

Type of Paper (Article, Review, Communication, etc)

# The Effect of Lateral Box Jump Training with Front Box Jump Training on Leg Muscle Power in Futsal Athletes

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Received: 2022-07-06. Accepted: 2022-10-23. Published: 2022-11-29.

**Abstract.** In the Futsal sport. Biomotor components such as leg power are one of the components that need to be considered by the trainer in compiling an exercise program, especially exercise in physical conditions. If the athlete can bring out the maximum leg power, the athlete can help the team win the match. So the coach must choose the right exercises to increase the strength of the athlete, one of which is plyometric exercises including the lateral box jump and front box jump. The research objective was to determine the effect of the lateral box jump and front box jump on leg power. The method used is qualitative research with an experimental approach. The subjects used were 20 athletes who participated in the futsal UKM UNIPA Surabaya. The results showed that the lateral box jump and front box jump had a significant effect on leg power, but the box jump training provided a greater increase in increasing leg muscle power.

**Key words:** lateral box jump, front box jump, leg power

**Abstract in Indonesia.** Pada Futsal. Pelatih yang akan menyusun suatu program latihan harus memperhatikan komponen biomotorik, seperti *power* otot tungkai. *Power* otot tungkai sangat berpengaruh dalam kemenangan pertandingan sebuah tim jika seorang atlet dapat mengeluarkan *power* otot tungkai secara maksimal. Sehingga pelatih perlu pandai dalam memilih latihan yang sesuai dalam menaikkan *power* atlet, salah satunya latihan *plyometric* antara lain *lateral box jump* dan *front box jump*. Tujuan penelitian untuk mengetahui pengaruh *lateral box jump* dan *front box jump* terhadap *power* tungkai. Metode penelitian kualitatif dengan pendekatan eksperimen. Subjek penelitian ini sejumlah 20 atlet yang mengikuti UKM futsal UNIPA Surabaya. Hasil penelitian menunjukkan bahwa *lateral box jump* dan *front box jump* berpengaruh signifikan terhadap *power* otot tungkai, tetapi pada pelatihan *front box jump* memberikan peningkatan yang lebih besar dalam meningkatkan *power* otot tungkai.

**Keywords:** *lateral box jump*, *front box jump*, *power* tungkai

**How to Cite:** Puriana, R. H., Pelamonia, S. P., Suryansyah, S. (2022). The effect of lateral box jump training with front box jump training on leg muscle power in futsal athletes. *MIKI: Indonesian Sports Science Media* 12 (2), 74-79.

**DOI:** <http://dx.doi.org/10.15294/miki.v12i2.27441>

## INTRODUCTION

In today's world, physical activity has been recognized as an essential component for the holistic development of an individual. Physical activities are not merely for physical fitness but also cater to the spiritual and social well-being of a person (Chelly, 2014). Among the diverse array of physical activities, sports play a significant role in this development process, as they encompass a deliberate and sequential approach to building physical strength and fostering team spirit (Maksum, 2012).

Futsal, a variant of association football played on a hard court and mainly indoors, is a sport that demands agility, speed, and strength. The success of a futsal team relies significantly on the physical attributes and fitness levels of its players. One of the critical factors in a player's performance is their leg muscle power. It is a crucial component as it directly impacts the player's ability to shoot on goal and make rapid movements or changes in direction, which are essential aspects of the game (Castagna, 2013; Gheller, 2015; Lockie, 2015; Menzel, 2013; Spiteri, 2014).

To optimize a player's leg muscle power, it is imperative for the coach to incorporate the right set of exercises in the training regimen. Plyometric exercises, such as lateral box jumps and front box jumps, are believed to be highly effective in enhancing leg muscle power (Bell, 2014; Johnston, 2013; Lockie, 2014; Loturco, 2015; Michailidis, 2013). Plyometric exercises involve explosive movements that can improve muscle strength, coordination, and speed, which are all vital for a futsal player. Several studies,

including expert research, have demonstrated that plyometric training can significantly improve jumping performance and sprint speed in athletes (Chu and Myer, 2013).

It is important to note that plyometric exercises involve anaerobic muscle metabolism. Anaerobic metabolism is characterized by the production of energy (in the form of ATP) without the use of oxygen. While this form of metabolism is advantageous for short bursts of energy, it also leads to the accumulation of lactic acid in the blood. This build-up can cause muscle fatigue and diminished muscle function, affecting the performance of the athlete (Comfort, 2014; Fernandez-Santos, 2015; Gonzalo-Skok, 2017; Haldane, 2016; Hammami, 2016).

This brings us to an area of interest for researchers and practitioners alike - understanding the best practices for plyometric training, particularly in determining the optimal form and intensity of the exercises, as well as the intervals between them. According to Chu and Myer (2013), the intervals in plyometric training using rest ratios between 1:5 to 1:10 are an area worth exploring.

This article aims to delve into plyometric exercises, focusing on their application in enhancing leg muscle power for futsal players. We will examine the various forms of plyometric exercises, explore the science behind them, and investigate the optimal intervals and intensity that maximize the benefits of plyometric training for futsal athletes. Through this, we seek to offer valuable insights for coaches and trainers to develop effective training programs tailored to the specific needs of futsal players (Loturco, 2016).

## METHODS

This study employs a quantitative research approach with an experimental design to investigate the impact of two different plyometric exercises on the explosive power of leg muscles in futsal players. The research design incorporates a pre-test and post-test for two groups, enabling the observation of changes before and after the intervention (Arikunto, 2010). The study focuses on two variables: the independent variable, which consists of two types of plyometric exercises (lateral box jumps and front box jumps), and the dependent variable, which is the explosive power of the leg muscles. A total of 20 athletes from the UNIPA Surabaya Futsal UKM were selected as subjects for this study. The group division technique used is Ordinal Pairing, which entails dividing the sample into experimental groups while taking into consideration the power abilities of the participants. This division is based on the initial test results, which are conducted before the intervention. The explosive power of the leg muscles is quantified through the measurement of jump height, which is then used to calculate power in joules using McGinnis's formula (McGinnis, 2013):

$$P = \text{joules/ second} \quad \frac{F(d)}{\Delta t} = \frac{m \cdot g \cdot d}{t} =$$

Where:

P = power (joules)

m = body weight (kg)

g = acceleration due to gravity (9.8 m/s<sup>2</sup>)

d = distance jumped (meters)

t = time taken (seconds)

**Procedures.** **Preparatory Stage:** This involves managing licensing letters and preparing the instruments necessary for the study. **Implementation Stage.** The participants are divided into two groups using the Ordinal Pairing technique. Group I receives the lateral box jump plyometric exercise treatment, while Group II undergoes the front box jump plyometric exercise treatment. Initial tests are performed using a vertical jump instrument to measure the jump height of each participant. This data is essential for calculating the explosive power using McGinnis's formula. The respective plyometric exercise treatments are administered to the groups. **Post-Intervention Assessment:** Following the completion of the exercise treatments, post-tests are conducted to reassess the explosive power of the leg muscles using the same measurements as the pre-tests.

Statistical Analysis. After ensuring the normality and homogeneity of the data, hypothesis testing is conducted using a paired T-test to evaluate the changes within each group. Additionally, an Analysis of Variance (ANOVA) is employed to compare the effects across the two groups. In cases where the ANOVA indicates significant differences, a Least Significant Difference (LSD) post hoc test is used for further analysis.

By adopting this methodological framework, the study aims to assess the effectiveness of lateral box jumps and front box jumps in enhancing the explosive power of leg muscles, which is crucial for futsal players. The findings can offer valuable insights for trainers and coaches in optimizing training programs for futsal athletes.

**Table 1.** Group Division

<b>Experimental Group</b>	<b>Student Power Ability Ranking</b>	<b>Sum</b>
Latera Box Jump	1,4,5,8,9,12,13,16,17,20	10
Front Box Jump	2,3,6,7,10,11,14,15,18,19	10

## RESULTS AND DISCUSSION

This section presents the results obtained from the study, which investigated the impact of two different plyometric exercises - Lateral Box Jump (Group I) and Front Box Jump (Group II) - on the explosive power of leg muscles in futsal players.

### Group I (Lateral Box Jump Training)

**Table 2.** Group I Limb Muscle Power Results

		<b>Treatment team 1</b>		
<b>Order</b>	<b>Identity</b>	<b>Power Leg Muscles</b>		
		<b>Pre test</b>	<b>Post test</b>	<b>difference</b>
1	G	757.44	917.10	159.66
2	BUT	670.32	820.20	149.88
3	WOULD	616.40	759.30	142.90
4	ACA	678.55	786.15	107.60
5	FN	591.40	730.80	139.40
6	ALH	615.30	742.73	127.43
7	ARYA	572.25	685.60	113.35
8	THAT	598.50	743.30	135.80
9	DN	534.10	657.42	123.32
10	NOW	478.62	588.40	109.78
<b>Average</b>		<b>611.29</b>	<b>742.20</b>	<b>1309.12</b>
<b>Standard Deviation</b>		<b>78.21</b>	<b>90.14</b>	<b>130.912</b>
<b>Increased</b>				<b>21.41%</b>

As illustrated in Table 2, the leg muscle power in Group I increased on average by 21.41% after undergoing 8 weeks of Lateral Box Jump training, with a frequency of 3 times per week. The exercise involved the athlete jumping onto a box and then sideways off it, ensuring eccentric and concentric muscle contraction.

### Group II (Front Box Jump Training)

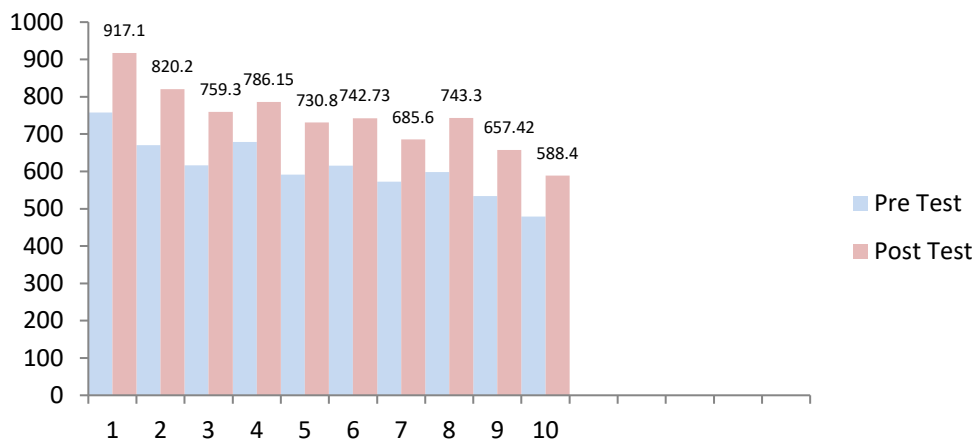


Figure 1. Average Results of Group I Exercise

Figure 1 represents the average results of leg muscle power pre-test and post-test for Group II. Based on Figure 1, there is an average increase in leg muscle power of 20.00% in Group II after 8 weeks of training with a frequency of 3 times per week. Front Box Jump training involves athletes jumping onto a single box and stepping back down in a manner that ensures the maintenance of eccentric and concentric muscle contractions.

Paired Sample T-test for Group I (Lateral Box Jump). The results indicated a significant increase in leg muscle power post-intervention. It was concluded that Lateral Box Jump training had a significant effect on leg muscle power.

Paired Sample T-test for Group II (Front Box Jump). Similarly, the results showed a significant increase in leg muscle power post-intervention. It was concluded that Front Box Jump training significantly affected leg muscle power.

Analysis of Variance (ANOVA) between Groups. The One-Way ANOVA test revealed a significant difference between the training results of Group I (Lateral Box Jump) and Group II (Front Box Jump) in terms of leg muscle power.

Post Hoc Test. The results indicated that Front Box Jump training resulted in a slightly higher increase in leg muscle explosive power compared to Lateral Box Jump training. It was observed that the Lateral Box Jump training posed a heavier load due to the sideways jumping movement.

The study results clearly indicate that both Lateral Box Jump and Front Box Jump exercises significantly enhance the explosive power of leg muscles. However, the Front Box Jump, albeit having a lighter load, yields slightly higher gains in explosive power compared to the Lateral Box Jump. These findings corroborate the statement of Chu (2013) who classified Front Box Jump exercises as a form of plyometric exercise effective in boosting leg muscle power.

From an application perspective, Front Box Jump exercises can be integrated into training programs for various sports where leg muscle power is a critical determinant for performance. Moreover, it is important for coaches and trainers to pay attention to the technique, especially the foot positioning during these exercises to maximize benefits and prevent injuries (Chaouachi, 2014; Ortega, 2015; Rodríguez-Rosell, 2017).

The present study was designed to investigate the impact of two distinct plyometric exercises - Lateral Box Jump and Front Box Jump - on the explosive power of leg muscles in futsal athletes. Through rigorous quantitative research and employing a pre-test and post-test experimental design, the study exhibited significant findings. The data collected from the 20 athletes who participated in this study indicated that both Lateral Box Jump and Front Box Jump exercises considerably enhanced the explosive power of the leg muscles. However, a comparative analysis between the two exercises revealed that Front Box Jump training is marginally more effective in achieving this goal. These findings can be exceedingly valuable for coaches, athletes, and sports scientists who are in search of effective training regimes that can optimize the athletic performance, particularly in sports where leg muscle power is pivotal. Both plyometric exercises - Lateral Box Jump and Front Box Jump - are effective.

However, Front Box Jump training emerged as slightly more advantageous in augmenting the explosive power of leg muscles, which is essential for sports performance.

## CONCLUSION

The conclusions drawn from this study demonstrate a significant relationship between Lateral Box Jump and Front Box Jump training on leg muscle explosive power. There is a significant distinction between the results of Lateral Box Jump group training and Front Box Jump group on leg muscle explosive power. Yet, Front Box Jump training showcased a comparatively higher increase in leg muscle explosive power. While this study provides substantive insights into the effectiveness of Lateral Box Jump and Front Box Jump training on enhancing leg muscle explosive power, it also lays the groundwork for further research. Future research can build upon the findings of this study and contribute to a more comprehensive understanding, which in turn, can lead to the development of more efficacious training programs for athletes across various sports.

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