

EFFECT OF CORE MUSCLES STRENGTHENING WORKOUTS IN IMPROVING THE STATIC BALANCE OF JUDO PLAYERS

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Abstract: Core muscles have multiple benefits for athletes and non-athletes, such as their importance in improving motor performance and preventing injuries. Judo players perform various movements during training or matches, such as bending, rotation, and flexion, which depend heavily on the muscles around the torso as well as the balance requirements during throwing to reach the optimal position of the throw. This study aimed to verify the effectiveness of intense training during the preparation period to strengthen the core muscles on the static balance of the judo players. In total, 24 judo players participated in the study to form two groups: an experimental group (12 players), who were trained via intense core muscle workouts (8 exercises) according to specific instructions (three times per week / 6 weeks), and a control group (12 players), who were trained on various muscle groups (three times per week / 6 weeks). The Flamingo test (European Fitness Test–Euro Fit) was applied to measure the static balance of the players (pretest–posttest). The results showed an improvement in the static balance for both groups, the comparison between the two groups showed the experimental group indicated statistically significant changes ($p < 0.05$) than the control group in terms of static balance because of core muscle strengthening workouts. The results obtained confirm the effectiveness of core muscle strengthening workouts in improving the static balance of judo players. Therefore, coaches can use these workouts during the preparation period and can manage training loads according to the characteristics of the players by regularly measuring the static balance through field or laboratory, results of this tests can be help in planning training programs.

Keywords: Core Muscles, Static Balance, judo.

INTRODUCTION

Throwing skills in judo include a skill that requires balance and stability during the throwing phase to specifically achieve effectiveness in performing a throw, especially those performed from standing on one leg, such as *Uchi Mata*, *Harai Goshi*, and *Osoto Gari*. This requires improvement of balance for players in training, which can be achieved by training the core muscles that have a major role in the player's balance and stability.

By observing unsuccessful throwing in junior competitions, it has been shown that many players lose balance during the throwing phase or do not use the correct throwing position.

In Judo, balance is of utmost importance, as the athletes need to maintain posture control and good balance to avoid losing points and ultimately the match (Alonso et al. (2009), Aboelwafa, H. S. (2021).

A number of scientific studies that have studied the reasons for failing throwing attempts in judo have described the many reasons that lead to this, including the player taking a correct position that enables him to balance to achieve the throw effectively (Kajmovic, H., & Huremovic, D. (2017), Gutiérrez-Santiago, et al. (2013), Gutiérrez, A., Prieto, I., & Cancela, J. M. (2009), Prieto, et al. (2016), and Prieto Lage, et al. (2014).

The muscles around the pelvis, lower back, and hip regions constitute what is referred to as the “core,” and they play a principal role in the transfer of forces between the trunk and extremities (Kellis, E., et al. (2020). Core muscles are responsible for all the major movements of the body. These muscles give strength and stability to the movements, such as bending, twisting, crouching etc. (Chakravarthy, M., & Vivekanandhan, T. (2020).

Core strengthening is a very important part of physical preparation. It is not only for athletes but also for regular people. These muscles play a vital role in bending, twisting, sitting, or standing for time periods during daily activity (Chakravarthy, M., & Vivekanandhan, T. (2020). The training of core muscles is key in sports training to improve performance and reduce the risk of injuries (Nuhmani, S. (2021), Huxel Bliven, K. C., & Anderson, B. E. (2013).

Therefore, it was important to include core muscle strengthening workouts in training programs in judo to improve performance as well as to prevent injuries, which can be dangerous. This study examined the effect and effectiveness of core muscle workouts in improving the static balance for judo players, and the results found can be suggested to coaches.

MATERIALS AND METHODS

The participants included 24 male judo players from local clubs in Egypt who participated in the study. They have at least five years of training experience, and they participated in multiple local championships; the players' data are shown in Table (1).

All participating players were at the beginning of the preparation period and did not suffer from any injuries. We obtained consent from all the players to participate in the study, and they pledged to perform the exercises according to the instructions of the researcher and assistant coaches.

The players were randomly assigned to experimental and control groups. The first group (the experimental group) included 12 players who were trained for a period of 6 weeks with core muscle strengthening workouts according to the performance instructions shown in Figure (1).

The second group (the control group) was not trained in the same workouts assigned to the first group, except for the judo skills exercises that they participated in.

The training instructions were explained to the players by the researcher and the assistant coaches, and their questions about the study were answered and motivated them to attend and participate effectively to obtain accurate results.

The balance test (Flamingo) from the European test battery was used to measure the static balance of the players. In this test, each player stands on one foot on a crossbar (1-inch wide, 1-inch high and 20-inches long) and holds the other foot by the ankle using the hand. Each player stood for one minute, and we counted the number of attempts fails, giving the player a rest for 30 seconds, and then, we repeated the test with another leg, The average was calculated for the two measures (Adam, C., et al (1987), Jakobsen, M. D, et al. (2011), Aboelwafa, H. S., et al. (2019).

The intensive training for core muscles lasted for 6 weeks and included 8 workouts aimed at strengthening the core muscles (rectus abdominis, external and internal obliques, transverse abdominis, multifidus, quadratus lumborum, and lumbar erector spinae).

The experimental group underwent intensive training with core muscle strengthening workouts for a period of 6 weeks (three times per week) within the training unit during the preparation period, and the physical training is shown in Figure (1). However, the control group did not undergo the same intensive training for core muscles, but they trained as usual, which included a variety of muscle groups.



Figure 1. Core Muscles Strengthening Workouts Protocol

The pretest for static balance was measured using the Flamingo test for both groups one day before the start of training, and the posttest for static balance was measured one day after the end of the specified training period (6 weeks).

Statistical analysis was performed using IBM SPSS (Version 21.0). The Shapiro–Wilk test ($p < 0.05$) was applied, and the pre- test and post-test data from each group were compared via paired sample t-test. Data are presented as the mean and standard deviation of the mean.

RESULTS

All participants in the study, whose characteristics are shown in Table (1), were regularly participating in the exercises, participated in the performance according to the training program for each group.

Table 1. The players' data

Group	NO.	Age (years)	Body mass (kg)	Body height (cm)	BMI (kg/m ²)	Training experience (years)
Experimental Group	12 players	17.08	70.50	1.77	22.46	6.1
Control Group	12 players	17.58	71.34	1.78	22.46	6.6

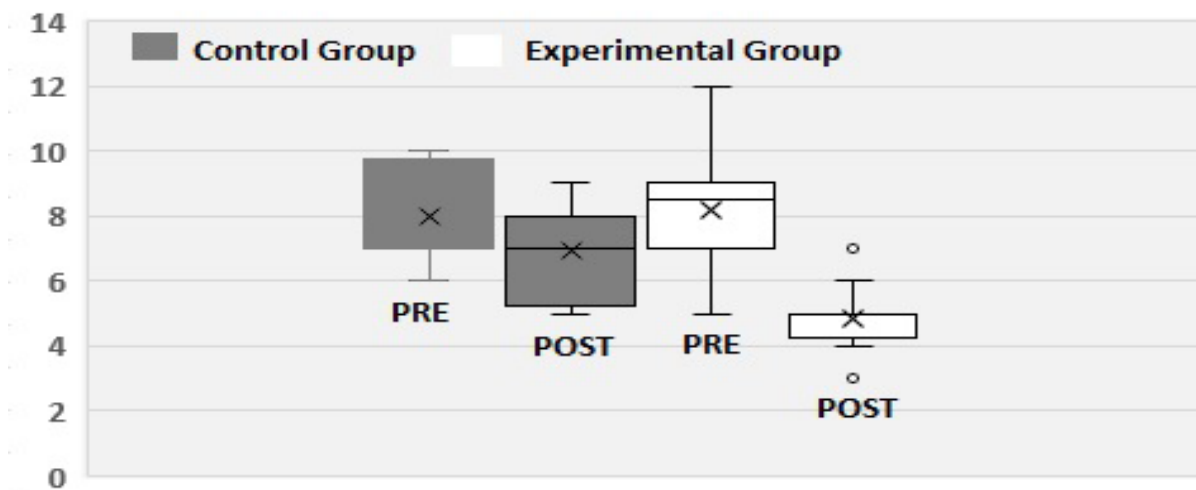
Table (2) shows the results of the paired sample T test (pretest - posttest), The table shows that there are statistically significant differences at the 0.05 level in favor of the post-measurement, and there is no correlation between the values during the pre- and post-measurement.

Table 2. the result of paired sample T test (pretest - posttest)

Pair 1	post - pre	Paired Samples Correlations			Paired Differences				
		N	Correlation	Sig.	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
								Lower	Upper
		24	.300	.155	2.20833	1.97768	.40369	1.37323	3.04344

Figure (2) shows the differences between the two groups in the pre- and post-measurements of the balance test (Flamingo) after 6 weeks of applying the program. The decreasing numbers in the figure indicate the balance level progress in the flamingo test. Both groups achieved an increase in their balance level with a different value for each group. Comparing the results of the two groups, the experimental group was significantly superior.

Figure 2. Pretest and posttest measurement of flamingo test



DISCUSSION AND IMPLICATIONS

According to the player data and the physical training program during the preparation period, which aimed to strengthen the core muscles to improve the static balance and statistical analysis, the results of our study showed that there was progress for both groups (experimental and control) in the flamingo test, but the progress in the experimental group was very high compared to the post-measurements of the control group. This difference can be explained by the effect of core muscle strengthening workouts during the preparation period for the experimental group to improve static balance.

The progress of the control group was limited compared to the experimental group, as the physical exercises for this group included the muscle groups in all parts of the body, and the intensity of the exercises differed from the exercises for the experimental group.

Improving the level of balance is closely associated to these results due to the role of core muscles in balance and stability during motor performance. (Kajmovic, H., & Huremovic, D. (2017), Gutiérrez-Santiago, et al. (2013), Gutiérrez, A., Prieto, I., & Cancela, J. M. (2009), Prieto, et al. (2016), and Prieto Lage, et al. (2014).

When performing throwing skills in judo, the player makes rotation and flexion movements around the main axis to reach the most appropriate position for throwing. This requires strong core muscles that enable the player to maintain balance and stability during performance, especially in the throwing phase, as most of the skills during the throwing phase require flexion movement in the forward and down direction to throw the defender. This requires a large contraction force of the rectus abdominis muscles, which is one of the important core muscles, in addition to the contribution of other core muscles to support performance and maintain balance and stability of the body. (Chakravarthy, M., & Vivekanandhan, T. (2020), (Nuhmani, S. (2021), Huxel Bliven, K. C., & Anderson, B. E. (2013).

There are throwing skills in judo that are performed from one foot. This means that the player needs balance and stability during the throwing phase for success of the throwing phase, and the skills of the player must be supported by physical abilities to achieve a successful throwing phase. Strengthening the core muscles can achieve this according to the results of the current study with the appropriate intensity during the training period.

Strengthening the core muscles has another benefit besides supporting and improving motor performance, including the prevention of injuries, which can stop the player from continuing training and competitions. (Nuhmani, S. (2021), Huxel Bliven, K. C., & Anderson, B. E. (2013).

CONCLUSION

The effect of intense workouts to strengthen the core muscles and their role in improving the static balance of judo players has been verified, which benefits skill performance, and this improvement can be observed during training and competitions.

The researcher suggests using the training program used in this study to strengthen the core muscles during the preparation period with a controlled training load according to the characteristics and type of players. The preparation period is the most suitable for improving balance, for strengthening the core muscles with varying intensity during training periods (preparation, competitions) and for gradation in the load intensity during the progress of training.

Coaches can use core muscle strengthening workouts with high-level players by adding weights to some of the workouts to achieve high load levels.

The importance of measuring the balance of judo players periodically before and during the training season via simple physical measurements, such as the flamingo test (the European fitness test), or via laboratory tests to verify the players' balance levels to provide accurate data of the players, it will enable improved training process planning.

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Disclosure statement

No potential conflict of interest was reported by the author.

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