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Improving basketball chest pass ability through push up exercises

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ABSTRACT

Problem: Chest pass ability in basketball requires optimal arm muscle strength. Many students show less than optimal chest pass technique due to weak arm muscle strength, so an effective training method is needed to improve it. **Purpose:** This study aims to determine the effect of push-up training on improving chest pass ability in basketball. **Methods:** This study used a randomized pre-test–post-test one group design with a sample of 30 male students aged 16–18 years. Push-up training was given for 6 weeks with a frequency of 3 times per week. Chest pass ability was measured using a ball throw-catch test against a wall as far as 3 meters for 30 seconds, before and after treatment. Data analysis used descriptive statistics and t-test. **Result:** The results showed a significant increase in chest pass ability after being given push-up training. The t-count value of 11.84 is greater than the t-table of 2.042, which means that there is a significant effect of push-up training on chest pass ability. **Conclusion:** Push-up training has been proven effective in improving basketball chest pass ability. This exercise can be used as one of the recommended arm muscle strength training methods in learning basic basketball techniques in schools.

Keywords: exercise, chest pass, push up, basketball

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Introduction

Basketball is a competitive sport that requires good physical and technical abilities from each player (Ricky, 2020; Mongsidi & Saman, 2022). One of the vital basic skills in this game is the chest pass, which is a technique for passing the ball straight from the chest to the chest of a teammate quickly and accurately (Ramdani et al., 2020; Indriani et al., 2022; Harja & Rahmat, 2022). Good chest pass skills greatly determine the smoothness of the game, team coordination, and attack effectiveness (Maksum & Wibowo, 2019). To be able to perform a chest pass optimally, upper body muscle strength is needed, especially the chest, shoulder, and arm muscles. Therefore, physical training that focuses on strengthening these muscles is an important component of a basketball athlete development program (Soederajat et al., 2022). As students' interest in basketball increases, there is a need for a simple, effective, and applicable training approach in the context of schools with limited facilities. Push-up exercise is a form of exercise that is cheap, practical, and easy to do in various conditions without the need for special equipment (Rianto, 2019). This exercise directly targets the muscles that play a role in the chest pass movement, so it has the potential to be the right method in improving the technical abilities of beginner players (Burhan & Herlina, 2022).

Several previous studies have examined the relationship between upper body muscle strength and basketball playing ability. However, most of them use resistance training methods in the gym or involve special equipment that is not always available in the school environment. According to Jufinda (2021), this study is different because it proposes push-ups as an alternative training method that is more inclusive and accessible to all groups, especially students. In addition, most previous manuscripts discuss increasing muscle strength in general, without specifically linking it to chest pass ability in basketball. The novelty of this study lies in the specific focus on push-up training as the main method, and in the use of measurement instruments that directly test chest pass ability, not just muscle strength. This study used a quasi-experimental design with a pretest and posttest model in a single group, which allows for direct measurement of performance changes after the training treatment is given. The subjects of the study were students, who are an age group with great potential in long-

term sports achievement development. This provides added value in the context of early childhood sports development in the school environment.

This study is strengthened by the fact that many schools and elementary sports clubs do not yet have complete training facilities. With push-ups as an alternative exercise that can be done anytime and anywhere, the results of this study can be a practical and efficient training solution. In the context of current physical education and sports coaching, an evidence-based and realistic approach to conditions in the field is needed. Therefore, this study is important to provide a scientific basis for the use of push-up training as one strategy in improving basketball playing skills. This study aims to determine the effect of push-up training on improving chest pass ability in basketball games.

Method

In terms of methodology, this study combines a quantitative approach with inferential statistical data analysis to test the significance of the effect of push-up training on chest pass ability. This distinguishes it from previous studies that tend to be descriptive or observational. The use of field-based measurement instruments, with direct testing of chest pass ability, also provides high practical value in the context of school sports training and coaching. This study was a field experiment with a randomized pre-test–post-test one group design (Kusumawati, 2015). The sample consisted of 30 male students of SMK Negeri 5 Konawe Selatan who were selected using a purposive random sampling technique based on the following criteria: age 16–18 years, height 160–165 cm, and able to do a chest pass. The independent variable was arm muscle strength training through push-ups, while the dependent variable was chest pass ability. The treatment in the form of push-up training was carried out for 6 weeks with a frequency of 3 times per week (a total of 18 times), using a training load of 80% of maximum strength and increasing the set every two weeks. The research instrument used a chest pass ability test, namely throwing a ball against a wall as far as 3 meters for 30 seconds according to Nurhasan (2001). The test participants stand behind a line 3 meters from the wall, holding the ball in the middle of the body. After hearing the command "Yes", participants start throwing the ball towards the wall using the chest pass technique as much as possible within 30 seconds. During the test, participants are not allowed to step on or cross the boundary line. If during the throw one or both of the participant's feet step on or cross the line, the throw is considered invalid and is not counted. Each valid throw is counted based on when the ball is released from both of the participant's hands. Data were collected through pretest and posttest, then analyzed using descriptive statistics by finding the average, standard deviation, maximum and minimum values, then the prerequisite test of homogeneity analysis and t-test were carried out with a significance level of 0.05.

Result

Descriptive statistical data from 30 participants before and after being given treatment in the form of push up exercises aimed at improving chest pass skills in basketball games. The parameters displayed include the number of samples (N), average (mean), standard deviation, maximum, and minimum values.

Table 1. Descriptive of Chest Pass Ability in Basketball Game
Posttest and Pretest Results with Push Up Exercise

	N	Average	Standard Deviation	Maximum	Minimum
Pretest	30	19,67	1,75	22	16
Posttest	30	24,63	1,52	29	22

Based on the results of the study, there is an average (mean), pretest is 19.67 and posttest is 24.63 A significant increase of 4.96 points or around 25.2% of the initial value. This shows that push-up training has a strong positive impact on improving the ability to do chest passes. The average that increases significantly reflects that almost all participants have made progress. Standard deviation, pretest is 1.75 and posttest is 1.52. The decrease in standard deviation indicates that after training, the variation in ability between participants becomes smaller, meaning that the results of the participants become more consistent and even. The training program is likely to be effective overall, not just for a few individuals. The maximum value, pretest is 22 and posttest is 29. This increase shows that the best participants experienced a significant spike in performance. This confirms that push-up training is able to develop a person's maximum performance in terms of arm strength for chest passes. The minimum value of the pretest is 16 and posttest is 22. The increase in the minimum value is also important because it shows that even participants with the

lowest abilities show real progress. This means that the program is inclusive and effective for all levels of entry-level ability. Statistically, the mean increase and standard deviation decrease reflect that push-up training significantly contributes to the increase in arm muscle strength that is important in the chest pass technique.

Table 2. Frequency Distribution of Chest Pass Ability Pretest Results or before being given Push Up Exercise

Class Interval	Frequency	Percentage %
16 - 17,02	5	17%
17,03 - 18,05	2	7%
18,06 - 19,08	6	20%
19,09 - 20,11	6	20%
20,12 - 21,14	6	20%
21,15 - 22	5	17%
Total	30	100%

Frequency distribution of chest pass ability from pretest or before push up training. This means that the data displayed describes the distribution of participants' initial abilities (before push up training intervention) in performing chest pass, which is a ball throwing technique in sports such as basketball. The distribution is even in the middle. The three middle intervals (18.06 - 21.14) have the highest frequency, 6 people or 20% each. This shows that the majority of participants are in the medium ability category. A little bit in the low value The lowest interval (17.03 - 18.05) only has 2 people (7%), meaning that only a small number of participants have the lowest ability in chest pass. Symmetrical to the Middle The lowest and highest intervals (5 participants or 17% each) show that the distribution of values is close to normal. The conclusion is that before push up training was given, participants generally already had moderate ability in performing chest pass. Only a few participants had low initial ability. This data can be used as a basis for comparison to see how much improvement there is after the training is done.

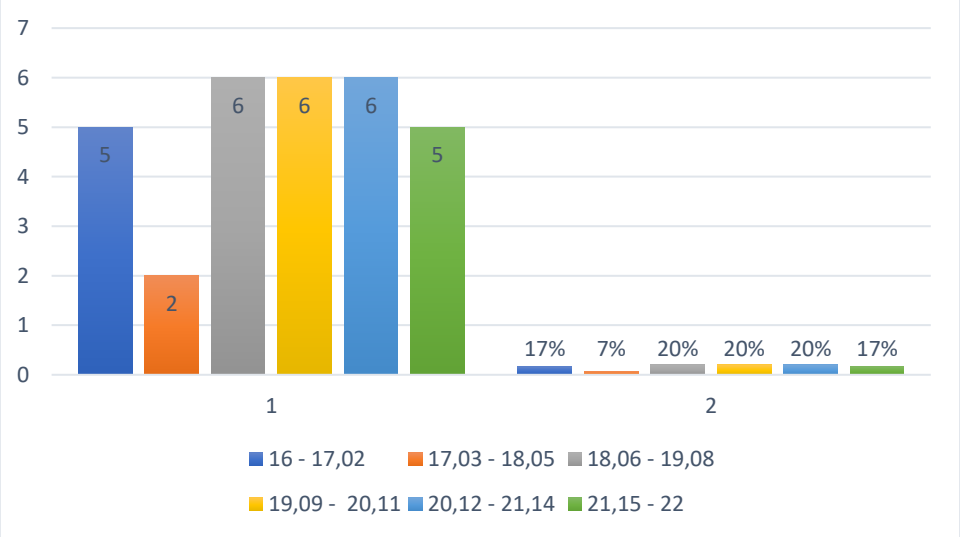

Figure 1. Histogram of Chest Pass Ability from Pretest Results or before Push Up Exercises were given

Table 3. Frequency Distribution of Chest Pass Ability in Basketball Game Posttest Results after Push Up Exercise

Class Interval	Frequency	Percentage %
22 - 23,19	5	17%
23,20 - 24,39	12	40%
24,40 - 25,59	5	17%
25,60 - 26, 79	5	17%

26,80 - 27,98	2	7%
27,99 - 29	1	3%
Total	30	100%

Shows the results of measuring the chest pass ability of participants after participating in push-up training. This data is important to evaluate whether the training has a positive impact on improving ability. A total of 12 participants (40%) were in the interval of 23.20 - 24.39, indicating that the majority of participants achieved good performance improvement after training. Although many participants improved, there were still a small number who were in the upper range (26.80 and above) and lower (22 - 23.19), indicating variation in the results of improvement between participants. When compared to the previous pre-test data, it can be seen that the post-test values were higher and tended to be centered above the previous middle value. This indicates that push-up training has a positive effect on the chest pass ability of participants. The conclusion is that push-up training contributes significantly to improving the chest pass ability of the majority of participants. The highest frequency is in the value class of 23.20 - 24.39, indicating a large group increase compared to the results before training. There are still some participants with limited improvement, but overall.

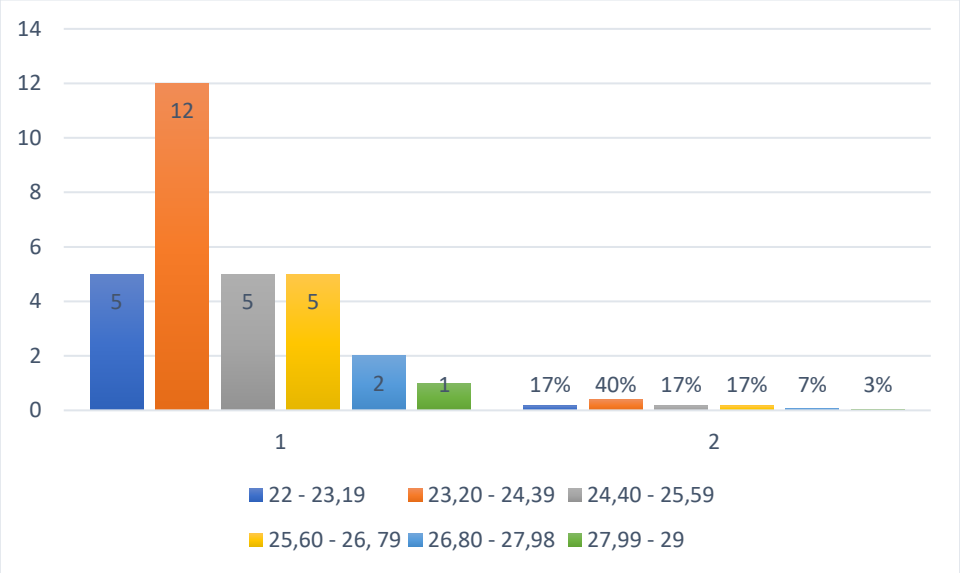

Figure 2. Histogram of Chest Pass Ability in Basketball Game
Posttest Results after Push Up Exercise

Table 4. Homogeneity Test

Statistical Results	S	S^2	t-count
Pretest	1,75	3,06	1,32
Posttest	1,52	2,31	

The homogeneity test aims to determine whether the variance of the two data groups (in this case the pretest and posttest data) has similarities or not. This is important to do before conducting a t-test, because one of the assumptions of the t-test is that the data comes from a homogeneous population (same variance). The standard deviation of the pretest is 1.75 and the posttest is 1.52. The difference between the two is relatively small, indicating that the distribution of data before and after treatment is not much different. The pretest variance is 3.06 and the posttest is 2.31. The variance is also not much different, strengthening the indication that the two data groups have homogeneity. The t-count value is 1.32. This value is compared with the t-table value. Based on the t-count value of 1.32, which is likely smaller than the t-table value, it can be concluded that the pretest and posttest data come from a homogeneous population, so that further statistical tests such as the t-test can be carried out validly.

Table 5. Pretest and Posttest t-test

variables	Posttest and pretest result	t_{table}

Pretest and *Posttest*	11,84	2,042

The t-test is used to determine whether there is a statistically significant difference between two groups of data, in this case between the pretest and posttest values of chest pass ability after being given push-up training. The t-value of 11.84 is the result of statistical calculations of the difference in pre-test and post-test scores. The t-table value of 2.042 is the threshold value at a significance level of 0.05. There is a significant difference between the pretest and posttest results. This means that push-up training has a significant effect on improving chest pass ability in basketball games.

Discussion

The results of this study showed a significant increase in participants' chest pass ability after they underwent a push-up training program for a certain period of time. Data obtained from 30 participants showed that the average post-test score was consistently higher than the pre-test score. Some participants showed a spike in performance of 5 to 7 points after the training was carried out. According to Reras et al., (2024), Physiologically, push-ups are included in the bodyweight training category which is very effective for training the strength of the upper body muscles, such as the pectoralis major (chest), deltoid (shoulder), and triceps brachii (upper arm). These three muscles have a central role in the chest pass movement, which is when the athlete pushes the ball with both hands forward using the strength of the chest and arms. Therefore, increasing the strength of these muscles will directly increase the thrust and stability of the ball when performing the chest pass technique. According to Hidayat et al., (2024), Furthermore, push-up training not only strengthens muscles, but also improves neuromuscular coordination and muscle endurance. This makes participants more able to maintain the consistency of throwing techniques and control the direction and power of the ball in real game situations. Thus, push-up training not only contributes to the strength aspect, but also improves the technical quality and fine motor skills needed in basketball.

From the perspective of physical education and sports training, these findings are very important. Push-ups can be done at any time, without the need for special equipment or facilities, making them very relevant to be implemented in school environments, small sports clubs, or areas with limited resources. Coaches and sports teachers can utilize this exercise as part of their learning routines to improve students' basic skills in the game of basketball (Putra, 2020; Prasetya et al., 2022).

The results of this study strengthen and extend the results of previous studies that show a positive relationship between strength training and improved technical skills in basketball. For example, in a study conducted by Saputra (2022), bodyweight exercises such as push-ups and pull-ups were shown to increase arm and chest muscle strength which directly contributes to the ability to throw the ball in basketball. Likewise, the results of this study support the findings of Syahruddin et al., (2023), which stated that calisthenics-based training methods can improve coordination and basic technique skills in various sports, including basketball. However, this study differs from previous studies in terms of method approach. If the previous study used a combination training method with additional equipment such as a medicine ball or resistance band, this study exclusively uses push-ups as the only form of intervention exercise.

This uniqueness makes our research provide added value to the treasury of sports research, because it successfully shows that simple and inexpensive methods such as push-ups still have a significant impact if done in a programmed and consistent manner (Sitinjak & Mustaqim, 2025; Cronin & Owen, 2004). This broadens the understanding that skill development in sports does not always have to be done with sophisticated technology or tools, but can be done with an applicable functional approach. This study also has several weaknesses and limitations that are important to convey openly as part of scientific reflection and consideration in assessing the validity and reliability of the results obtained.

First, this study did not use a control group. This is a methodological limitation that can affect the extent to which we can claim that changes in chest pass scores are solely due to push-up training. Without a comparison group, it is difficult to eliminate the possibility that other factors such as motivation, natural growth, or physical activities outside the program play a role in improving performance. Second, the population used is quite homogeneous, namely students or participants in a certain age range and come from relatively the same environment. This causes the research results to be less generalizable to a wider population, such as professional athletes, elementary school students, or populations with certain physical conditions (Hermayani et al., 2018; Andriyani & Rizky, 2023). Third, this study only measures the results in quantitative dimensions based on chest pass ability scores, without qualitative data such as technique observations, interviews, or movement video analysis. In fact, technical aspects such as body posture, eye-hand coordination, and movement stability are also important in evaluating the overall quality of chest passes (Maimón et al., 2020).

The results show that the increase in performance could be due to the learning effect or repetition during the testing period. Participants may have experienced an increase because they were more accustomed to doing the chest pass movement, not solely because of the push-up exercise. The increase in results could also be influenced by motivational factors (Perabunita & Meidiansa, 2020; Saputra et al., 2024). After undergoing training, participants could feel more confident and motivated to show better performance during the post-test. Push-ups are exercises that involve various muscle groups at once. Therefore, the increase in chest pass performance could also be the result of increased general body fitness, not just because of the strength of the chest and arm muscles. If the exercise is carried out in a competitive atmosphere or accompanied by a trainer who provides psychological encouragement, then these environmental factors can also contribute to the increase in results.

Suggestions for further research include using a control group in an experimental research design so that the effects of the intervention can be compared clearly and objectively. Add variations in training programs, such as medicine ball throws, weight training, or other functional training to determine which method is most effective in improving chest pass skills. Expand the scope of participants to different age groups (children, adolescents, adults), different genders, and ability levels (beginners, intermediate, advanced) to see variations in the effects of the intervention on various populations. Use qualitative measurement methods, such as video recordings for movement analysis, participant interviews to find out their experiences during training, or observation of chest pass execution techniques. Increase the duration and intensity of the training program to determine the long-term effects of push-up training on the development of other basic basketball technique performance, such as other passing, dribbling, and shooting. Collaboration with professional coaches in designing training programs can increase the validity and efficiency of implementing these exercises in the real context of the sports world.

Conclusion

Based on the results of the study on improving chest pass ability in basketball through push-up training, it can be concluded that there is an increase in chest pass ability in basketball after students are given treatment in the form of push-up training. The results of this study indicate that regular push-up training can increase the strength of the arm, chest, and shoulder muscles, which directly contributes to improving chest pass techniques in basketball. With the increase in the strength of these muscles, the accuracy, speed, and distance of the ball pass become more optimal. Coaches can include push-up training as part of a routine training program to improve players' passing abilities, especially chest passes. Emphasis on simple physical exercises such as push-ups is also an effective alternative to developing basic techniques without always having to use additional aids.

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