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The Effect of Core Stability Training on Jump Serve Accuracy in Youth Volleyball Players

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Abstract

The purpose of this study was to examine the effect of core stability training on jump serve accuracy in adolescent volleyball players. In the sport of volleyball, jump serve accuracy is essential for creating effective attacks, while core stability plays an important role in controlling body movement, improving balance, and generating the strength needed to serve accurately. This study used an experimental design with 30 youth volleyball players from the New Antarctica Club who were divided into two groups: an experimental group that underwent a 6-week core stability training program and a control group that received no specific training intervention. The results showed that the experimental group experienced a better and significant improvement in jump serve accuracy compared to the control group. Therefore, it can be concluded that core stability training can improve jump serve accuracy in adolescent volleyball players.

How to Cite

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INTRODUCTION

In volleyball, the jump serve technique is one way to put pressure on the opponent through a strong and accurate serve. An effective jump serve can make it difficult for the opponent to receive the ball, especially if the serve is directed to a hard-to-reach area. Therefore, accuracy in jump serving is one of the determining factors in the success of the game (Hughes & Franks, 2017). However, to be able to perform an effective jump serve, athletes must have optimal physical condition, especially in terms of strength, agility, and good body stability.

One important aspect of body stability during the jump serve movement is core stability. Core stability refers to the ability of the muscles surrounding the spine and pelvis to work synergistically to maintain body balance and support dynamic movements, such as during a jump serve (kibler et al., 2016). These muscles are essential in a variety of sporting movements, including jump serve in volleyball, as good body stability improves movement efficiency and reduces the risk of injury (shrier, 2004). When athletes have good core stability, they will be able to maintain better body control, which impacts the accuracy of the ball produced.

Core stability training focuses on strengthening these muscles with various exercises, such as planks, bridging, and exercises involving balance balls (behm & boudarham, 2017). Core stability exercises have been shown to be effective in improving strength, coordination, and balance. Based on research conducted by behm & sale (2017), exercises that focus on strengthening core muscles can increase body stability and improve athletes' performance in various sports, including volleyball. In addition, core stability also plays a role in reducing the risk of injury, which is important in sports with fast movements and changes in direction such as volleyball (shrier, 2016; kibler et al., 2006).

Previous research has also shown that core stability training can help improve posture and control during the jumping motion, which is an important part of jump serve technique (hibbs et al., 2017). In addition, research by kibler et al. (2006) also showed that good core stability can improve accuracy in volleyball serving, which makes this exercise relevant for improving jump serve accuracy. Athletes who have good core strength can keep their body balanced and stable when serving, so they can direct the ball more precisely and avoid uncontrolled movements that can reduce accuracy.

Agility and lower body muscle strength are also important factors that influence jump serve success. However, the main factor underlying body control and resulting accuracy in jump serve is the ability to maintain balance and body control. With good core stability, athletes can maximise jumping movements and produce more powerful and accurate serves (kibler et al., 2016). Research by behm & sale (2017) also found that core training not only increases strength, but also improves coordination between different body parts, which helps athletes in performing more efficient movements. On the other hand, regular core stability training can improve a volleyball player's ability to regulate the rhythm of their movements, as well as improve the overall efficiency of their jump serve technique (hibbs et al., 2017).

This study focuses on the effect of core stability training on improving the ability of jump serve technique, which is one of the key skills in volleyball games, especially in adolescents who are in the stage of physical and technical development. Thus, the formulation of the problem in this study is how the effect of core stability training on jump serve accuracy in adolescent volleyball players. While the purpose of this study is to evaluate the effect of core stability training on improving service accuracy in adolescent volleyball players. By increasing the strength and stability of the core muscles, it is hoped that athletes will be able to direct the ball more accurately, minimize common errors, and increase consistency in jump serving. In addition, this study aims to provide practical guidance for coaches in designing training programs that can improve service accuracy, especially for adolescent athletes who are in the technical skill development stage. It is hoped that the results of this study can make an important contribution to improving serving performance at an early age, as well as providing a deeper understanding of the relationship between core strength and serving performance in volleyball.

Many studies investigating core stability and jump serve accuracy have focused on senior or professional athletes. This study makes a novel contribution by focusing on adolescent volleyball players, who often have not received enough attention in research on service technique development. This novelty is important because the muscle development and body stability of adolescent players are very different from those of adult players, requiring a more specific training approach. Another novelty is the science-based, more measurable approach to core stability training. This study included more standardized objective

measurements to assess the degree of improvement in jump serve accuracy as a result of core stability training, which is a novel contribution to research methodology in this area.

METHODS

Research Design

This study used an experimental design with a control group to evaluate the effect of core stability training on jump serve accuracy in adolescent volleyball players [**Figure 1**]. Experimental design with a control group is one of the effective methods to assess the cause-and-effect relationship between the variables being tested, in this case core stability training and jump serve accuracy (Gabbett & Kelly, 2017). In this study, the researcher compared two groups that were given different treatments to see the difference in results on the variables under study.

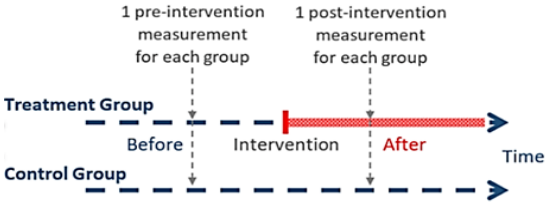


Figure 1. Pretest-Posttest Control Group Design
(Source: Reichardt et al., 2019)

This study was conducted at a volleyball club in New Antartika, Bekasi Regency, involving 30 adolescent volleyball players aged between 14-16 years. This age selection was based on the fact that adolescents in this age range are in a stage of rapid physical development, so improving physical fitness and technique can have a significant impact (McGill, 2016). The participants were randomly divided into two groups: an experimental group (n = 15) that underwent a 6-week core stability training programme, and a control group (n = 15) that received no specific training programme. The control group simply continued with their routine volleyball practice.

Exercise Intervention

The experimental group in this study underwent a core stability exercise programme designed to improve the strength and stability of the core muscles. The programme consisted of 3 training sessions per week for 6 weeks. Each training session lasted 45 minutes and included various exercises that focused on strengthening the core muscles, such as plank, side plank, bridging, as well as balance exercises using a Swiss ball. These exercises were chosen because they can activate the mid-body stabiliser muscles that play a role in maintaining body balance and stability during dynamic movements, such as jump serves in volleyball (Behm & Faigenbaum, 2017). Plank and side plank are particularly effective for strengthening the abdominal and lower back muscles, while bridging works the gluteus and hamstring muscles which also play a role in body stability (Hibbs et al., 2017).

This core stability training programme is designed to increase core strength, as well as improve body coordination and balance, which are essential in improving athlete performance in the sport of volleyball (McGill, 2016). Exercises are performed at a progressive intensity, where the difficulty and duration of the exercises increase over time. The programme is also designed to increase the endurance of the core muscles in order to last longer in performing explosive movements such as jump serves. A study by Gabbett et al. (2017) showed that structured core stability training over a 6-week period can improve body control and muscle strength supporting dynamic movements, contributing to improved athlete performance.

Jump Serve Accuracy Measurement

Jump serve accuracy was measured by asking participants to make 10 jump serve attempts to a predetermined target area [**Figure 2**]. Each ball that successfully entered the target area was counted as a hit. The target area was divided into three clear sections, namely left, centre, and right. Any ball that goes into one of these sections is considered a hit. This measurement aims to assess the extent of the athlete's ability to direct the ball precisely to the desired area, which is a crucial aspect in the jump serve technique (Santos et al., 2019).

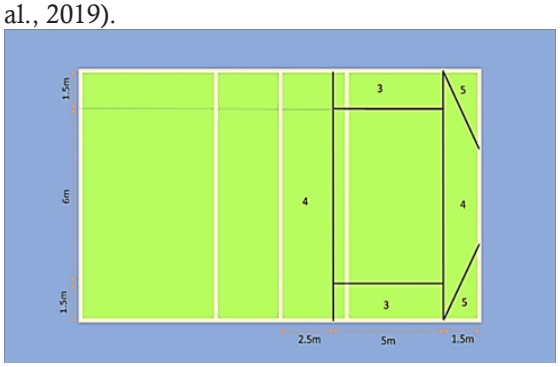


Figure 2. Volleyball Jump Serve Accuracy Test Diagram Test Modification of the NCSU Volleyball Skills Test Battery model
(Source: Bujang, 2022)

Data Analysis

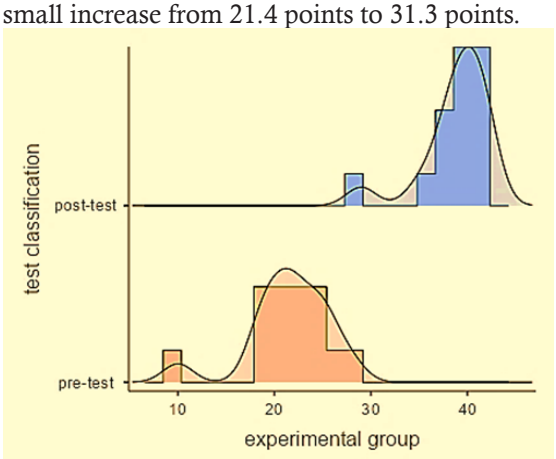
The data obtained was analysed using the

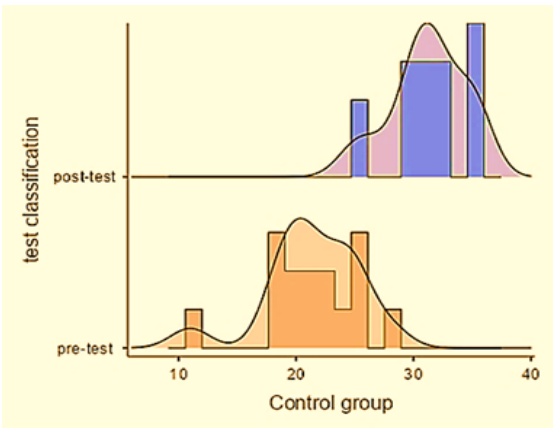
t-test to compare the difference in jump serve accuracy between the experimental group who underwent the core stability training program and the control group who did not receive the training treatment. The t test was used to determine if there was a significant difference between the two groups in terms of jump serve accuracy, the difference was considered significant if the p value was <0.05, indicating that the results obtained did not occur by chance. This method of analysis has proven effective for testing differences between two groups in various types of experimental research (Field, 2017). In this study, the t-test will provide a clear picture of the effectiveness of core stability training in improving the jump serve accuracy of adolescent volleyball players.

RESULTS AND DISCUSSION

Jump Serve Accuracy Measurement Results

The results of the jump serve accuracy measurement showed that the experimental group undergoing core stability training experienced a significant increase in jump serve accuracy. The average number of balls into the target for the experimental group increased from 21.5 points (before training) to 38.9 points (after training), while the control group only experienced a small increase from 21.4 points to 31.3 points.





Statistical Analysis

The independent t-test showed that the difference in the improvement of jump serve accuracy between the experimental group and the control group [see table below]. The results of the analysis showed that both groups provided significant improvement with each p value <0.001.

Furthermore, to find out which one is better between the two groups, a paired samples T-test was conducted. The results of the analysis showed that there was a statistical value of 11.5 with $p < 0.001$. with the average value of improvement for each group being 38.9 for the experimental group and 31.3 for the control group. It can be concluded that the core stability training group is better than the training group that did not get the core stability training treatment.

The results of this study indicate that core stability training has a positive effect on jump serve accuracy in adolescent volleyball players. This finding is in line with previous research showing that good core stability is essential for improving body control and movement coordination, which are indispensable in producing accurate serves. According to Behm & Chaouachi (2017), good core stability can help athletes to control body movements more effectively, especially when performing dynamic movements such as jump serves in volleyball. Exercises that focus on strengthening the core muscles allow players to better control their bodies when jumping and performing jump serves, thus improving the accuracy of the resulting serves.

Core stability training focuses on strengthening the muscles surrounding the spine, abdomen, lower back, and pelvis. These core muscles play a major role in maintaining the body's balance, especially during the jumping motion that occurs during a jump serve (Santos et al., 2019). With exercises that focus on core strengthening, such as plank, side plank, bridging, and balance exercises using a Swiss ball, athletes can improve their body stability, which in turn contributes to improved jump serve accuracy. These exercises have been shown to be effective in strengthening the core muscles and help improve body stability during movements involving jumping and ball striking, which are crucial in volleyball (McGill, 2016)

Better motor coordination can also be obtained through structured core stability exercises. Kibler et al. (2017) explain that good core stability allows athletes to perform more coordinated and more efficient movements, which is especially important in sports like volleyball, which

involve explosive movements and rapid changes in direction. Core strengthening also plays a role in improving balance and body control, which allows players to maintain stability while in the air and direct the ball to the right area. This improved motor coordination, gained through core stability training, can assist volleyball players in optimising their jump serve technique, resulting in more accurate and effective serves (Santos et al., 2019)

Research by Gabbett & Domrow (2017) also added that good core stability can improve core muscle endurance and reduce the risk of injury, which is especially important in sports with fast and repetitive movements such as volleyball. By improving core strength and endurance, players can maintain consistent jump serve quality throughout the match, even after many service attempts. Training programmes that focus on core strengthening can also improve athletes' performance in the long term, giving them greater stability and reducing the likelihood of injury (Gabbett & Domrow, 2017)

Overall, the results of this study confirm that core stability training can improve jump serve accuracy in adolescent volleyball players. By improving body control, movement coordination, and core strengthening, players can improve their jump serve technique and enhance in-match performance. These findings provide further evidence that a training programme focused on core strength can provide significant advantages in improving the accuracy and effectiveness of the serve in volleyball.

CONCLUSION

This study shows that core stability training has a positive influence on jump serve accuracy in adolescent volleyball players. A structured training programme can improve core stability, which contributes to improved jump serve accuracy. Therefore, core stability training should be included in the regular training programme of adolescent volleyball players who want to improve their jump serve performance.

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