas

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ABSTRACT

Background: Dynamic stretching exercises performed before competition or training can contribute to improve performance in athletes. However, there may be differences in performance development depending on the duration of the stretching exercises.

Aim: The purpose of this study is to evaluate the effect of different dynamic stretching exercise durations on different agility performances in judokas.

Methods: Twelve male athletes between 18-25 years old, who exercised judo regularly for three days a week for at least 3 years (age, 21.42± 1.97 years; body height, 173.25± 3.13 cm; body weight 69.25± 2.98 kg; BMI 23.16±.39) participated in the study. Judokas' exercise protocols consisted of 5MDS (5 minutes of jogging + 5 minutes of dynamic stretching), 10MDS (5 minutes of jogging + 10 minutes of dynamic stretching) and 15MDS (5 minutes of jogging + 15 minutes of dynamic stretching) exercise protocols in consecutive days. After DS exercise, T-test agility, 505 agility and Illinois agility tests were performed.

Results: There was a significant improvement in the performance of T test agility [F (1,595)= 19,184 p=.000, η^2 : .636], 505 agility test [F(1,703)= 9.448 p=.002, η^2 : .462] and Illinois agility test [F(1,419), p=.003, η^2 : .493] after 10MDS, 15MDS and 5MDS exercise protocols, from low to high, respectively. In addition, a significant difference was found between 5MDS, 10MDS and 15MDS exercise protocols (p<.05).

Conclusion: According to the results of the study, it can be recommended that male judokas could perform 10MDS exercises before competition or training to improve their agility performance. On the contrary, 5MDS exercise is not recommended for judokas to improve their agility performance.

Keywords: agility, judo, stretching, performance.

INTRODUCTION

Judo is known as Japanese martial art, which was first trained by Jigoro Kano in 1882 and was among the Olympic sports in 1964 ¹. During a single judo match, athletes may need to perform many high-level technical and energetic athletic movements ², and their physical coordination, strength, agility and flexibility performances should be at a high level as well as mental concentration ³. Judokas should frequently use stretching exercises to increase their flexibility and agility performance. Stretching is often done to aid performance preparation before exercise ⁴⁻⁷. It has traditionally been believed that increasing flexibility (increasing joint range of motion) will increase better performance ⁸ and reduce the risk of injury during strenuous exercise ⁹. In addition, stretching exercises generally lead to the formation of sarcomeres in series ¹⁰, which is essential for all sports, increases contraction speed and strengthens muscle strength ^{11,12}.

Dynamic stretching (DS) is defined by Fletcher and Jones (2004) as controlled movement throughout the active range of motion for each joint. It is defined by Nelson and Brady (2004) as a technique that allows the muscle to naturally lengthen while it is relaxed ^{13,14}. In addition, DS includes controlled movement through the active range of motion (ROM) for a joint and includes running exercises that include calisthenic movements (for example, lunging), forward, sideways, and change-of-direction (COD) movements ⁷. Among the exercises with COD, agility exercises are frequently used. In general, agility is defined as a rapid whole-body movement with a change in running direction in response to a stimulus ¹⁵. It has been reported in the literature that DS exercises improve dynamic

concentric external resistance ¹⁶, strength ¹⁷, agility ¹⁸, sprint ^{13,19}, and vertical jump height ²⁰.

When the studies were examined, it was seen that many studies were conducted to improve performance in judo ^{21,22}. However, no studies are examining the agility performance of different dynamic stretching exercise durations in judokas. The study aims to examine the effects of different dynamic stretching exercise durations on agility performances in judokas. It is hypothesized that 10MDS and 15MDS exercise durations will result in improved agility performance. In addition, the other hypothesis is that different dynamic stretching exercise durations will produce different results in agility performance.

MATERIAL AND METHODS

Participants: Twelve male judokas between the ages of 18-25, who exercise regularly for three days a week, and who have been doing judo sports for at least 3 years (age, 21.42± 1.97 years; body height, 173.25± 3.13 cm; body weight, 69.25± 2.98 kg; BMI 23.16±.39) participated in the study. The criteria for inclusion of judokas in the research are (a) practised judo for at least 3 years; (b) no prior history of disability that would affect the result of the study; (c) regular participation in the study and; (d) compliance with the researchers' instructions throughout the study. All judokas were given the necessary information about the requirements and risks related to the study and signed an informed consent form stating that they voluntarily participated in the study. This study was approved by the Human Research Ethics Committee of Malatya Inonu University, numbered 2021/2720 and was conducted by the Declaration of Helsinki.

Experimental Design of the Study: Before data collection, all judokas attended a familiarization phase session in which they performed all stretching exercises and test parameters. This familiarization period is designed solely to reduce the learning effects caused by the mechanics of performing study protocols. This study consisted of a single group. Different dynamic stretching durations consist of 5 minutes of jogging + 5 minutes of dynamic stretching (5MDS), 5 minutes of jogging + 10 minutes of dynamic stretching (10MDS) and 5 minutes of jogging + 15 minutes of dynamic stretching (15MDS) exercise protocols. After different dynamic stretching periods, judokas performed T test agility, 505 agility and Illinois agility tests ^{15,23,24}. To see the effect of dynamic stretching exercises in more detail, three different agility tests were applied.

Dynamic Stretching Exercises Protocols: Judokas performed 5-minute light tempo aerobic jogging consisting of 30-40% heart rate ²⁵. After the 5-minute run, the judokas performed dynamic stretching exercises. Dynamic stretching exercises consisted of 10 dynamic stretching exercises from moderate to high intensity (high knee pulls, straight-leg march, power skip, light skip, high glute pulls, light high knees, light butt kicks, rapid high knees, carioca, walking lung) (Table 1) ²⁶. All dynamic stretching exercises were performed sequentially at 48-hour intervals. The similarity between 5MDS, 10MDS, and 15MDS is a 5-minute light tempo aerobic run in the general warm-up phase. Dynamic stretching exercises were performed at an increasing pace. In the 10MDS and 15MDS exercises, 3 minutes of rest was performed after each set was completed. In this way, fatigue was tried to be prevented.

Table 1: DS exercise protocols

DS exercises	Description	5 Min	10 Min	15 Min
High-knee walk	While walking, lift knee towards chest, raise body on toes, and swing alternating arms.	30 sec.	2*30 sec.	3*30 sec.
Straight-leg march	While walking with both arms extended in front of body, lift one extended leg towards hands then return to starting position before repeating with other leg.	30 sec.	2*30 sec.	3*30 sec.
Hand walk	With hands and feet on the ground and limbs extended, walk feet towards hands while keeping legs extended then walk hands forward while keeping limbs extended.	30 sec.	2*30 sec.	3*30 sec.
Lunge walks	Lunge forward with alternating legs while keeping torso vertical.	30 sec.	2*30 sec.	3*30 sec.
Backward lunge	Move backwards by reaching each leg as far back as possible.	30 sec.	2*30 sec.	3*30 sec.
High-knee skip	While skipping, emphasize height, high-knee lift, and arm action.	30 sec.	2*30 sec.	3*30 sec.
Lateral shuffle	Move laterally quickly without crossing feet.	30 sec.	2*30 sec.	3*30 sec.
Back pedal	While keeping feet under hips, take small steps to move backwards rapidly.	30 sec.	2*30 sec.	3*30 sec.
Heel-ups	Rapidly kick heels towards buttocks while moving forward.	30 sec.	2*30 sec.	3*30 sec.
High-knee run	Emphasize knee lift and arm swing while moving forward quickly.	30 sec.	2*30 sec.	3*30 sec.

Statistical Analysis: The obtained data were analyzed in SPSS (25.0) package program. Repeated Measures Anova was used to determine the effect of different dynamic stretching exercise durations on agility tests. Bonferroni test was used to determine which dynamic stretching exercise durations favored the agility performances.

Mauchly's test of sphericity was used for homogeneity of variances and the Greenhouse-Geisser correction factor was used to correct for variances. The significance level was chosen as $p < 0.05$.

RESULTS

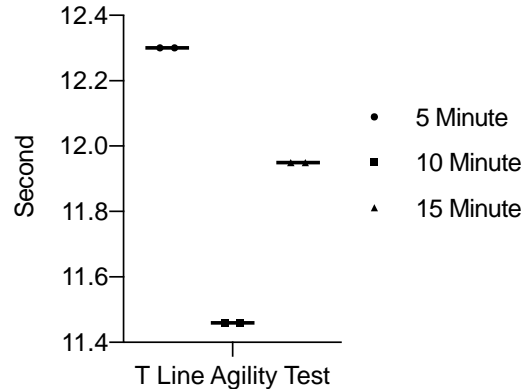


Figure 1: T test agility (T Line Agility) performance values at different dynamic stretching exercise durations

Figure 1 shows the difference between T test agility performance of judokas after 5MDS, 10MDS and 15MDS protocols. T test agility performance observed after 10MDS (11.46 ± 0.27) protocol was reported to be better than T test agility test performance observed after 5MDS (12.30 ± 0.37) and 15MDS (11.95 ± 0.43). In addition, it was determined that there was a statistically significant difference between T test agility Test performance [$F(1,595) = 19,184$ $p = .000$, partial eta square: $.636$] after 5 MDS, 10 MDS and 15 MDS protocols ($p < .05$).

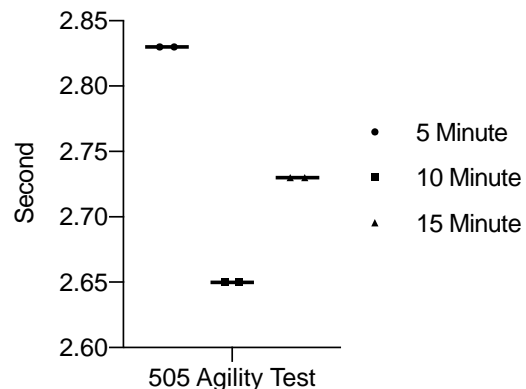


Figure 2: 505 Agility test performance values of different dynamic stretching exercise durations

Figure 2 shows the difference between 505 agility test performance after the 5MDS, 10MDS, and 15MDS exercises. It was observed that 505 agility test performances examined after 10MDS (2.65 ± 0.15) exercises were better than 505 agility test performances observed after 5 MDS (2.83 ± 0.12) and 15 MDS (2.73 ± 0.13) exercises. In addition, it was determined that there was a statistically significant difference between 505 agility test performance [$F(1,703) = 9.448$ $p = .002$, partial eta squared: $.462$] after 5MDS, 10MDS and 15MDS protocols ($p < .05$).

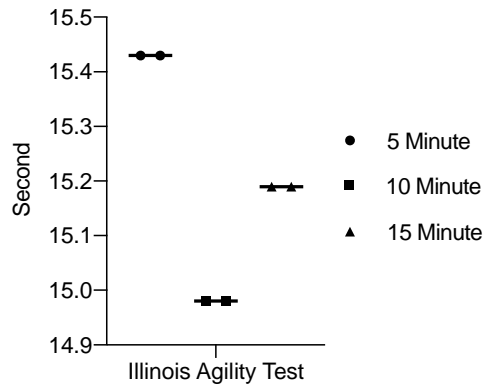


Figure 3: Illinois agility test performance values for different stretching exercise durations of judokas

Figure 3 shows the difference between the Illinois agility test performance of judokas after the 5MDS, 10MDS, and 15MDS exercise protocols. It was observed that Illinois agility test performance observed after 10MDS ($14.98 \pm .43$) exercise protocol was better than 5MDS ($15.43 \pm .38$) and 15MDS ($15.19 \pm .37$) exercise protocols. In addition, statistically significant difference was found between Illinois agility test performance after 5MDS, 10MDS and 15MDS exercise protocols [$F(1.419)$, $p=.003$, partial eta square: .493] ($p<.05$).

DISCUSSION

It is stated that there are differences between the performance levels of the athletes according to the exercise protocols performed before the exercise or competition. Accordingly, studies involving different exercise protocols are carried out in order to optimize the performance of the athletes. It is thought that dynamic stretching exercises before exercise or competition contribute to the development of athlete performance. However, each athlete randomly performed dynamic stretching exercises at different durations on consecutive days by judokas. It is important to determine the most appropriate dynamic stretching durations that contributes to performance development, especially in sports that require anaerobic performance such as judo. In this context, studies examining the effects of dynamic stretching exercises that provide performance developments before exercise or competition may add originality to the literature for judo. Our study aims to evaluate the effects of different dynamic stretching exercise durations on agility performance on judokas. From our hypotheses, it was confirmed that 10 MDS and 15MDS exercise protocols can improve agility performance. In addition, the hypothesis that dynamic stretching exercises applied at different durations could produce different results on agility performance was also confirmed. As a result of the literature review, it is the first study to compare the acute effects of 5MDS, 10MDS and 15MDS exercise protocols on T-test agility test, 505 agility test and Illinois agility test performances in judokas. Accordingly, it was determined that 10 MDS exercise protocols were more effective on agility performance than 5 MDS and 15 MDS exercise

protocols.

The results of this study are partially consistent with studies examining the effect of dynamic stretching (DS) exercises on agility performance. Although there is no clear distinction between the duration of DS required to improve agility performance. There are studies in which DS does not impair performance⁶. It has been stated that shorter durations (<90sec) in DS exercises do not negatively affect performance²⁷⁻²⁹, but longer durations of DS can increase performance more^{16,30,35,31}. Acute increases in 20 m sprint performance¹³, vertical jump height^{18,26} have been reported as a result of DS. In addition, Yamaguchi and Ishii (2005) reported that there was no change in force output after static stretching, but there was an increase in power output after DS, and that the increases in force output after DS were due to increased neuromuscular function. They also noted that dynamic stretching has a post-activation potentiation effect on performance through an increase in speed¹⁷. Similarly, it has been reported that DS significantly improves agility performance compared to static stretching, and the DS protocol is more suitable than the static stretching protocol for activities that require balance, agility, and movement time of the upper extremities³². The reason why DS performs better than static stretching could be explained of raises muscle temperature after DS¹³ and stimulates the nervous system³³. Amiri et al. (2010) reported that warm-up protocols including dynamic stretching exercises increase agility more than static stretching alone³⁴.

CONCLUSION

In conclusion, the present study confirms that different dynamic stretching exercise durations produced different results in agility performances. Furthermore, it was determined that 10 MDS protocols were more effective on agility performance than 5 MDS and 15 MDS exercise protocols. This can be taken into account when planning training programs. This study includes some limitations. This study was not performed on judokas of different sexes, and the muscle temperature of the judokas was not measured. The study can be repeated by increasing the sample size in men and women elite and top elite judo players of different age groups. Increasing the number of studies examining the effects of different stretching exercise durations, different stretching exercise protocols on different performance parameters in Judo (sprint, strength, flexibility, Uchikomi Fitness Test, Judo Specific Fitness Test etc.) may give more specific recommendations about the planning of judo training programs. However, it is conceivable that improvement of agility performances could be achieved by elevating HR and muscle temperature with 10MDS protocols. This can contribute to judo athletes getting maximum efficiency from their agility performances both before training and competitions, and minimizing the risk of injury.

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Conflict of interest: None.

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