



## **The effect of strength training using the standing bench press method on shot put ability**

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**Abstract:** This study aims to determine the effect of strength training using the standing bench press method on shot put ability. This study used a quantitative method with a pre-experimental design with a one-group pretest-posttest design. The total population is 110 students at SMK Negeri 5 Konawe Selatan, with 50 male students and 60 female students. Samples were drawn using purposive sampling techniques or considerations with the male sex and those who had good and correct shot put technique skills so that 30 students were found as samples in the study. The exercise was carried out using the standing bench press method for 16 exercises with the intensity used, namely 70% moderate, 80% heavy, and 60% light. The research instrument is using a shot put ability test. From the results and analysis of the research on the pretest or before the implementation of the exercise with an average of 7.21, while the posttest after the implementation of the exercise with an average of 8.79 from these results there is an increase in shot put ability. Based on the results of the paired samples test or the t-test at a significance of  $0.000 > 0.05$ , it means that the effect of strength training using the standing bench press method on shot put ability is significant. The results of the study show that strength training using the standing bench press method can improve shot put ability with maximum results.

**Keywords:** exercise, standing bench press, shot put.

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### **INTRODUCTION**

Human development begins with motion and can behave so that it has a purpose, while the form of activity is very broad in behavior, this is because humans have a lot of potentials compared to other creatures. Therefore, humans need physical activity. The role of physical education is part of fostering the growth and development of a group both physically and spiritually (Sukamto et al., 2022). It helps humans exercise and can launch the body's metabolism which will make the body physically healthier. The function of exercise besides being healthy can improve fitness can also increase immunity and protect against all diseases and avoid stress (Suganda & Sumantri, 2022). The implementation of sports is currently very much followed by the community, ranging from children to adults (Sobczyk et al., 2022). Sports activities can be carried out during school time which is taught in physical education so that they are more active in moving (Alcántara-Porcuna et al., 2022). Through physical education, students can develop mental and social skills to develop knowledge, attitudes, and movement abilities (Susanto et al., 2022; Kok et al., 2020). With sports movements in physical education, students can avoid mental health problems and are not easily depressed (Simons & Bird, 2022). So that it can meet the target, one of which is in athletic learning (Brearley & Bishop, 2019).

Athletics can cover various scientific disciplines physiologically and physically whose goal is to achieve achievement (Giráldez-Costas et al., 2022). Athletics includes walking, running at various distances, throwing, and jumping (Muxametovich, 2022). One of the athletic sports, namely shot put training or learning, basically requires the ability to refuse, so it can involve bouncing the ball with the



hands (Schofield et al., 2022; Landolsi et al., 2018). When the bullet is repelled with maximum force, it can be done with orthodox or O'Brien forces with an angular velocity of about forty degrees at the time of repulsion (Błażkiewicz et al., 2016). Shot put training requires physical components, one of which is the strength of the hands and elbows in reflecting the ball well (Riemann et al., 2018). Strength is an important factor in the implementation of the shot put (Hisham Ali Al-Aqra, 2022). The type of strength can vary, namely the strength in the chest muscles which play an important role in bouncing the ball. Shoulder strength and hand strength play an important role in carrying out a strong and stable repulsion (Aminudin et al., 2020). Continuous and programmed training can help improve hand and elbow muscles (Nasrulloh, Yuniana, et al., 2021; Nasrulloh, Prasetyo, et al., 2022) In addition to strength when executing the shot put, balance can play a role, namely in the stability of holding and throwing the ball (Zhang & Alahmadi, 2021). With regular and continuous training, strength training is carried out using the standing bench press method (Sukamto et al., 2022).

The standing bench press training method focuses on the chest muscles, namely playing an important role in carrying out a strong and stable repulsion, the triceps, which plays a role in carrying out a strong and precise repulsion, and the shoulders which play an important role in reflecting the ball strongly and stably so that the exercise the standing bench press can help strengthen the muscles needed to do the take-off. Exercise using a barbell by holding it in a wide grip position and straightening your arms up, then with the control, you can lower it to your chest, then raise it back to the starting position (Jarosz et al., 2020; Maicas-Pérez et al., 2023). In this exercise supervision from a researcher or trainer is needed, so that the exercise can be carried out properly and correctly. Because there are some weaknesses in carrying out the exercise. If the lack of stability in the exercise will cause or increase the risk of injury in repulsion (Pérez-Trejos et al., 2022). Standing bench press exercises require good control and coordination in maintaining the correct position throughout the movement (Stastny et al., 2017). Then the implementation of standing bench press exercises requires good balance in carrying out movements, especially when lowering and lifting weights (Boolani et al., 2022).

Based on the reality in the field, it was found that students often had the wrong skills in executing the shot-put technique, which resulted in poor results that increased the risk of injury. Students do not have enough strength to do the shot put properly resulting in a shorter distance. The condition of flexibility is not owned, to make the right movements and obtain the optimal distance. Students are less motivated to practice and improve their shot-put skills which can affect the repulsion results. So, to help overcome this problem, in research given strength training with the standing bench press method is a good solution in training to improve the shot put, as well as providing support from the teacher or coach, and encouragement to continue practicing and improving skills.

Although the standing bench press exercise is not directly related to shot put ability, it can help increase overall body strength and explosive power, which can improve performance in sports such as shot put. The standing bench press exercise can help strengthen the chest, shoulder, and triceps muscles which are important in the shot-put movement. Increasing the strength of these muscles can help improve the ability to resist and reject weights, as well as increase explosive power when throwing. In addition, standing bench press exercises can help improve body speed, balance, and coordination, which are also important in shot put movements. In the shot-put movement, good coordination is needed between the upper and lower body, as well as body balance to produce optimal throws. However, standing bench press exercises should be considered as part of a broader exercise program and tailored to individual needs and goals. Specific and focused shot-put training should be a top priority in improving shot put ability.

This is the first time this research has been carried out using the standing bench press training method to improve students' abilities before and after practice. Several research results support the ability to put out a shot but with the effect of a different exercise, namely Sari et al., (2021), aim to investigate the incline push-up depth jump exercise with a shot put ability with a value of 8.86 greater than 1.734, giving significant influence. Other research was also conducted (Prabowo, 2016), this study used strength training using the standing

bench press method with shot put ability, and the results showed an average increase of 33.92 so the results of the study had a significant effect. Based on the results of the research, there are similarities in the training methods but have different movements in these exercises, for example, standing bench press research uses exercises using barbells, while bench press research uses medicine balls, but the same goal is to increase shot put. Based on these results, the exercises used in strength training can improve shot put ability.

**METHODS**

This study uses a quantitative method with a pre-experimental design with a one-group pretest-posttest design, in which only one group is measured before and after the treatment is carried out, with the variable  $O_1$  being the pretest before the exercise, while X is the strength training method. standing bench press, and variable  $O_2$  is a posttest, namely after the exercise (Sugiyono, 2017). The total population is 110 students at SMK Negeri 5 Konawe Selatan, with 50 male students and 60 female students. Samples were drawn using purposive sampling techniques or considerations with male gender and those who had good and correct shot put technique skills so that 30 students were found as samples in the study. The exercise was carried out using the standing bench press method for 16 exercises (three times a week), with an average maximum capacity of 15 kg. The intensity used is moderate 70%, heavy 80%, and light 60%. Then for a load of 9-12 kg, repeat 10 times, and rest between sets 1-2 times. The research instrument was the shot put ability test, that is, before the test was carried out, warm-up and stretching were first given, before the test the participants were allowed to experiment alternately with the shot put technique. The tools used include repulsion fields, bullets, and record results, in the data collection technique the test participants are called to immediately get ready to do the shot put. closest to the limit of repulsion, each legal throw is recorded as a result. The data analysis technique uses the analysis technique with the t-test intending to compare the average between the pre-test and post-test, but first, a normality test and homogeneity test are carried out using SPSS version 26. The validity test of the pretest and posttest instruments is 0.592 with a smaller significance of 0.001 0.05, while the reliability test for the pretest and posttest instruments was 0.743.

**RESULT AND DISCUSSION**

Based on the descriptive statistical analysis of the results of the research and data processing of strength training using the standing bench press method for shot put ability, namely the lowest, highest, average number of research results, and standard deviation. So that the implementation of the initial test, the implementation of exercises, and to see at the end of the test the increase in shot put ability.

**Table 1.** Descriptive Statistics

Descriptive Statistics	Pretest	Posttest	Difference
N	30	30	30
Minimum	5.80	6.80	1.00
Maximum	9.60	10.70	1.10
Mean	7.21	8.79	1.58
Std. Deviation	0.97	1.03	0.06
Total	53.58	57.32	33.74

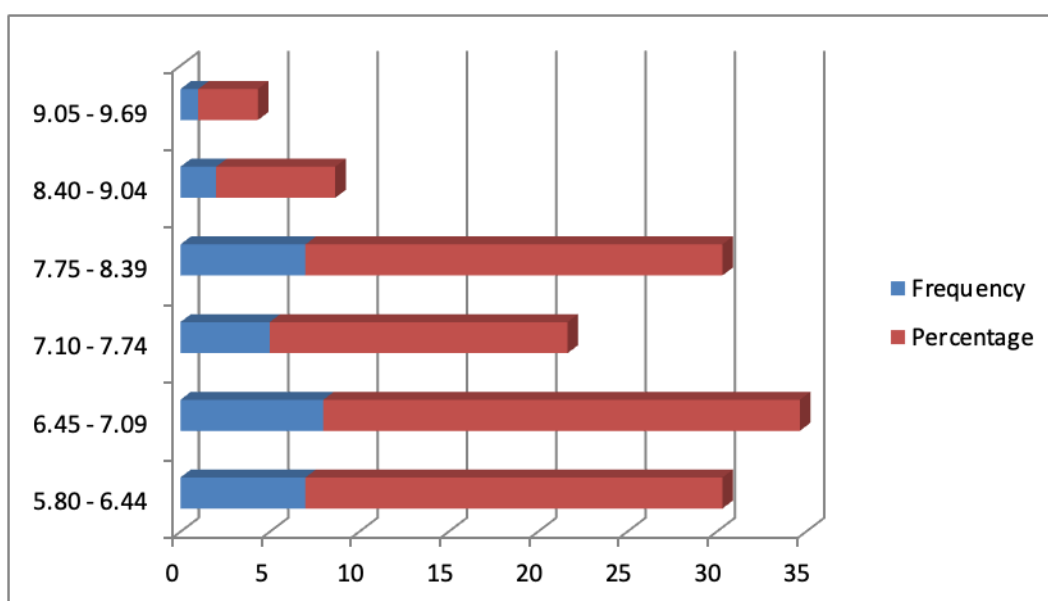
Table 1 describe that there were 30 samples in the study, the minimum score on the initial test of putting the shot put was 5.80, and after the implementation of the treatment, there was an increase in the final test of 6.80 with a difference in the value of 1.00. The maximum value of the initial test was 9.60, which increased to 10.70 in the final test with a difference in the value of 1.10. The average score on the initial test was 7.21, while on the final test, it increased by 8.79 with a difference of 1.58. At a standard deviation of 0.97, there was an increase in the final test of 1.03 with a difference of 0.06. Based on descriptive statistical analysis, the results of the study experienced an increase from the

implementation of the initial test, and treatment, to the implementation of the final test. The results of the frequency distribution can be seen in the following table.

**Table 2.** Pretest and Posttest Shot-Put Performance Frequency Distribution Data

Variable	Interval	Frequency	Percentage (%)	Variable	Interval	Frequency	Percentage (%)
<i>Pretest</i>	5.80 - 6.44	7	23	<i>Posttest</i>	6.80 - 7.46	5	17
	6.45 - 7.09	8	27		7.47 - 8.13	2	7
	7.10 - 7.74	5	17		8.14 - 8.80	9	30
	7.75 - 8.39	7	23		8.81 - 9.47	5	17
	8.40 - 9.04	2	7		9.48 - 10.14	6	20
	9.05 - 9.69	1	3		10.15 - 10.81	3	10
	total	30	100		Total	30	100

Table 2 shows in the initial test before the implementation of the standing bench press, there were 7 people with a percentage of 23% who could put bullets with an interval score of 5.80 to 6.44, there were 8 people with a percentage of 27% who could put a shot with an interval score of 6.45 up to 7.09, there are 5 people with a percentage of 17% having the ability to put bullets with interval scores of 7.10 to 7.74, there are 7 people with a percentage of 23% having the ability to put bullets with interval scores of 7.75 to 8.39, there are 2 people with a percentage of 7% having the ability shot put with a score interval of 8.40 to 9.04, there is 1 person with a percentage of 3% having the ability to put a shot with a score interval of 9.05 to 9.69. Whereas in the final test after the implementation of the standing bench press, there were 5 people with a percentage of 17% having the ability to put a shot at an interval score of 6.80 to 7.46, there were 2 people with a percentage of 7% having the ability to put a shot at an interval of 7.47 to 8.13, there were 9 people with a percentage of 30% having the ability to put bullets with an interval score of 8.14 to 8.80, there are 5 people with a percentage of 17% having the ability to put bullets with an interval score of 8.81 to 9.47, there are 6 people with a percentage of 20% having the ability to put a bullet with an interval score of 9.48 to 10.14, there are 3 people with a percentage of 10% having the ability to put bullets with interval scores of 10.15 to 10.81. The magnitude of the increase in the initial test before treatment to the stage after treatment or the final test can be seen in Figure 1 and Figure 2.



**Figure 1.** Shot Put Ability Pretest

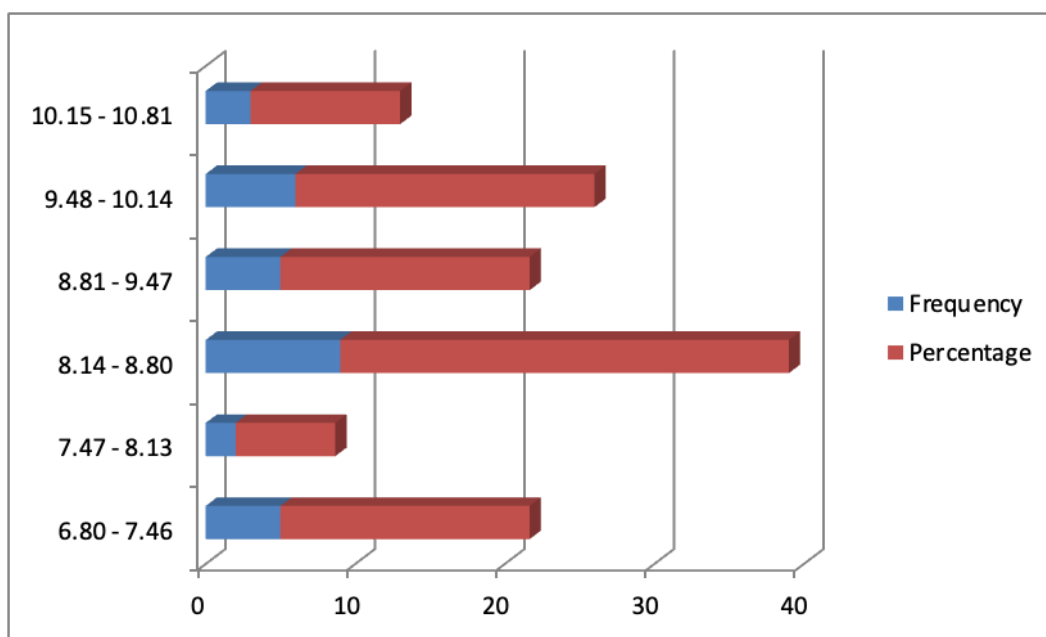


Figure 2. Posttest histogram of shot put the ability

Table 3 shows the normality value of Asymp. the significance of the initial test of shot-put ability is 0.990, and the normality test value is greater than 0.05, meaning that the research results of the data are normal, whereas, after the treatment or final test, the value is 0.125, the normality test value is greater than 0.05, meaning normal data.

Table 3. Kolmogorov-Smirnov Test

Variable	Kolmogorov-Smirnov Z	Asymp. Sig. (2-Tailed)
Pretest	0.440	0.990
Posttest	1.178	0.125

Table 4. Summary of research homogeneity test data

Variable	Levene Statistic	df1	df2	Sig.	Difference
Pretest and Posttest	0.014	1	58	0.907	Homogenous

Table 4 shows the homogeneity test data from the research on shot put ability through strength training using the standing bench press training method, the significance value of 0.907 is greater than 0.05. Based on these results, it is homogeneous between the pre-test data and the post-test data.

Table 5. T-test With Paired Samples Test

	t	df	Sig. (2-tailed)
Pretest and Posttest	-9.476	29	0.000

Based on the research data (Table 5), it is known that the basic decision making, namely  $H_0$ , is that there is no effect of strength training using the standing bench press method on shot put ability,  $H_a$  is that there is an effect of the effectiveness of strength training using the standing bench press method on shot put ability. If the probability value is greater than 0.05 then  $H_0$  is accepted, if the probability value is less than 0.05 then  $H_0$  is rejected. From the research results in sig. (2-tailed) that is 0.000. This result means that the probability value is less than 0.05, that is, there is an effect of strength training using the standing bench press method on shot put ability. The results of data analysis showed that there was a significant effect through strength training using the standing bench press method to increase shot put ability. The effect of these exercises can increase the strength of the chest muscles and triceps, this method works when doing bench press movements. This can improve the subject's ability to perform daily activities that require muscle strength. Increase in upper body muscle strength.

strength training using the standing bench press method can help improve overall upper-body muscle strength because it involves a lot of muscles in the shoulder and back area.

According to Burhanuddin et al (2021) apart from strength, several physical conditions support bench press exercises to improve shot put, namely to maintain body balance and coordination so that during training the subject performs movements while standing which requires the body to be balanced and good coordination to maintain posture proper body during exercise. According to (Falk Neto & Kennedy, 2019; Nasrulloh, Apriyanto, et al., 2022; Yuniana et al., 2023) in addition to strength training, it can increase endurance and cardiovascular, especially if it is done in a series of high-intensity exercises that are carried out for quite a long time.

The increase in shot put performance is not only based on muscle strength alone, besides the subject's strength it is also necessary to train the shot-put technique. In the execution of shot put which involves throwing or repelling a technical metal ball as far as possible from the starting point. This sport requires good technique and good body coordination to achieve maximum throwing distance. Athletes or students in throwing shot put usually use the correct technique in achieving optimal momentum before throwing bullets (Sobarna et al., 2022; Sulistianta et al., 2022). Meanwhile, according to Mastalerz & Sadowski (2022), several techniques are used in shooting. shot put include glide techniques, spin techniques, and rotational techniques.

Supporting research in this study was conducted by Thaqi et al., (2021), with the title the effect of plyometric training on shot put ability, and the results obtained were significant. Based on the results of the study, there were similarities, namely using shot put abilities for the dependent variable, while for the independent variables there were differences, namely using plyometric exercises, while the researchers used standing bench press exercises, but the results of data analysis showed that the exercises were carried out to improve the ability to shoot. bullets have a significant effect. Meanwhile, research was conducted by Sakamoto et al., (2018), which examined the effect of bench press training on shot put distance. Based on the results of this study, it has similarities to find out how much shot-put ability is produced, the difference is in the training used, but the goal is the same through bench press exercises and standing bench press exercises, namely, to increase the distance of repulsion in shot put sports.

The implementation of shot put through standing bench press strength training requires careful supervision from a coach and follows a training program that has been designed to the fullest, and athletes or students need to do it seriously. If it is not done correctly, it will cause injury to the shoulder because the shot put requires a very strong throw and the body can rotate, therefore it is necessary to warm up sufficiently before training and carry out the correct technique. Back injuries will also occur if during the usual resisting technique back injury occurs, therefore strengthening exercises for the back muscles accompanied by stretching movements are needed in training. Then the shot-put training equipment that is not following the standards can also cause injury and affect the shot-put technique. To avoid these weaknesses, it is necessary to carry out the exercises correctly, always follow instructions from a trainer, warm up sufficiently, and do stretches that can prevent injury and improve training performance in the shot put.

The results of research on the effect of standing bench press strength training on shot put ability can make an important contribution to education and the development of science in sports, especially in the shot-put sports. The contributions that can be generated from this research are increasing the effectiveness of the training program. The results of this study can help sports trainers or fitness experts in designing training programs that are more effective in increasing shot-put ability. Knowledge of the standing bench press exercise can be integrated into a training program to increase the strength, explosive power, and body coordination needed in shot put movements. Increase understanding of the influence between strength and shot-put ability.

This research can help strengthen the understanding of the importance of body strength in the increasing shot-put ability. Knowledge of the effects of strength training on the muscles involved in the shot put can help athletes or sports coaches design more focused and effective training programs. For the development of further research, the results of this study can be the basis for conducting further research on the effect of other strength training on shot put ability, or to deepen understanding of the mechanisms involved in increasing shot-put ability through strength training.

Improving athlete performance, namely increasing knowledge about the effect of standing bench press exercises on shot put ability, can help improve shot put athlete performance. By increasing overall body strength and explosive power, athletes can achieve better results in their sport (Ihsan Sabillah et al., 2022; Nasrulloh, Deviana, et al., 2021; Nasrulloh, Prasetyo, et al., 2022; Prasetyo & Nasrulloh, 2017). Thus, research on the effect of standing bench press strength training on shot put ability can make an important contribution to education and the development of science in sports and can help improve the overall performance of shot-put athletes.

### CONCLUSION

The results of the study showed that strength training with the standing bench press method on shot put ability can improve shot put ability. Through strength training with the standing bench method, students who are still lacking in repulsion can increase to the maximum, because of the effects of programmed exercises, so that the muscles in the body gain maximum strength because this exercise focuses on the chest, arm, and shoulder muscles which are the crucial area in executing the shot put.

### REFERENCES

- Alcántara-Porcuna, V., Sánchez-López, M., Martínez-Andrés, M., Martínez-Vizcaíno, V., Ruíz-Hermosa, A., & Rodríguez-Martín, B. (2022). Teachers' Perceptions of Barriers and Facilitators of the School Environment for Physical Activity in Schoolchildren: A Qualitative Study. *Qualitative Research in Sport, Exercise and Health*, 14(7), 1113–1137. <https://doi.org/10.1080/2159676X.2022.2037696>
- Aminudin, A., Sugiyanto, S., & Liskustyawati, H. (2020). Contribution Leg Muscle Strength, Dynamic Balance and Hip Joint Flexibility to the Accuracy of Football Shooting. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*, 3(2), 912–918. <https://doi.org/10.33258/birle.v3i2.985>
- Błażkiewicz, M., Łysoń, B., Chmielewski, A., & Wit, A. (2016). Transfer of Mechanical Energy During the Shot Put. *Journal of Human Kinetics*, 52(1), 139–146. <https://doi.org/10.1515/hukin-2016-0001>
- Boolani, A., Moghaddam, M., Fuller, D., Mondal, S., Sur, S., Martin, R., Kadry, A., Torad, A. A., Elwan, M. A., & Kakar, R. S. (2022). The Effects of Vision-Deprived Progressive Resistance Training on One-Repetition Maximum Bench Press Performance: An Exploratory Study. *Vision*, 6(3), 47. <https://doi.org/10.3390/vision6030047>
- Brearley, S., & Bishop, C. (2019). Transfer of Training: how Specific Should we be? *Strength & Conditioning Journal*, 41(3), 97–109. <https://doi.org/10.1519/SSC.0000000000000450>
- Burhanuddin, S., Ihsan, A., Jumareng, H., & Anugrah, B. A. (2021). Biomotor, Psychomotor, And Anthropometry As Determiners Of Sport Talent Scouting At Secondary Schools: Analysis Of Dominant Determinants Of Sports Talent At Secondary Schools In Indonesia. *PalArch's Journal of Archaeology of Egypt/Egyptology*, 18(4), 3426–3444.
- Falk Neto, J. H., & Kennedy, M. D. (2019). The Multimodal Nature of High-Intensity Functional Training: Potential Applications to Improve Sport Performance. *Sports*, 7(2), 33. <https://doi.org/10.3390/sports7020033>
- Giráldez-Costas, V., Aguilar-Navarro, M., González-García, J., Del Coso, J., & Salinero, J. J. (2022). Acute Caffeine Supplementation Enhances Several Aspects of Shot Put Performance in Trained Athletes. *Journal of the International Society of Sports Nutrition*, 19(1), 366–380. <https://doi.org/10.1080/15502783.2022.2096415>
- Hisham Ali Al-Aqra, S. M. A.-M. (2022). Designing a Proposed Training Program Combining Weight and Flexibility Training and Its Effect on Physical Qualities and Digital Level of Shot-Put Female Players with F56 Disabilities. *Journal of Hunan University Natural Sciences*, 49(9), 165–

171. <https://doi.org/10.55463/issn.1674-2974.49.9.19>
- Ichsan Sabillah, M., Tomoliyus, Nasrulloh, A., & Yuniana, R. (2022). The effect of plyometric exercise and leg muscle strength on the power limb of wrestling athletes. *Journal of Physical Education and Sport* ® (JPES), 22(6), 1403–1411. <https://doi.org/10.7752/jpes.2022.06176>
- Jarosz, J., Gołaś, A., Krzysztofik, M., Matykiewicz, P., Strońska, K., Zajac, A., & Maszczyk, A. (2020). Changes in Muscle Pattern Activity During the Asymmetric Flat Bench Press (Offset Training). *International Journal of Environmental Research and Public Health*, 17(11), 3912. <https://doi.org/10.3390/ijerph17113912>
- Kok, M., Komen, A., van Capelleveen, L., & van der Kamp, J. (2020). The Effects of Self-Controlled Video Feedback on Motor Learning and Self-Efficacy in a Physical Education Setting: an Exploratory Study on the Shot-Put. *Physical Education and Sport Pedagogy*, 25(1), 49–66. <https://doi.org/10.1080/17408989.2019.1688773>
- Landolsi, M., Labiadh, L., Zarrouk, F., Maaref, K., Ghannouchi, S., Tabka, Z., & Lacouture, P. (2018). Kinematic Analysis of the Shot-Put: A Method of Assessing the Mechanical Work of the Hand Action Force. *European Journal of Sport Science*, 18(9), 1208–1216. <https://doi.org/10.1080/17461391.2018.1478449>
- Maicas-Pérez, L., Hernández-Lougedo, J., Heredia-Elvar, J. R., Pedauyá-Rueda, B., Cañuelo-Márquez, A. M., Barba-Ruiz, M., Lozano-Estevan, M. del C., García-Fernández, P., & Maté-Muñoz, J. L. (2023). Effects of Creatine Supplementation after 20 Minutes of Recovery in a Bench Press Exercise Protocol in Moderately Physically Trained Men. *Nutrients*, 15(3), 657. <https://doi.org/10.3390/nu15030657>
- Muxametovich, M. A. (2022). Athletics are a Tool for Education of a Healthy Generation. *Vital Annex: International Journal of Novel Research in Advanced Sciences*, 1(4), 9–13.
- Nasrulloh, A., Apriyanto, K. D., Yuniana, R., Dev, R. D. O., & Yudhistira, D. (2022). Developing Self Body Weight Training Methods to Improve Physical Fitness in the COVID-19 Era: Aiken Validity. *Journal of Hunan University Natural Sciences*, 49(6), 129–139. <https://doi.org/10.55463/ISSN.1674-2974.49.6.14>
- Nasrulloh, A., Deviana, P., Yuniana, R., & Pratama, K. W. (2021). The Effect of Squat Training and Leg Length in Increasing the Leg Power of Volleyball Extracurricular Participants. *Teoriâ Ta Metodika Fizičnogo Vihovannâ*, 21(3), 244–252. <https://doi.org/10.17309/TMFV.2021.3.08>
- Nasrulloh, A., Prasetyo, Y., Nugroho, S., Yuniana, R., & Wahyudin Pratama, K. (2022). The effect of weight training with compound set method on strength and endurance among archery athletes. *Journal of Physical Education and Sport* ® (JPES), 22(6), 1457–1463. <https://doi.org/10.7752/jpes.2022.06183>
- Nasrulloh, A., Yuniana, R., & Pratama, K. W. (2021). The effect of skipping combination with body weight training on cardiorespiratory endurance and body mass index (BMI) as a covid-19 prevention effort for overweight adolescents. *Jurnal Keolahragaan*, 9(2), 220–230. <https://doi.org/10.21831/JK.V9I2.41678>
- Pérez-Trejos, L. E., Gómez Salazar, L., Ortiz-Muñoz, D., & Arango-Hoyos, G.-P. (2022). Effect of a Virtual Reality Program to Improve Trunk Stability in Paralympic Shot Put and Javelin throwers. A case study. *Revista de Investigación e Innovación En Ciencias de La Salud*, 4(2), 34–48. <https://doi.org/10.46634/riics.135>
- Prabowo, B. Y. (2016). Pengaruh Latihan Bench Press dan Motivasi terhadap Kemampuan Tolak Peluru. *Jurnal Keolahragaan*, 4(2), 135–144. <https://doi.org/10.21831/jk.v4i2.10891>
- Prasetyo, Y., & Nasrulloh, A. (2017). Weight training with pyramid systems to increase the leg and back muscular strength, grip strength, pull, and push strength. *Man in India*, 97(24).
- Riemann, B. L., Johnson, W., Murphy, T., & Davies, G. J. (2018). A bilateral comparison of the



- underlying mechanics contributing to the seated single-arm shot-put functional performance test. *Journal of Athletic Training*, 53(10), 976–982. <https://doi.org/10.4085/1062-6050-388-17>
- Sakamoto, A., Kuroda, A., Sinclair, P. J., Naito, H., & Sakuma, K. (2018). The effectiveness of bench press training with or without throws on strength and shot put distance of competitive university athletes. *European Journal of Applied Physiology*, 118, 1821–1830. <https://doi.org/10.1007/s00421-018-3917-9>
- Sari, P. S., Putra, D. D., Iswana, B., & Okilanda, A. (2021). Pengaruh Latihan Incline Push Up Depth Jump terhadap Hasil Tolak Peluru Gaya Ortodox Siswa SMP Negeri 29 Palembang. *Jurnal MensSana*, 6(1), 75–83. <https://doi.org/10.24036/MensSana.06012021.22>
- Schofield, M., Cronin, J. B., Macadam, P., & Hébert-Losier, K. (2022). Rotational shot put: a phase analysis of current kinematic knowledge. *Sports Biomechanics*, 21(3), 278–296. <https://doi.org/10.1080/14763141.2019.1636130>
- Simons, E. E., & Bird, M. D. (2022). Coach-Athlete Relationship, Social Support, and Sport-Related Psychological Well-Being in National Collegiate Athletic Association Division I Student-Athletes. *Journal for the Study of Sports and Athletes in Education*, 1–20. <https://doi.org/10.1080/19357397.2022.2060703>
- Sobczyk, K., Grajek, M., Rozmiarek, M., & Sas-Nowosielski, K. (2022). Physical Activity Promotion at the Local Government Level Among the Local Community. *Journal of Education, Health and Sport*, 12(8), 170–178. <https://doi.org/10.12775/JEHS.2022.12.08.016>
- Stastny, P., Gołaś, A., Blazek, D., Maszczyk, A., Wilk, M., Pietraszewski, P., Petr, M., Uhlir, P., & Zajac, A. (2017). A Systematic Review of Surface Electromyography Analyses of the Bench Press Movement Task. *PloS One*, 12(2), e0171632. <https://doi.org/10.1371/journal.pone.0171632>
- Suganda, M. A., & Sumantri, R. J. (2022). The Relationship Between The Explosion Of Arm Muscles And Balance With Bullet Rejection Of Ortodok's Style. *International Conference on Science, Education, and Technology*, 8, 1237–1242.
- Sugiyono. (2017). *Metode Penelitian Kombinasi (Mixed Methods)*. Alfabeta, CV.
- Sukamto, A., Hakim, H., Dewi, R., & Sinaga, F. (2022). Effect of Bench Press Exercise and Triceps Strength Bullet Rejection Ability to be Reviewed from the Flexibility of the Togok to FIK UNM Makassar Students. *Kinestetik: Jurnal Ilmiah Pendidikan Jasmani*, 6(3), 543–552. <https://doi.org/10.33369/jk.v6i3.23719>
- Susanto, H. D. J., Kesumawati, S. A., Hardiyono, B., & Sukmawati, N. (2022). Development of Athletic Learning Model Based on Traditional Games in Class IV Students Primary School (SD). *Kinestetik: Jurnal Ilmiah Pendidikan Jasmani*, 6(3), 594–599. <https://doi.org/10.33369/jk.v6i3.23893>
- Thaqi, A., Berisha, M., & Asllani, I. (2021). The effect of plyometric training on performance levels of the shot put technique and its related motor abilities. *Pedagogy of Physical Culture and Sports*, 25(3), 144–151.
- Yuniana, R., Tomoliyus, Kushartanti, B. M. W., Nasrulloh, A., Pratama, K. W., Rosly, M. M., Karakauki, M., & Ali, S. K. S. (2023). The Effectiveness of the Weight Training Method and Rest Interval on VO<sub>2</sub> max, Flexibility, Muscle Strength, Muscular Endurance, and Fat Percentage in Students. *International Journal of Human Movement and Sports Sciences*, 11(1), 213–223. <https://doi.org/10.13189/SAJ.2023.110125>
- Zhang, X., & Alahmadi, D. (2021). Study on the Maximum Value of Flight Distance Based on the Fractional Differential Equation for Calculating the Best Path of Shot Put. *Applied Mathematics and Nonlinear Sciences*, 7(2), 151–162. <https://doi.org/10.2478/amns.2021.2.00136>