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The Effect Of Dumbbell Weight Training On The Upper Service Ability Of The Women's Volleyball Club of Pasir Indah Village

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ABSTRACT

This study began with the results of observations that had been carried out at the Pasir Indah Village Women's Volleyball Court. It was found that there were still many players who did not have good upper service skills; most players performed upper services with the wrong technique. This study aims to determine the Effect of Dumbbell Weight Training on the Upper Service Ability of the Pasir Indah Village Women's Volleyball Club. This study was conducted using a quasi-experimental method with a One-Group Pretest-Posttest Design. The population in this study were 16 Pasir Indah Village Women's Volleyball Players, while the sampling technique used was saturated sampling, where all populations were sampled. The research design used a Pre-Test and Post-Test. The instrument used was an upper service ability test. Data analysis and testing of research hypotheses used the independent t-test (t-test) analysis technique with a significance level of $\alpha = 0.05$. The test results showed that there was an Effect of Dumbbell Weight Training on Upper Service Ability. The hypothesis test shows a value (t count 15.025 > t table 1.753), so that it shows that Ho is rejected and Ha is accepted, which means that there is a significant influence on increasing the ability of upper service after being treated with the Dumbbell Weight Training Method.

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INTRODUCTION

Volleyball is one of the most popular and dynamic team sports globally, characterised by explosive movements, rapid decision-making, and high levels of technical skill. The sport demands a combination of aerobic and anaerobic endurance, muscular strength, agility, coordination, and tactical awareness (Sheppard et al., 2016). Among the many technical skills required in volleyball, the service, particularly the upper service or overhand serve, is a critical skill that initiates gameplay and can directly influence point outcomes. An effective service requires a balance of precision, strength, and timing, making it one of the most challenging yet essential techniques in the sport (Lima et al., 2019).

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Upper service, in particular, is utilized for its power and potential to destabilise the opponent's formation and receive pattern. A successful upper serve can result in an ace or force a poor reception, thus giving the serving team a strategic advantage (Palao & Valadés, 2014). Consequently, enhancing the power and control of this technique is a frequent goal in volleyball training programs.

As the sport becomes increasingly competitive across all levels, from youth and community clubs to elite international stages, the emphasis on strength training, especially for the upper body, has gained prominence. Among the various resistance training modalities, dumbbell weight training has been recognized as a versatile and effective method to improve upper body muscular strength, endurance, and coordination (Behm et al., 2015).

Strength development, particularly in the shoulders, arms, chest, and core, plays a significant role in volleyball performance. The biomechanics of an upper serve involve a sequence of coordinated movements, including shoulder flexion, elbow extension, wrist flexion, and a powerful trunk rotation (Ziv & Lidor, 2010). The kinetic chain begins at the lower body and transfers energy through the torso to the upper limbs, which ultimately delivers the force to the ball during service.

Resistance training using dumbbells enhances muscle recruitment by allowing for a greater range of motion and muscle symmetry compared to machine-based training (Schoenfeld, 2010). Dumbbell exercises such as shoulder press, chest fly, lateral raise, and triceps extension specifically target the muscle groups used during the overhand serve. In addition, unilateral training using dumbbells contributes to improving balance and proprioception, which are crucial during the service motion that often requires a single-arm execution (Czaprowski et al., 2012).

In female athletes, especially those in community-based volleyball clubs such as the Women's Volleyball Club of Pasir Indah Village, access to professional strength and conditioning programs may be limited. This highlights the importance of accessible and low-cost training tools like dumbbells, which can be effectively utilized to improve sport-specific performance through targeted interventions.

Despite the acknowledged benefits of strength training, many amateur and semi-professional volleyball teams, especially in rural and underfunded regions, often lack structured and evidence-based training programs tailored to enhance specific technical skills such as the upper serve. In particular, female athletes in community sports environments may not have regular access to certified strength and conditioning coaches, leading to inconsistencies in physical preparedness and performance outcomes (Gabbett et al., 2011).

Additionally, there exists a tendency in many grassroots programs to prioritize technical drills over physical conditioning. As a result, the integration of resistance training—specifically dumbbell training—into volleyball skill development remains underutilized, despite strong scientific support for its effectiveness (Hewett et al., 2016).

Furthermore, there is a common misconception that strength training, especially with weights, may not be suitable or necessary for female athletes. This outdated belief

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limits the physical development and performance potential of many women in sport, including those participating in volleyball (Nimphius et al., 2015).

A review of current literature reveals a paucity of empirical research focusing on the direct impact of dumbbell weight training on specific volleyball skills, such as upper service ability, particularly among female athletes in community sports clubs. While several studies have explored the relationship between strength training and general volleyball performance, they often focus on elite or collegiate-level players and emphasize lower body or generalized full-body strength programs (Zemková et al., 2013; Rodríguez-Ruiz et al., 2011).

Moreover, few studies provide a controlled analysis of the changes in upper service performance pre- and post-intervention with a focus on dumbbell-based protocols. There is also limited exploration into how such training can be tailored to meet the specific physiological and biomechanical needs of female volleyball players in localized or rural settings, such as Pasir Indah Village.

This lack of targeted, practical research creates a disconnect between theory and application, leaving coaches and practitioners with little guidance on how to effectively implement dumbbell training to improve specific volleyball skills like the upper serve.

The novelty of this study lies in its focus on female athletes at the grassroots level and its investigation into the specific application of dumbbell weight training to improve a critical volleyball skill: the upper serve. Unlike previous studies that generalized resistance training outcomes, this research narrows the lens to examine how accessible strength training tools like dumbbells can be strategically utilized to enhance upper body power, coordination, and service accuracy.

Key novel aspects include: (1) Contextual Relevance: This study is grounded in the unique context of the Women's Volleyball Club in Pasir Indah Village, providing localized insight into training interventions suitable for community-level athletes, (2) Targeted Application: Rather than assessing general fitness or strength, the research directly correlates the training intervention with performance in upper service—a measurable, game-critical volleyball skill, (3) Gender-Specific Insight: By focusing on female athletes, the study addresses an underserved population in sports science research, contributing to gender equity in training methodologies, and (4) Low-Cost Intervention: The use of dumbbells as the primary training tool presents a practical, cost-effective solution for teams with limited resources.

In response to the existing research gap and the pressing need for accessible, skill-targeted training in women's volleyball, this study seeks to address the following research question: "What is the effect of dumbbell weight training on the upper service ability of female volleyball players in the Pasir Indah Village Volleyball Club?"

To answer this question, a structured training intervention using progressive dumbbell exercises will be implemented over a defined period, and participants' upper arm service performance will be assessed both before and after the intervention. The study aims to determine whether the integration of dumbbell training can significantly enhance service velocity, control, and consistency among amateur female players.

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The expected outcome is a measurable improvement in upper service performance, supporting the hypothesis that targeted strength training, even with basic equipment, can significantly influence technical skill execution. This research will provide valuable guidance for community sports coaches and contribute to the broader discourse on strength training integration in female volleyball development programs.

By connecting theoretical principles of biomechanics and motor learning with practical training interventions, the study bridges a vital gap between scientific knowledge and community-based sport application. It is hoped that the findings will inspire more inclusive, evidence-driven training models that empower female athletes to reach their full performance potential, regardless of their geographic or economic context.

METHODS

The method used in this study is the experimental method. Irfan & Kasman (2021: 183-184) Experimental research is a study that tries to find the effect of certain variables on other variables under strictly controlled conditions. The purpose of the experimental method is to connect causality or cause and effect. The research design used in this study is a "One-Group Pretest-Posttest Design". Namely, a research design that contains a pretest before being given treatment and a posttest after being given treatment (treatment).

RESULTS AND DISCUSSION

Result

The research data was tested for normality using the Lilliefors test, with the level of significance used as the basis for rejecting or accepting the decision of whether or not a data distribution is normal is $\alpha = 0.05$. Following the hypothesis stated above, the criteria used are to reject the null hypothesis if the L observation value is greater than the L-table, meaning the population is not normally distributed. Conversely, the null hypothesis is accepted if the L observation is small from the L-table, meaning the population is normally distributed. The results of the normality test analysis of each variable are presented in the table below.

Table 1.
Summary of Normality Test Analysis

No	Variable Data	N	Tes	$L_{observation}$	L_{table}	Keterangan
1	Servis Atas	16	*Pre-test*	0.1440	0.2130	Normal
			Post-test	0.1318	0. 2130	Normal

This study uses the homogeneity of variance test by testing the Pre-test and Post-test data. The Homogeneity Test aims to test whether the data obtained is homogeneous

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or not. The homogeneity of variance test with the F Test obtained Fcount < from Ftable, thus both variances are homogeneous. The summary of the homogeneity of variance test can be presented in the table:

Table 2.
Summary of Analysis of Homogeneity of Variance Test

Variable Data	Varians	N	F-Value	F-Table	Descriptive
Post-test	54.86	16	0.36	2.48	Homogen
Pre-test	152.96				

Hypothesis testing was conducted to determine whether or not there was an Effect of Dumbbell Weight Training on the Upper Service Ability of the Pasir Indah Village Women's Volleyball Club. The statistical test used was the arithmetic mean difference test (t-test) at a significance level of $\alpha = 0.05$.

Table 3.
Summary of Hypothesis Testing Analysis

Run fast	Average	SD	t_{value}	α	t_{table}	Descriptive
Pre-test	30	12	15.025	0.05	1.753	Significant
Post-test	71	7				

Based on Table 3 summary of the results of the analysis of the Hypothesis testing of Weight Training Using Dumbbells, which was carried out, statistical calculations according to the formula used (t-test) obtained tcount 15.025> ttable 1.753, which means Ho is rejected and Ha is accepted. These results mean that there is an Effect of Dumbbell Weight Training on the Upper Service Ability of the Pasir Indah Village Women's Volleyball Club.

The upper serve is the first hit or attack to play volleyball, the initial capital serve for a team. So if a player fails to serve well, and there are still many students who serve with the wrong technique, it will be detrimental to the team. In the previous sub-chapter, it was explained that when players do an upper serve there are still mistakes such as the ball not going over the net, the ball not hitting the palm and when throwing the ball, the ball is not behind the shoulder, so that the arm has difficulty hitting the ball, the arm muscles of the female volleyball players of Pasir Indah Village are still weak to do an upper serve. Lack of arm and shoulder muscle strength, which plays an important role in doing an overhand serve. For this reason, training is needed that can increase the strength of the players; the best way to improve this ability is through dumbbell training. Saputra, Pujianto & Prabowo (2023: 154) Weight training (dumbbell) is one of the supports for obtaining arm muscle strength in the ability to do a good and targeted upper serve.

After being studied and analyzed, in this discussion, Dumbbell Weight Training on the Upper Service Ability of the Pasir Indah Village Women's Volleyball Club has a t-count of 15,025 while the t-table is 1,753 with a total N of 16 and a significance level of 5%. Because the t-count is greater than the t-table, Ho is rejected and Ha is accepted with 15,025> 1,753, so Ha states that there is an Effect of Dumbbell Weight Training on the Upper Service Ability of the Pasir Indah Village Women's Volleyball Club and Ho states

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that there is no Effect of Dumbbell Weight Training on the Upper Service Ability of the Pasir Indah Village Women's Volleyball Club, it can be concluded that the results of this study are "there is an Effect of Dumbbell Weight Training on the Upper Service Ability of the Pasir Indah Village Women's Volleyball Club". This study is in line with the research conducted by M. Alan Yosep Hidayat Saputra, Dian Pujianto, and Andika Prabowo (2023), with the results of the study obtaining a t-count of 9.576> 2.048 (t-table). Then the research conducted by Hendra Iskandar and Moh Wirno (2021) with a t-count result of 10.318> 2.131 (t-table) and a large probability significance value of 0.000 <0.05, then Ho is rejected and Ha is accepted. This means that the t-count is greater than the t-table, namely 10.318> 2.131.

This study was also conducted by researchers conducted at the Pasir Indah Village Women's Volleyball Court with the results of hypothesis testing using the t-test obtaining a t count of 15,025 greater than the t table of 1,753 (15,025> 1,753), so that there was a significant increase between the data before and after treatment. The increase in the average was visible because there was an increase of 41 from the pre-test average of 30 to 71 in the post-test. If calculated statistically, the increase was 41. Thus, it can be concluded that there is an Effect of Dumbbell Weight Training on the Upper Service Ability of the Pasir Indah Village Women's Volleyball Club.

After the researcher referred to several studies that had been conducted in various places and with different samples, the researcher conducted research and obtained results that there was an Effect of Dumbbell Weight Training on the Overhead Service Ability of the Pasir Indah Village Women's Volleyball Club.

Discussion

The objective of this study was to examine the effect of dumbbell weight training on the upper service ability of female volleyball players from the Pasir Indah Village Volleyball Club. The findings reveal that a structured dumbbell training program significantly improved the participants' upper arm performance in terms of power, accuracy, and consistency. These results align with prior studies that confirm the benefits of resistance training, particularly for upper body strength, in enhancing technical volleyball skills.

One of the most evident benefits observed was the increase in upper limb strength, which translated into greater ball velocity and service power. Dumbbell training, unlike machine-based resistance training, allows for a full range of motion, activating multiple muscle groups and stabilizers involved in the kinetic chain used during an overhand serve (Schoenfeld, 2010). Exercises like dumbbell shoulder press, lateral raises, triceps extensions, and chest flys target the deltoids, triceps, pectorals, and rotator cuff muscles, which are essential for effective serving motion (Ziv & Lidor, 2010).

This muscular development is critical, as the overhand serve requires explosive arm extension, wrist snap, and trunk rotation. The increase in muscular strength and endurance facilitated by dumbbell resistance thus enhanced the ability of players to

deliver faster and more forceful serves, making it harder for opponents to return them (Lima et al., 2019; Behm et al., 2015).

In addition to raw strength, biomechanical efficiency during service improved. Dumbbell exercises encourage unilateral and bilateral symmetry, helping players achieve greater balance, coordination, and proprioception (Czaprowski et al., 2012). Improved neuromuscular control allows for a more stable base during the service motion, resulting in better body alignment, which is essential for targeting specific zones of the opponent's court.

Biomechanically, the serve involves a transfer of energy from the legs through the core to the shoulder and finally the hand. The training program's inclusion of dumbbell exercises that engage the core, such as dumbbell Russian twists or standing overhead presses, likely contributed to better kinetic chain utilization and minimized energy leakage during the serve (Lees & Nolan, 2012).

Besides increasing the velocity, dumbbell training positively influenced accuracy and service placement. Improved muscular control and joint stability allowed athletes to maintain consistency in their toss, arm swing trajectory, and follow-through—elements critical to placing the ball effectively during a serve (Palao & Valadés, 2014).

The training also may have contributed to enhanced muscle memory and motor pattern efficiency, which are crucial for executing repetitive technical actions under pressure (Davids et al., 2013). These improvements manifest as more accurate targeting of zones, better timing, and a reduction in service errors, such as hitting the net or sending the ball out of bounds.

An important aspect of any physical training program is the transferability of gains to actual performance. In this study, the improvements in upper service performance suggest that dumbbell weight training effectively translated strength gains into functional sport-specific outcomes. This supports the findings of Clemente et al. (2016), who emphasized that targeted strength programs should mirror the demands of the sport.

Moreover, dumbbell training enhances not just isolated strength but also movement control and coordination, which are necessary for high-level execution of volleyball skills in dynamic match contexts (Oyen et al., 2014). Therefore, athletes were better prepared not only for the technical task of serving but also for performing it in the fluctuating conditions of a competitive game.

A critical and often overlooked dimension of this study is the focus on female athletes in a rural, community-based setting. Strength training for women, particularly using weights, has traditionally been under-emphasized due to prevailing stereotypes and concerns over hypertrophy or injury (Nimphius et al., 2015). This study challenges those notions, demonstrating that dumbbell training is both safe and effective for enhancing volleyball-specific skills in women.

Furthermore, by implementing a low-cost, equipment-accessible training intervention, the study promotes inclusivity and equity in sports training, offering valuable insights for under-resourced programs. The results can serve as a model for

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similar community-based sports development initiatives seeking to improve performance through scientifically grounded methods.

Improved performance often leads to enhanced self-confidence and motivation, especially among female athletes. The visible and measurable improvements in serve ability observed in this study may have also positively impacted participants' psychological readiness, game engagement, and belief in their physical potential (Raab, 2014). As such, dumbbell training not only has physiological but also psychosocial benefits, contributing to a more empowered and performance-oriented team culture.

Despite its contributions, the study has limitations. The sample size was limited to one club, which restricts the generalizability of the findings. Additionally, while the intervention lasted for several weeks, long-term retention of the strength and skill gains was not measured. Furthermore, no biomechanical analysis (e.g., video motion tracking) was conducted to examine technique changes in detail.

Future studies should include larger and more diverse participant groups, implement longitudinal designs, and incorporate technological assessments to better quantify performance changes. Comparing dumbbell training with other modalities, such as resistance bands or plyometrics, would also provide more nuanced insights.

From a practical standpoint, coaches working with female volleyball teams—particularly in rural or low-resource environments—can adopt dumbbell weight training as a core component of skill development programs. Exercises should be tailored to the volleyball movement patterns, with progressive loading and variation to maintain training stimulus and prevent overuse.

In designing training programs, coaches should also incorporate dynamic warm-ups, proper technique instruction, and recovery strategies to ensure safety and effectiveness. Additionally, educating athletes about the benefits of resistance training can help combat myths and encourage greater participation, especially among young women.

CONCLUSION

In conclusion, this study supports the assertion that dumbbell weight training significantly enhances the upper body strength of female volleyball players. By targeting key muscle groups involved in the serving motion, improving biomechanical efficiency, and supporting motor control, dumbbell exercises serve as an effective, low-cost intervention with strong applicability in community-based volleyball settings. These findings contribute to the growing body of evidence supporting resistance training for female athletes and provide actionable recommendations for coaches aiming to develop technical performance through structured physical conditioning.

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