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The Effect of Pull-Up Training on Smash Performance in Volleyball Extracurricular Activities at SMA Negeri 1 Sungai Pinang

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ABSTRACT

This study aims to determine whether pull-up training has a significant effect on the volleyball smash performance of students participating in the extracurricular volleyball program at SMA Negeri 1 Sungai Pinang. The research employed an experimental (quantitative) method with a pre-experimental design, specifically the one-group pretest-posttest design. The population consisted of 12 male students who were active members of the school's volleyball extracurricular activity. The sampling technique used was total sampling. The data collection techniques employed in this study included observation, testing, and documentation. The data analysis technique employed in this study utilized inferential statistics, specifically the Paired Sample t-test, which SPSS assisted. The results of the Paired Sample t-test analysis showed a t-count value of -8.424 with degrees of freedom (df) = 11, and N-1 and a significance value (p-value) of 0.001. The significance value (p-value) is 0.001, which is smaller than 0.05 (0.001 < 0.05). This means that H0 is rejected, and Ha is accepted. Therefore, pull-up training has a significant effect on improving smash performance in volleyball among students participating in the extracurricular program at SMA Negeri 1 Sungai Pinang.

Keywords: Pull-Up Training, Smash Performance, Volleyball

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INTRODUCTION

In 1895, William G. Morgan invented volleyball in the United States. Initially, the sport was named "Mintonette." However, after its first demonstration, a suggestion was made to change the name to "Volleyball," as the main action in the game involves volleying the ball. Volleyball is a sport that utilizes a large ball and is played in teams using the upper limbs, specifically the hands. Each team consists of six players, and the game can be played either indoors or outdoors.

Volleyball is one of the most popular sports among Indonesians of all ages and has become a source of national pride. This is due to its consistent success in

securing medals at various Olympic and international events, making it a sport that requires continuous development and maintenance. Volleyball is a team sport played by two opposing teams, each consisting of six players (Azahrah, Afrinaldi, & Fahrudin, 2021, p. 534). The game includes four fundamental techniques that every volleyball athlete must master: serving (initiating play by striking the ball), passing (delivering the ball to teammates), spiking (striking the ball forcefully), and blocking (defending against opponents' attacks at the net).

Among these techniques, the smash is a vital component in volleyball. A smash is an offensive move executed by jumping near the net and striking the ball with power over the net. Strength is a crucial physical component for athletes, significantly contributing to their overall physical fitness. In the context of this study, strength plays a crucial role in enhancing the power of a smash, enabling the ball to be hit with greater force and velocity. The most effective way to improve strength in volleyball smash techniques is through bodyweight resistance training, also known as internal resistance training.

One form of internal resistance training that can enhance upper limb muscle strength is the pull-up exercise. Pull-up training involves lifting one’s body using arm strength while gripping an overhead bar, pulling the body upward until the chin reaches above the bar, and repeating the motion multiple times. This form of training can significantly improve upper arm muscle endurance, which in turn contributes to stronger and more accurate smashes.

Based on the description above, it is evident that the concept of smash strength has not been fully developed among volleyball extracurricular participants. Therefore, there is a need for a training method that can enhance smash performance in volleyball, particularly in terms of power and precision. This need is further supported by the findings of preliminary observations conducted by the researcher at SMA Negeri 1 Sungai Pinang, which indicated that the athletes' smash abilities require improvement.

During preliminary observations, the researcher identified several issues related to the execution of smash techniques in volleyball among students participating in the extracurricular volleyball program at SMA Negeri 1 Sungai Pinang, Ogan Ilir Regency. One major issue observed was the lack of proficiency

in performing the volleyball smash among extracurricular members. This was evident during the inter-school volleyball tournament held in 2024, where students committed approximately 68% errors while attempting smashes. These errors included failures to cross the net, inaccurate ball direction, and mistimed execution.

The implementation of an effective smash technique in volleyball requires a structured and appropriate training method that can serve as a tool to improve the power and accuracy of the smash. A relevant study supporting the use of pull-up exercises in enhancing explosive upper-body movements is the research conducted by Taufiq Hidayat, Amal Fauqi, and Rizky Ramadhan titled The Effect of Pull-Up Training on Javelin Throw Performance Among Students of SMAN 2 Dompu in the 2023–2024 Academic Year. The findings from their research showed a calculated t-value of 12.69, while the critical t-value at a 5% significance level with a sample size of 20 was 2.086. Since the t-calculated (12.69) was greater than the t-table value (2.086), the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_a) was accepted.

Based on the aforementioned issues, the researcher proposes implementing a targeted intervention to address deficiencies in volleyball smash performance by introducing pull-up training as a means to enhance upper-body strength during the execution of the smash. Pull-up exercises, as upper-body training modalities, contribute both biomechanically and physiologically to the development of smash power in sports such as badminton, tennis, and volleyball. To fully understand this contribution, it is essential to examine the biomechanics of the pull-up movement, the involvement of primary muscle groups, as well as the transfer of force and the kinetic chain principles that underlie the smashing action.

METHODS

The research method refers to a systematic procedure or stage undertaken by the researcher in conducting a study. According to Sugiyono (2022, p. 2), research methodology is defined as a scientific approach used to obtain relevant data to achieve specific research objectives and address particular issues. This study employed a quantitative experimental research approach. The type of research used in this study is classified as pre-experimental, utilizing a One-Group Pretest-Posttest Design.

The population refers to a general group consisting of objects or subjects with specific quantities and characteristics that become the focus of a study, from which conclusions are drawn (Sugiyono, 2022, p. 126). The population in this study consisted of all male students participating in the volleyball extracurricular program at SMA Negeri 1 Sungai Pinang, totalling 12 students.

This study is an experimental research aimed at examining the effect of pull-up exercises on the improvement of basic smash techniques in volleyball. The treatment design involved a sequence of pretest, treatment, and post-test. The study began with a pretest in which participants performed smash drills for 30 minutes. Following the pretest, a treatment phase was implemented, consisting of pull-up training conducted over 16 sessions, held three times per week. Each training session lasted 90 minutes with moderate to high intensity. Prior to implementation, the training program was validated by a certified coach. Upon completion of the treatment period, participants underwent a post-test, which also involved performing 30 minutes of smash drills.

A test is an activity used to assess and measure the success of a particular action or program. In this study, tests were administered to determine the subjects' initial condition before treatment (pretest) and after treatment (posttest). The scoring sheet used for assessing the volleyball smash training will be presented in the following table:

Table 1. Test Assessment Sheet

Indicator	**Sub-Indicator**	**Scale**				
		1	**2**	**3**	**4**	**5**
Prefix	1. Stand facing the net about 45 and 4-5 meters away					
	2. The body leans forward to hang, and the hands are limp					
Jump	3. The last step before the long jump					
	4. Carry forward while swinging					
	5. Folloowed by jumping					
Drifting and Hitting the Ball	6. Swing the arms and hands above the head					
	7. Hands and arms hit the ball over the head					
	8. Hit the wrist motion so that the ball rotates forward					
Landing	9. Landing two feet and slightly bent towards balance					

Description: 1 = Very Poor; 2 = Poor; 3 = Fair; 4 = Good; 5 = Excellent

The questionnaire used in this study was adapted from the research of Supriyanto & Martiani (2019), as cited in Syamsuryadin, Fauzi, Hartanto, Yachsie, and Arianto (2021, pp. 194–195). The validity of the questionnaire was assessed using the Product Moment correlation formula and Cronbach's alpha coefficient, yielding a score of 0.896, indicating that the questionnaire is both valid and reliable.

RESULTS AND DISCUSSION

To obtain an overview of the student's initial and final smash abilities, pretest and posttest data on volleyball smash performance were collected from 12 members of the extracurricular volleyball team at SMA Negeri 1 Sungai Pinang. The table below presents the results of the pretest and posttest assessments, along with statistical analysis used to examine the effect of pull-up training:

Tabel 2. Pretest and Posttest Data on Volley Ball Smash Performance

No	Name	Pretest Score	Posttest Score	Score Difference
1	MZ	33	41	8
2	R	26	41	15
3	MA	31	41	10
4	M	23	38	15
5	J	25	39	14
6	MBR	36	43	7
7	FA	26	37	11
8	I	31	44	13
9	DHS	26	34	8
10	SI	39	44	5
11	RDC	32	43	11
12	N	43	45	2
Range		30,92	40,83	9,92
Standard Deviation		6,13	3,30	

The pretest (before treatment) and posttest (after treatment) results of students' volleyball smash performance are illustrated in the diagram below:

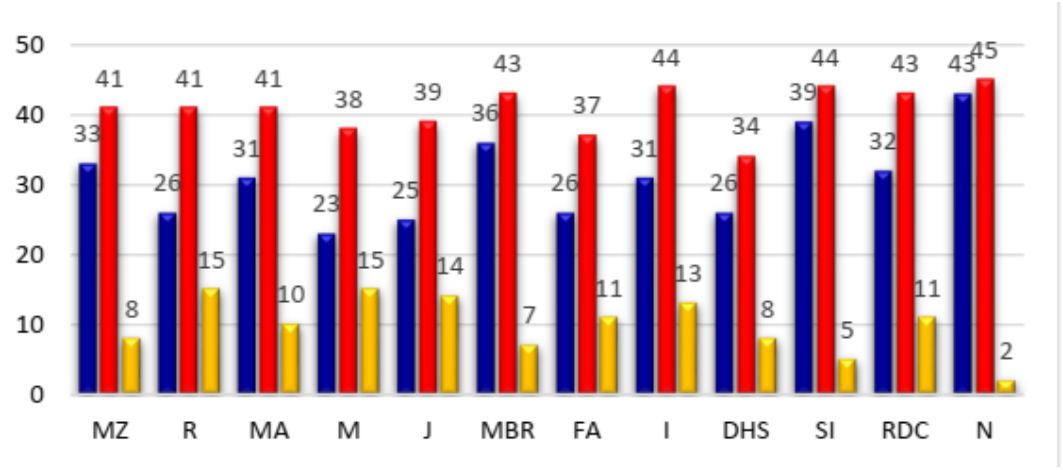

Figure 1. Pretest and Posttest Results

Based on the diagram above, it can be observed that the student with the initials N showed a 2-point score difference between the pretest and posttest. The student SI showed a 5-point difference, MBR improved by 7 points, while MZ and DHS both showed an 8-point increase. The student MA demonstrated a 10-point difference, FA and RDC improved by 11 points, and student I improved by 13 points. Furthermore, student J showed an improvement of 14 points, while students R and M each recorded the highest increase of 15 points between the pretest and posttest. After obtaining the pretest and posttest data on volleyball smash performance, the data were further analyzed using SPSS software. The output is presented in the following figure below:

Table 3. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-Tes Eksperimen	12	23	43	30.92	6.127
Post-Tes Eksperimen	12	34	45	40.83	3.298
Valid N (listwise)	12				

The tables present the pretest scores (before the treatment) and post-test scores (after the treatment) for the volleyball smash performance of 12 students participating in the extracurricular program. In general, the data indicate an increase in volleyball smash performance scores following the students' receipt of the pull-up training treatment. This suggests an improvement in performance following the intervention.

The paired sample t-test was used to determine whether there was a significant difference in students' volleyball smash performance before and after

the pull-up training intervention. The results of the paired sample t-test, including the t-value, degrees of freedom (df), and significance value (p-value).

The results of the paired sample t-test analysis showed a t-calculated value of 8,424 with degrees of freedom *(df)* = 11 atau N-1, serta nilai significance (p-value) and a significance value (p-value) of 0.001. Based on the analysis results, since the p-value = 0.001 < 0.05, it can be concluded that H_0 is rejected and H_a is accepted. This means that pull-up training has a significant effect on the volleyball smash performance of students participating in the extracurricular program at SMA Negeri 1 Sungai Pinang.

The findings of this study demonstrate that the implementation of a pull-up training program over the study period had a positive and significant impact on improving smash performance among volleyball extracurricular participants at SMA Negeri 1 Sungai Pinang. (Firdaus, Kristina, and Sari, 2022, p. 164 assert that well-structured and systematic training can enhance performance outcomes and the overall quality of play. The observed increase in average smash scores from the pretest to the post-test, supported by statistical analysis, confirms the research hypothesis that pull-up exercises positively influence volleyball smash performance.

This improvement aligns closely with existing theories, and prior studies that emphasize the importance of upper-arm and shoulder strength in executing powerful volleyball smashes. As outlined in the literature review, pull-up training is a bodyweight resistance exercise that specifically targets and strengthens the muscles of the back, shoulders, and arms. These muscle groups are essential for generating the force and speed required for effective arm swings during a smash. As these muscles strengthen, the explosive power of the smash naturally improves, enabling the ball to be struck with greater force and accuracy across the net. These findings are consistent with the results of Lestari, Rahmat, and Pranata (2021), who also reported a significant impact of pull-up training on the smash performance of volleyball athletes. Although the participants and research settings differed, the effect of pull-up training on smash capability is reaffirmed, strengthening the argument that pull-up exercises are an effective method for developing the muscular strength required for volleyball smashes.

Additionally, the initial issues identified at SMA Negeri 1 Sungai Pinang namely, inadequate smash performance, monotonous training routines, and poor accuracy were at least partially addressed through the introduction of varied training stimuli. Pull-up exercises provided a new form of resistance training that had likely not been systematically experienced by these students before. Enhanced upper-arm and shoulder strength contributed not only to more powerful smashes but also to improved movement stability and control, thereby increasing smash accuracy.

It is also important to note that the intervention was conducted over a period of one month, comprising a total of 16 training sessions, which indicates a sufficient training volume to elicit muscular adaptation. From a practical standpoint, these results offer strong recommendations for volleyball extracurricular coaches and physical education instructors at SMA Negeri 1 Sungai Pinang and potentially at other schools—to consider incorporating pull-up training as a key component of their athletic development programs. As stated by Wanto, Putri, Fahritsani, and Fajar (2022, p. 272), training is the cornerstone for achieving objectives in any performance process. In this study, the training program was not only simple to administer but also proven effective in enhancing muscular strength, which is a critical element in volleyball smashes.

CONCLUSIONS

In conclusion, this research provides valuable evidence to support the continued improvement of the volleyball extracurricular program at SMA Negeri 1 Sungai Pinang, contributing to the development of athletes with stronger, more competitive smash abilities.

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