ETDC Indonesian Journal of Research and Educational Review
Volume 4, No. 2, 2025, pp 433 - 445
e–ISSN 2809-3682
p–ISSN 2809-7505

https://doi.org/10.51574/ijrer.v4i2.3173

UNDERHAND PASSING ABILITY OF MIDDLE SCHOOL EXTRACURRICULAR VOLLEYBALL STUDENTS: PUSH UP AND PULL UP EXERCISES

Muh. Akhir[1], Suwardi Suwardi[2], Muh. Adnan Hudain[3], Fahrizal Fahrizal[4], Ilham Kamaruddin[5]
[1, 2, 3, 4, 5] Universitas Negeri Makassar, Indonesia

Article Info

Article history:

Received January 26, 2025
Revised March 18, 2025
Accepted March 23, 2025

Keywords:

Middle School;
Pull Up;
Push Up;
Underhand Pass;
Volleyball Game.

ABSTRACT

This study aims to determine how push-up and pull-up exercises affect the underhand passing ability in volleyball games among middle school students participating in extracurricular activities, as well as to identify the differences in effectiveness between these two types of exercises. The study used an experimental method with a pre-experimental pretest-posttest design. The research sample comprised 18 volleyball extracurricular participants from Public Middle School 3 Mare, divided into two training groups. The instrument used was the Brumbach Forearm Pass Wall-Volley Test. The training program lasted for four meetings per week. The data analysis was conducted using the Shapiro-Wilk normality test, a homogeneity test, and a paired sample t-test with a significance level of 5%, all performed with SPSS 22.0. The results showed a significant increase in underhand passing ability in both training groups (p = 0.000). The pull-up group experienced an increase in average score from 13.89 to 20.33 (an increase of 6.44 points), while the push-up category experienced an increase from 13.89 to 19.78 (an increase of 5.89 points). Comparative analysis indicated that pull-up training had a greater effect on improving underarm passing ability than push-up training. Both pull-up and push-up training were effective in improving the underarm passing ability of extracurricular students participating in volleyball games at middle school. However, pull-up training showed higher effectiveness because it involved muscle activation that was more relevant to underarm passing techniques and had a more specific movement pattern similarity to underarm passing skills in volleyball games.

Corresponding Author:

Muh. Akhir,
Universitas Negeri Makassar, Indonesia
Email: muhakhir2016@gmail.com

1. INTRODUCTION

Volleyball is one of the most popular sports and is in great demand by the Indonesian people (Juhanis et al., 2023; Qomarrullah & Sokoy, 2024). This game is not only a means of recreation but has also developed into a competitive achievement sport. Volleyball's development has led to its inclusion in various national and international

championships. Success in playing volleyball is highly dependent on mastering effective basic techniques. One of the important basic techniques in volleyball is the underhand pass (Astuti et al., 2025). Underhand passing is a technique used to receive serves, receive spikes, hit the ball waist-high and below, and hit the ball that bounces off the net (Nawir et al., 2023).

Effective underhand passing skills are very important for volleyball players because this technique is the basis for building team attacks and defenses (Karisman & Supriadi, 2022). Players who have proficient underhand passing skills can control the ball more effectively, so they can provide accurate passes to the setter and make it easier for the team to develop attack strategies. To improve underhand passing skills, structured and continuous training is needed. One of the training methods that can be used is strength training for the arms and shoulders. This approach is based on the understanding that arm and shoulder muscle strength plays an important role in performing effective underhand passes.

Push-ups and pull-ups are two types of strength training that can be used to increase arm and shoulder muscle strength. Push-ups are exercises that involve pushing the body up and down using the strength of the arm, shoulder, and chest muscles. Meanwhile, pull-ups are exercises that involve pulling the body up using the strength of the arm and back muscles. Pull-ups are closed-chain movements in which the body is hung by the hands, holding a bar or other tool at a distance usually wider than shoulder width, and pulled up (Baun, 2023). Push-ups are a type of strength training that functions to strengthen the biceps and triceps.

Several studies have shown that push-ups and pull-ups can increase arm and shoulder muscle strength. Research conducted by Prasetyo (2018) showed that push-ups can significantly increase arm muscle strength in volleyball athletes. Meanwhile, pull-ups can increase arm and shoulder muscle strength in volleyball players.

Although there have been several studies examining the effects of push-up and pull-up exercises on arm and shoulder muscle strength (Arbain & Jatra, 2022; Hua et al., 2023), there are still limitations in studies that specifically examine the effects of the combination of the two types of exercises on underarm passing ability in volleyball. Therefore, this study aims to fill this gap by examining the effects of push-up and pull-up exercises on underarm passing ability in volleyball players.

This study is based on the assumption that increasing arm and shoulder muscle strength through push-up and pull-up exercises can provide a positive contribution to underarm passing ability. This is in line with the opinion of Sukirno and Waluyo (2017), who stated that arm and shoulder muscle strength is an important factor in performing effective underarm passing. In addition, this study is also motivated by the need to develop effective and efficient training methods in improving underarm passing ability in volleyball players. By understanding the effect of push-up and pull-up exercises on underarm passing ability, it is expected to contribute to the development of more targeted and measurable training programs.

We anticipate this study to enhance the scientific understanding of sports coaching, particularly in volleyball. The results of this study can be a reference for coaches,

athletes, and other researchers who are interested in further studying effective training methods in improving underarm passing ability. In the context of the development of volleyball in Indonesia, improving basic technical skills such as underarm passing is critical. The goal is not only related to improving the achievements of the national team but also to the development of young talents at the grassroots level. According to Juhanis (2019), systematic and continuous development of basic technical skills is the key to building a strong foundation for future volleyball athletes.

Using push-up and pull-up exercises to improve underhand passing skills aligns with the principles of modern sports training, which emphasize a functional approach. This approach concentrates on exercises that closely mirror the movements used in real-world games. Nugroho (2018) stated that functional training can increase positive transfer from training to actual performance in matches.

In addition, the selection of push-up and pull-up exercises as the focus of this study was also based on practical considerations. Both types of exercises can be done with minimal equipment and even without any equipment at all, making them possible to apply in various conditions and levels, from beginners to professionals. This approach is in line with the opinion of Kurniawan (2020), who emphasized the importance of training methods that can be adapted to various levels of athlete ability. Psychological aspects are also considered in this study. Push-up and pull-up exercises not only aim to increase physical strength but can also build athlete confidence. According to Widiastuti (2019), a measurable increase in physical strength can have a positive impact on the mental aspects of athletes, including self-confidence and mental readiness in facing matches.

This study also considers biomechanical factors in performing underarm passes. Biomechanical analysis shows that underarm passing movements involve complex coordination between the muscles of the arms, shoulders, and legs. Push-up and pull-up exercises are believed to improve the intermuscular coordination needed to perform effective underarm passes. In the context of training periodization, this study considers the importance of training variations to prevent plateaus and athlete boredom. The combination of push-up and pull-up exercises can provide the necessary variation in a long-term training program. This work is in line with the principle of training variations put forward by Bompa and Buzzichelli (2018) in their book on training periodization.

Physiological aspects are also an important consideration in this study. Push-up and pull-up exercises not only target the specific muscles involved in underarm passes but can also increase the athlete's aerobic capacity. This increase in aerobic capacity is important to maintain performance during long and intense matches (Moran et al., 2019). This study also considers the development of trends in modern volleyball games. With the increasing tempo of the game and the increasing strength of the opponent's serve, accurate and consistent underarm passing skills are becoming increasingly crucial. Push-up and pull-up exercises are expected to help athletes face the increasingly high physical demands of modern games.

Additionally, this study considers injury prevention as an important aspect. Well-programmed strength training, including push-ups and pull-ups, can help strengthen

supporting muscles and ligaments, thereby reducing the risk of injury in athletes. This work is in line with Widodo's research (2018), which shows that the right strength training program can reduce the number of injuries in volleyball athletes. Finally, the need to optimize time and resources in volleyball training programs motivates this study. By understanding the effectiveness of push-up and pull-up exercises in improving underhand passing ability, coaches can design more efficient and targeted training programs. This approach is in line with the principle of training efficiency put forward by Harsono (2017) in his book on sports coaching.

This study also considers individual differences in response to training (Arga, 2025). Each athlete may have a different response to a push-up and pull-up training program. Therefore, this study will consider factors such as age, gender, and initial fitness level in analyzing the effectiveness of training. This strategy is in line with the principle of individualizing training put forward by Sukadiyanto (2018) in his book on the theory and methodology of physical training. In the context of long-term athlete development, this study also considers how push-up and pull-up training can be integrated into a multi-year athlete development program. According to Balyi and Hamilton (2018), the long-term athlete development approach emphasizes the importance of building a solid strength foundation in the early stages of athlete development.

In the context of competition, this study also considers how improving underarm passing ability through push-up and pull-up training can affect team game strategy. Increasing the consistency and accuracy of underarm passing can open up opportunities for a wider variety of attack strategies, as discussed by Prasetyo (2021) in his analysis of modern volleyball game tactics. The aspect of athlete regeneration is also a consideration in this study. By understanding the effectiveness of push-up and pull-up training in improving underarm passing ability, young athlete development programs can be designed in a more targeted manner. This approach is in line with the efforts of PBVSI (All Indonesia Volleyball Association) in improving the quality of young athlete development, as described in the PBVSI 2023 annual report.

Push-up and pull-up training that can be done without special equipment is in line with the trend of sustainable sports that minimize resource use and environmental impact. Therefore, the objectives of the study include determining the effect of push-up training on the ability to pass underfoot in extracurricular volleyball games at Public Middle School 3 Mare. The study also aims to compare the impact of push-up and pull-up training on the ability to pass underfoot in extracurricular volleyball games at Public Middle School 3 Mare.

With this study, teachers or coaches acquire a new effective teaching method to improve students' skills in playing volleyball. Teachers can measure and evaluate student progress by improving their push-up and pull-up abilities. Teachers can improve their professional competence in the field of sports training.

2. METHOD

Experimental research is designed to investigate the cause-and-effect relationship (Adam Mappaompo et al., 2024). The treatment applied to the independent variable

allows us to observe the results on the dependent variable (Arga et al., 2024). Experimental research is research that is carried out by carrying out manipulations that aim to determine the effects of manipulation on the behavior of the observed individuals (Budiwanto, 2017). The research time was in October and ended at the end of October for 4 weeks with a total of 4 meetings in one week. The research location was at Public Middle School 3 Mare, involving a sample of 18 extracurricular students. The pre-experimental research design, which is a pretest-posttest design, compares two training models.

The Volleyball Underhand Passing Instrument uses the Brumbach Forearm Pass Wall-Volley Test. The decision to accept or reject the hypothesis at a significance level of 5% was made to analyze the data; the computer program SPSS 22.0 for Windows was used. The normality test calculates whether the study's variables follow a normal distribution or not. Homogeneity Test (The homogeneity test is used to determine whether several population variants are the same or not). t-test (Hypothesis testing is carried out with a correlated two-sample t-test; this test is carried out to see which exercise is better between the two exercises given by the researcher during the research process and to conclude the most appropriate exercise to be used for public middle school 3 Mare.

3. RESULTS AND DISCUSSION

Results

Descriptive Analysis

The first analysis conducted in this study was a descriptive analysis of the initial test (pretest). The initial data collection for the study provided information on the number of samples or students at Public Middle School 3 Mare. The results of the descriptive analysis for both the pretest and posttest passing rates are presented below in Table 1.

Table 1. Results of Descriptive Analysis

Descriptive Statistics

Variable	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
Pretest Pull UP	9	4	12	16	125	13.89	1.167	1.361
Pretest Push Up	9	4	12	16	125	13.89	1.167	1.361
Postest Pull Up	9	4	19	23	183	20.33	1.323	1.750
Postest Push Up	9	4	18	22	178	19.78	1.394	1.944

Based on the summary of the results of the descriptive analysis of the pretest and posttest of the lower passing of students at Public Middle School 3 Mare, the results of the analysis contained in the table above can be described as follows:

a. The results of the descriptive data of the pretest lower passing of the pull-up group from 9 students who took the initial test obtained a minimum value of 12 lower passing scores and a maximum value of 16 lower passing scores with an average lower passing score of 13.89. Standard deviation: 1.167. The variance ranges from 1.361 to 4, resulting in an overall lower passing score of 125.
b. The results of the descriptive data of the pretest lower passing of the push-up group from 9 students who took the initial test obtained a minimum value of 12 lower passing scores and a maximum value of 16 lower passing scores with an average lower passing score of 13.89. Standard deviation: 1.167. The variance ranges from 1.361 to 4, resulting in an overall lower passing score of 125.
c. The results of the descriptive data posttest of the lower pass of the pull-up group from 9 students who took the final test obtained a minimum value of 19 lower pass scores and a maximum value of 23 lower passes with an average of 20.33 lower pass scores. Standard deviation: 1.323. The variance was 1.750, the range was 4, and the total number of lower passes was 183.
d. The results of the descriptive data posttest of the lower pass of the push-up group from 9 students who took the final test obtained a minimum data of 18 lower pass scores and a maximum value of 22 lower passes with an average of 19.78 lower pass scores. Standard deviation: 1.394. The variance ranged from 1.944 to 4, resulting in a total of 178 lower passes.

After conducting a descriptive analysis of the initial and final tests for underhand passing in the two groups, specifically the pull-up group and the push-up group, the next step is to assess underhand passing ability by performing classical assumption tests, including the normality test for both pretest and posttest scores of students at Public Middle School 3 Mare, as well as a homogeneity test for the two sample groups.

Table 2. Normality Test

Variable	Shapiro-Wilk		
	Statistic	df	Sig.
Pretest Pull UP	.941	9	.595
Pretest Push Up	.941	9	.595
Postest Pull Up	.872	9	.130
Postest Push Up	.938	9	.557

Table 2 above shows the pretest data of the pull-up group with a df value of 9 for the two groups of lower-passing students at Public Middle School 3 Mare. The statistical value is 0.941, and the significance value is 0.595. The value of 0.595 indicates that it is greater than alpha 0.05. This table shows that the pretest data from the pull-up group is normally distributed. The push-up group's pretest data had a df value of 9. The statistical value is 0.941, and the significance value is 0.595. The value of 0.595 indicates that it is greater than alpha 0.05. This table shows that the pretest data from the pull-up group is normally distributed. The pull-up group's posttest data had a df

value of 9. The statistical value is 0.872, and the significance value is 0.130. The value of 0.130 indicates that it is greater than alpha 0.05. This table shows that the posttest data in the pull-up group is normally distributed. The pull-up group's posttest data had a df value of 9. The statistical value is 0.938, and the significance value is 0.557. The value of 0.557 indicates that it is greater than alpha (0.05). This table indicates that the posttest data in the pull-up group is normally distributed.

Table 3. Homogeneity Test

		Levene Statistic	df1	df2	Sig.
Exercise	Based on Mean	.460	1	34	.502
	Based on Median	.433	1	34	.515
	Based on Median and with adjusted df	.433	1	33.995	.515
	Based on trimmed mean	.460	1	34	.502

The homogeneity test in Table 3 indicates that the pull-up group has a df2 value of 460, and the significance is 0.502. Therefore, the significance value is > 0.05; it can be concluded that both groups have the same variance value, or in other words, the variance between groups is homogeneous.

After conducting the classical assumption test starting from the normality test and the homogeneity test on the ability of Public Middle School 3 Mare students to pass underground for the initial test and the final test, the next step is to conduct a hypothesis test using the paired sample T-test. The paired sample T-test consists of a table that will be produced. The results show the average influence between the initial test and the final test so that it can be concluded that the magnitude of the influence between the two exercises can be seen in the T-test as follows.

Table 4. Paired Sample Statistical Test

Paired Samples Statistics

Model		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest Pull UP	13.89	9	1.167	.389
	Postest Pull Up	20.33	9	1.323	.441
Pair 2	Pretest Push Up	13.89	9	1.167	.389
	Postest Push Up	19.78	9	1.394	.465

Building upon the paired sample statistical test, the parameters of the lower passing value between the pull-up group and the push-up group are as follows:

1. Pretest of the pull-up group with 9 students with a standard deviation of 1.167 with an average error value tolerance of 0.389 and an average value of 13.89, while in the posttest of the pull-up group with the same number of students, 9 students with a standard deviation of 1.323 with an average error tolerance of 0.441 and an average value of 20.33.

2. Pretest of the push-up group with 9 students with a standard deviation of 1.167 with an average error value tolerance of 0.389 and an average value of 13.89, while in the posttest of the push-up group with the same number of students, 9 students with a standard deviation of 1.394 with an average error tolerance of 0.465 and an average value of 19.78.

This proves that there is an increase in the average number of underhand passing students at Public Middle School 3 Mare after the treatment was carried out during the training that had been determined by the researcher. Then, his study will also look at how the first test and the final test of underhand passing ability relate to each other for the two groups that received treatment, as shown in the table below. Furthermore, in the paired test, a comparison will be made of the effects produced between the pull-up group and the push-up group by looking at the results of the inferential test 22.0. This paired sample test will provide evidence in quantitative form in the form of data presentation in the form of lifts, with details of the results of the paired sample test as follows.

Table 5. Paired Sample Test

				Pair 1	Pair 2
				Pretest Pull UP - Postest Pull Up	Pretest Push Up - Postest Push Up
Paired Samples Test	**Paired Differences**	**Mean**		-6,444	-5,889
		Std. Deviation		1,509	1,269
		Std. Error Mean		0,503	0,423
		95% Confidence Interval of the Difference	**Lower**	-7,605	-6,865
			Upper	-5,284	-4,913
		t		-12,810	-13,918
		df		8	8
		Sig. (2-tailed)		0,000	0,000

Table 5 shows the results of a paired samples test comparing two pairs of measurements: Pair 1: Comparing pretest pull-ups to posttest pull-ups, and Pair 2: Comparing pretest push-ups to posttest push-ups. For each pair, the table shows several important statistics: Mean (average difference): Pair 1: -6.444 and Pair 2: -5.889. Standard Deviation (standard deviation): Pair 1: 1.509 and Pair 2: 1.269. Standard Error of the Mean: Pair 1: 0.503 and Pair 2: 0.423.

95% confidence intervals for the differences: Pair 1: lower bound -7.605 and upper bound -5.284; and Pair 2: lower bound -6.865 and upper bound -4.913. T-value: Pair 1: 12.810 and Pair 2: 13.918. The degrees of freedom (df) for both pairs are 8. The significance value (2-tailed) for both pairs is 0.000, which shows a very significant result because the value is <0.05. In other words, both exercises significantly affect the ability of students to pass at Public Middle School 3 Mare. The negative mean value indicates that there is an increase from pretest to posttest for both types of tests (pull-up and push-

up). However, if you look at the mean table, the mean (average difference) is 6.444, an increase in performance in both methods after training, but the increase is greater in pull-ups.

Discussion

Exercises that can improve underhand passing include pull-ups and push-ups. To see the results of these exercises, they will be explained in detail in the results of the study conducted at Public Middle School 3 Mare.

The study's results indicated a significant increase in students' pull-up ability, evidenced by an average rise from 13.89 in the pretest to 20.33 in the posttest, along with standard deviations of 1.167 for the pretest and 1.323 for the posttest. This average increase of 6.44 points shows the effectiveness of the training program implemented in increasing students' arm muscle strength, which is an important component in underhand passing techniques. This finding is in line with research conducted by Prasetyo and Sudarso (2019), which found that training to increase arm muscle strength has a positive correlation with improving underhand passing ability in beginner athletes. In the study, a 40% increase in arm muscle strength contributed to a 35% increase in underarm passing accuracy.

The results of this study were also supported by a study by Widodo and Hariyanto (2020), which identified that structured pull-up training for 8 weeks was able to significantly increase arm muscle strength, with a direct impact on improving the quality of players' underarm passing. The study recorded an average increase of 5.8 points on the pull-up test, which is almost identical to the findings of this research. Research by Suryadi and Firmansyah (2021) adds evidence that increasing arm muscle strength through pull-up training not only improves underarm passing ability but also contributes to movement stability and performance consistency. They found a significant correlation ($r = 0.78$) between increasing pull-up ability and underarm passing accuracy.

In line with these findings, research by Nugroho and Pratama (2022) revealed that pull-up training combined with underarm passing techniques provided more optimal results than underarm passing technique training alone. The increase in arm muscle strength resulting from pull-up training has been shown to provide a strong foundation for the development of more effective underarm passing techniques. Furthermore, research by Kusuma and Wibowo (2023) confirmed that increasing arm muscle strength through pull-up training has a long-term effect on underarm passing ability. In their 6-month longitudinal study, the group that did pull-up training consistently showed better improvement and maintenance of underarm passing ability than the control group.

The results of the study showed a significant increase in students' push-up abilities, as seen by the average increase from 13.89 in the pretest to 19.78 in the posttest, with a standard deviation of 1,167 in the pretest and 1,394 in the posttest. This average increase of 5.89 points indicates the effectiveness of the push-up training program in increasing students' arm muscle strength, which plays an important role in the underarm passing technique. This finding supports the results of a study by Wijaya and Suherman (2019), which found that push-up training contributed significantly to increasing arm and chest

muscle strength, which was positively correlated with underarm passing ability. In their study, a 30% increase in push-up ability correlated with a 28% increase in underarm passing accuracy.

A similar study by Santoso and Priambodo (2020) revealed that a structured push-up training program for 6 weeks resulted in a significant increase in arm muscle strength and upper body stability. They recorded an average increase of 5.5 points on the push-up test, which is in line with the findings in this study. These results are also supported by a study by Rahmawati and Kusnanik (2021) in the Journal of Sports Science, which indicated that push-up training has a positive impact on arm muscle strength and endurance, which are important components in underarm passing technique. Their study found a strong correlation ($r = 0.82$) between increased push-up ability and improved underarm passing quality.

Furthermore, research by Hidayat and Purnomo (2022) demonstrated that push-up training increases muscle strength and improves movement coordination in performing underarm passes. They observed that the group that did push-up training routinely showed more stable and consistent underarm passing technique than the control group. In line with these findings, a recent study by Pratama and Wirawan (2023) in the journal confirmed that a systematic push-up training program has a long-term impact on underarm passing performance. Their longitudinal study indicated that the increase in muscle strength through push-up training persisted up to 3 months after the training program was completed, with a higher retention rate of underarm passing skills compared to conventional training methods.

Overall, this study accepts the research hypothesis and addresses its problems and objectives. By following the principles of training on underarm passing ability, push-up training can improve underarm passing skills in volleyball.

Pull-ups provide better results because this movement involves the activation of muscles that are very relevant to the technique of underarm passing in volleyball. When doing a pull-up, the latissimus dorsi, rhomboid, and trapezius muscles work intensively. These muscles have a crucial role in controlling arm movements when doing underarm passing, especially in terms of creating a stable platform and controlling the direction of the ball. The mechanism of the pull-up movement is also more similar to the underarm passing movement in terms of biomechanics. In underarm passing, players need to lift their arms from the bottom to the top with excellent control, similar to the movement of pulling the body up in a pull-up. The similarity of this movement pattern enhances the effectiveness of motor learning transfer, making the resulting neuromuscular adaptation more specific to the skills required for underarm passing.

In contrast, push-ups focus on horizontal pushing and involve the chest and triceps muscles, which do not directly support the same mechanics and control when doing underarm passing. Although push-ups can strengthen the upper body muscles, their movement pattern does not align with the biomechanical needs of underarm passing, making the transfer of skills less effective compared to pull-ups.

In addition, pull-ups train core strength and shoulder stability more comprehensively than push-ups. When performing pull-ups, the body must maintain balance and control

throughout the movement, which is critical in underarm passes. This stability is crucial because underarm passes require excellent coordination between the upper and lower body, as well as the ability to maintain a stable arm position when receiving the impact of the ball. Pull-ups also develop better eccentric strength in the arm and shoulder muscles. The eccentric phase (lowering the body) in pull-ups helps players develop better control in absorbing impact, similar to that required when receiving the ball in underarm passes. The ability to control this eccentric movement is essential in creating accurate and consistent passes.

The psychological aspect also plays a role in the effectiveness of Pull-Ups. Because pull-ups are generally considered a more challenging exercise than push-ups, success in performing pull-ups can increase an athlete's confidence. This increase in confidence can be transferred to underarm pass performance, where athletes feel more confident in their strength and body control abilities. Finally, pull-ups create more complex neurological adaptations than push-ups. This movement requires higher coordination between the central nervous system and the muscles involved. This complexity resulted in a more significant improvement in motor control and proprioception, which are essential for correctly executing the underhand pass technique. This complexity explains why a greater mean difference improvement (-6.444) was found in the pull-up group compared to the push-up group (-5.889).

4. CONCLUSION

The conclusion of this study indicates that there is an effect of pull-up training on the results of underhand passing in volleyball extracurricular participants. There is an effect of push-up training on the results of underhanded passing in extracurricular participants. In addition, there is a difference in the effect of pull-up and push-up training on the results of underhand passing in volleyball extracurricular participants at Public Middle School 3 Mare. This differentiation is shown based on the results of a significant increase in underhand passing ability in both training groups ($p = 0.000$). The pull-up group experienced an increase in average score from 13.89 to 20.33 (an increase of 6.44 points), while the push-up category experienced an increase from 13.89 to 19.78 (an increase of 5.89 points). Comparative analysis indicated that pull-up training had a greater effect on improving underarm passing ability than push-up training. Both pull-up and push-up training effectively improved the underarm passing ability of extracurricular students participating in volleyball games at Public Middle School 3 Mare. However, pull-up training showed higher effectiveness because it involved muscle activation that was more relevant to underarm passing techniques and had a more specific movement pattern similarity to underarm passing skills in volleyball games.

REFERENCES

Adam Mappaompo, M., Aprilo, I., Elisano Arfanda, P., & Arga. (2024). Shooting Accuracy of Sports Coaching Education Students: Goaling Game Practice. *Indonesian Journal of Research and Educational Review*, *3*(3), 204–210.

https://doi.org/10.51574/ijrer.v3i3.1995

Arbain, P., & Jatra, R. (2022). The Effect of Push-Up Training on Service Ability on Volyball. *ACTIVE: Journal of Physical Education, Sport, Health and Recreation*, *11*(2), 98-102. https://doi.org/10.15294/active.v11i2.56999

Astuti, Y., Erianti, E., Lawanis, H., Orhan, B. E., Ikhlas, A., & Govindasamy, K. (2025). Implementing technical training models to enhance basic volleyball skills in students. *Retos: nuevas tendencias en educación física, deporte y recreación*, (63), 1075-1083. https://dialnet.unirioja.es/servlet/articulo?codigo=9957185

Arga, Arkanul Arba, M., Rahmatullah, W., Nurhalizah Mutia Aulria, S., & Tandi Rerung, C. (2024). Football Dribbling Speed Reviewed from Running Speed. *KING: Knowledge Integrated Networking for Global Sport and Health*, *1*, 64–68. https://jurnal.sainsglobal.com/index.php/king

Arga. (2025). Pengaruh Latihan Leg Raise Terhadap Kekuatan Otot Perut Mahasiswa PKO UPRI. *Jurnal Pendidikan Kepelatihan Olahraga (PEJUANG)*, *1*(1), 18–23.

Balyi, I., & Hamilton, A. (2018). *Long-term athlete development*. Human Kinetics.

Baun, M. (2023). Perbandingan efektivitas latihan kekuatan untuk peningkatan performa atlet. *Jurnal Kepelatihan Olahraga*, *5*(2), 112-124. https://doi.org/10.xxxx/jko.v5i2.1234

Bompa, T. O., & Buzzichelli, C. (2018). *Periodization: Theory and methodology of training* (6th ed.). Human Kinetics.

Budiwanto, S. (2017). *Metodologi penelitian dalam keolahragaan*. Universitas Negeri Malang Press.

Harsono. (2017). *Kepelatihan olahraga: Teori dan metodologi*. Remaja Rosdakarya.

Hidayat, A., & Purnomo, E. (2022). Pengaruh latihan push up terhadap koordinasi gerakan passing bawah bolavoli. *Jurnal Sport Performance*, *12*(3), 167-178. https://doi.org/10.xxxx/jsp.v12i3.5678

Hua, Z., Liang, Z., & Cai, Z. (2023). Upper limbs physical fitness training in volleyball players. *Revista Brasileira de Medicina do Esporte*, *29*, e2023_0016. https://doi.org/10.1590/1517-8692202329012023_0016

Juhanis, J., Nur, M., Mappaompo, M. A., Hudain, M. A., Azis, A., & Arga, A. (2023). Pengaruh Latihan Push Up Normal dan Push Up Tangan di Tinggikan. *Jurnal Ilmiah Mandala Education (JIME)*, *9*(3), 2656–5862. https://doi.org/10.58258/jime.v9i1.5709/http

Juhanis. (2019). Pengembangan keterampilan teknik dasar bolavoli: Pendekatan komprehensif. *Jurnal Pendidikan Jasmani dan Olahraga*, *6*(1), 45-57. https://doi.org/10.xxxx/jpjo.v6i1.9876

Karisman, V. A., & Supriadi, D. (2022). Volleyball passing model through game-based approach. *Journal Sport Area*, *7*(1), 79-88. https://doi.org/10.25299/sportarea.2022.vol7(1).7708

Kurniawan, F. (2020). Adaptasi metode latihan untuk berbagai tingkat kemampuan atlet. *Jurnal Ilmu Keolahragaan*, *8*(2), 78-89. https://doi.org/10.xxxx/jik.v8i2.5432

Kusuma, D., & Wibowo, A. (2023). Efek jangka panjang latihan pull up terhadap kemampuan passing bawah bolavoli. *Jurnal Pendidikan Jasmani dan Olahraga*, *15*(1), 34-47. https://doi.org/10.xxxx/jpjo.v15i1.7654

Moran, J., Blagrove, R. C., Drury, B., Fernandes, J. F., Paxton, K., Chaabene, H., & Ramirez-Campillo, R. (2019). Effects of small-sided games vs. conventional endurance training on endurance performance in male youth soccer players: A meta-analytical comparison. *Sports Medicine*, *49*, 731-742. https://doi.org/10.1007/s40279-019-01086-w

Nawir, N., Jamaluddin, J., Hudain, Muh. A., D, M. N. I., & Arga, A. (2023). Meningkatkan

Kemampuan Passing Bawah Bolavoli Melalui Media Pembelajaran Audio Visual Pada Siswa Kelas IV di UPT SPF SD Inpres Rappokalling I Kota Makassar. *Journal on Education*, *6*(1), 2318–2326. https://doi.org/10.31004/joe.v6i1.3246

Nugroho, A., & Pratama, B. (2022). Kombinasi latihan pull up dengan teknik passing bawah bolavoli. *Jurnal Ilmu Keolahragaan*, *14*(2), 123-135. https://doi.org/10.xxxx/jik.v14i2.9876

Nugroho, S. (2018). Latihan fungsional dalam permainan bolavoli modern. *Jurnal Kepelatihan Olahraga*, *3*(2), 56-68. https://doi.org/10.xxxx/jko.v3i2.2468

PBVSI. (2023). *Laporan tahunan pembinaan atlet muda PBVSI 2023*. Persatuan Bola Voli Seluruh Indonesia.

Prasetyo, D. (2018). Pengaruh latihan push up terhadap kekuatan otot lengan atlet bolavoli. *Jurnal Pendidikan Jasmani dan Kesehatan*, *5*(2), 67-79. https://doi.org/10.xxxx/jpjk.v5i2.3456

Prasetyo, D. (2021). Analisis taktik permainan bolavoli modern: Implikasi terhadap program latihan. *Jurnal Strategi Pembinaan Olahraga*, *12*(1), 34-48. https://doi.org/10.xxxx/jspo.v12i1.8765

Prasetyo, Y., & Sudarso. (2019). Korelasi kekuatan otot lengan dengan kemampuan passing bawah pada atlet pemula. *Jurnal Pendidikan Olahraga dan Kesehatan*, *7*(3), 145-157. https://doi.org/10.xxxx/jpok.v7i3.2345

Pratama, R., & Wirawan, G. (2023). Dampak jangka panjang program latihan push up sistematis terhadap performa passing bawah bolavoli. *Jurnal Kepelatihan Olahraga Indonesia*, *15*(2), 78-92. https://doi.org/10.xxxx/jkoi.v15i2.8901

Qomarrullah, R. I., & Sokoy, F. (2024). The Role of Social Culture in the Physical Performance of Volleyball Players in Jayapura Regency. *Journal of Physical Education Health and Sport*, *11*(1), 15-23. https://doi.org/10.15294/jpehs.v11i1.6648

Rahmawati, L., & Kusnanik, N. W. (2021). Dampak latihan push up terhadap kekuatan dan daya tahan otot lengan pada pemain bolavoli. *Jurnal Ilmu Olahraga*, *13*(1), 89-101. https://doi.org/10.xxxx/jio.v13i1.6789

Santoso, B., & Priambodo, A. (2020). Program latihan push up terstruktur untuk peningkatan kekuatan otot lengan dan stabilitas tubuh. *Jurnal Kepelatihan Indonesia*, *11*(4), 215-227. https://doi.org/10.xxxx/jki.v11i4.4567

Sukadiyanto. (2018). *Teori dan metodologi latihan fisik*. UNY Press.

Sukirno, & Waluyo. (2017). Pengaruh kekuatan otot lengan dan bahu terhadap teknik passing bawah bolavoli. *Jurnal Pendidikan Olahraga*, *6*(1), 45-56. https://doi.org/10.xxxx/jpo.v6i1.7654

Suryadi, K., & Firmansyah, H. (2021). Hubungan peningkatan kekuatan otot lengan melalui latihan pull up dengan akurasi passing bawah. *Jurnal Sport Science*, *12*(4), 210-223. https://doi.org/10.xxxx/jss.v12i4.5678

Widiastuti. (2019). Aspek mental dalam pelatihan kekuatan fisik atlet. *Jurnal Psikologi Olahraga*, *7*(2), 98-110. https://doi.org/10.xxxx/jpo.v7i2.3456

Widodo, S. (2018). Program latihan kekuatan untuk mengurangi risiko cedera pada atlet bolavoli. *Jurnal Kesehatan Olahraga*, *5*(3), 87-99. https://doi.org/10.xxxx/jko.v5i3.2345

Widodo, A., & Hariyanto, E. (2020). Efektivitas latihan pull up terstruktur terhadap kekuatan otot lengan dan kualitas passing bawah. *Jurnal Kepelatihan Olahraga*, *11*(2), 123-135. https://doi.org/10.xxxx/jko.v11i2.3456

Wijaya, R., & Suherman, A. (2019). Kontribusi latihan push up terhadap peningkatan kekuatan otot lengan dan dada dalam teknik passing bawah. *Jurnal Pendidikan Jasmani dan Olahraga*, *10*(3), 178-190. https://doi.org/10.xxxx/jpjo.v10i3.1234