



## The Effect of Plyometric Training Knee Tuck Jump and Jump To Box on the Jump Height of Volleyball Athletes

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### Abstract

The purpose of this study was to determine the effect of plyometric knee tuck jump and Jump to box training on the jump height of volleyball athletes. This study uses an experimental method with a two group pretest posttest design. The population in this study were 35 PBV.Kapila Tanjungpinang male volleyball athletes using probability sampling technique in determining the number of samples so that a sample of 30 people was obtained. The instrument in this study used the vertical jump test. The data analysis technique uses a hypothesis test (t-test) to determine the difference in the effect of pretest and posttest. The results of the study showed the knee tuck jump training group on jump height has a significant effect ( $P < 0.05$ ). This can be proven that the average value of the post test is higher than the average value of the pre-test or ( $\mu A1 37.20 < \mu A2 45.87$ ) with a difference of 8.65. 2) In the jump to box training group on jump height has a significant effect ( $P < 0.05$ ). the average value of the post test is higher than the average value of the pre-test or ( $\mu A1 35.20 < \mu A2 55.87$ ) with a difference of 20.67. 3). In the knee tuck jump and jump to box training groups on jump height there is a significant difference in influence ( $P < 0.05$ ). the average value of the post test of the jump to box training group obtained an average value of 55.87 is greater than the average value of the knee tuck jump training group 45.87 ( $\mu B2 55.87 \geq \mu A2 45.87$ ) with a difference of 10. Based on the research findings, it can be concluded that knee tuck jump training and jump to box training, have a significant and positive effect on leg muscle strength in PBV.Kapila Tanjungpinang volleyball athletes. Although both show a significant positive effect, jump to box training is more effective in increasing leg muscle strength compared to knee tuck jump training.

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## INTRODUCTION

Exercise is one of the physical and psychological activities of a person that is useful for maintaining and improving the quality of that person's health. Raharjo, et al. (2018) Explains that personality determinants of sports achievement are reliable for individuals who can help customize certain types of sports. Sports as a physical or physical activity can have a positive influence on the perpetrator as an individual need. Irawan, et al. (2020) said that health is an absolute necessity for everyone to get health, humans are willing to do physical activity and exercise to achieve the desired goals. As for busyness or laziness, sometimes exercise is often neglected and even forgotten, even though if you exercise regularly, attacks from various diseases will be avoided. Achmad & Yuwono (2021) said that the purpose of exercising is to just fill time, recreation, health, fitness or achievement in the name of the nation. The stamina of someone who likes to exercise regularly will be different from someone who rarely or never does sports. Irawan, et al. (2019) Explains that sport is a unifying medium for the nation because sports activities are an important part that can improve the quality of human life. Setiawan, et al. (2017) Saying sports can contribute real inspiration and valuable pro-vide for the welfare and survival of humans from physical, spiritual and social aspects. Sport is a necessity for every individual in an effort to improve physical conditions in life. Sports are very beneficial for human life, because sports can improve health opening character and individuality, discipline and high specificity, and increased achievement can increase the nation's self-esteem (Nopiyanti, Y. E., & Raibowow 2019). In addition to physical health, sports can also be used to form individuals who are

physically, spiritually and emotionally healthy in order to create quality humans. Latif, et al. (2023) Argued that public awareness to exercise contributes to the development of individuals and communities that are smart, healthy, skilled, resilient, competitive, prosperous, and dignified. Sport is a benefit for each person to improve conditions in everyday life.

Sports are not only useful for a person's physical activity to improve and maintain one's body fitness, but sports are also a way to achieve achievements that can boast of a sport that athletes pursue. Abidin & Yuwono (2021) Explains that sports achievement is a sporting activity and is managed professionally with the aim of obtaining optimal performance in sports. Irawan & Prasetyo (2019) argue that sports are physical or psychological activities that are useful for maintaining and improving the quality of a person, one of the goals of sports is achievement. Various sports achievements, volleyball is one of the sports that is very popular and is in great demand by the people in Indonesia. Bakar, et al. (2019) Presenting volleyball as a team game basic techniques are indispensable. There are four basic techniques in volleyball games, namely 1) basic service techniques, 2) basic passing techniques, 3) basic smash techniques and 4) basic block techniques. Volleyball games are played on outdoor and indoor courts in sports halls. Volleyball games are played by touching the body a maximum of 3 times with each team of one person touching the ball once and crossing it through a net that is installed across the middle of the field. Volleyball is a sport played by two teams, each team consisting of six players. Asdi & Rifki (2020) stated that volleyball sports can be practiced by teenage children to adults, both men and women. The more the existence of this volleyball sports party, there are many benefits for

adolescents in growth, both physical, mental and social (Abrian & Nasuka, 2021).

According to Kusuma, et al. (2015) physical fitness consists of muscle strength, respiratory muscle endurance blood circulation, and flexibility. To achieve the target of achievement in volleyball games, good physical condition is always considered. Mapato, et al. (2018) Said the most important physical variety of sports such as volleyball is a very popular form of sport. Aryadi (2022) explains the physical condition of an athlete to carry out a load that makes work. According to Subarjah (2013) physical condition is a very important element in athletes in all branches. An athlete in good condition can be said to be able to do without training fatigue. In physical condition there are component elements, namely strength, speed, endurance, agility, accuracy, flexibility, muscular power, balance, and coordination. Irawan & Sandiyudha (2018) say the physical component is a requirement to know someone is in a fit state, some of these components are used for physical skill tests both in the academic and non-academic fields. To improve these athletes, the physical condition factor in training is very important to achieve an athlete's condition. Fauzi & Raharjo (2023) Explains that sport is now a part of human activity developing with different realized goals. The lack of adequate prepared physical conditions to achieve the targeted achievements will be difficult. Physical condition aims to improve the functional quality of the body's organs that the needs and demands of the targets that must be achieved by a branch. For volleyball games it is very important to master the techniques and physical conditions that must be possessed by volleyball game athletes.

According to Nasuka & Priambodo (2017) volleyball games have basic movement skills in

volleyball games, namely vertical jump, spike jump reach and block jump reach. In a volleyball game, jumping is one of the techniques that is very important to master to become an athlete who has the technical ability to play volleyball. Nasuka & Pradana (2019) argue that smash and block are characteristic movements in volleyball games. In carrying out attacks using smash athletes need a very high jumping ability so that the ball can be reached and so is the block. Improving the ability to smash athletes requires physical condition components such as leg muscles and flexibility. In a good volleyball game is the ability to perform attacks that produce points by dropping the ball into the opponent's field. From good physical conditions in basic techniques in volleyball games is very important to improve the ability of athletes. In volleyball games, efforts and efforts to improve the quality of Physical with a program that has been prepared by the coach (Dawi, Soegiyanto, & Irawan, 2020). Sports training and development are directed towards achievement at regional, national and international levels. With serious training to improve the ability of both jumps and flexibility in athletes who are trained need high discipline planned programs. Nasuka (2020) Explains that volleyball games require high jumps, strength, agility, flexibility and speed to develop attack and defense.

According to AAP Karo-karo, LP Sari (2020) Leg muscle power is the ability of the lower limbs which aims the leg muscles in overcoming the ability to do weight training with full strength and in the shortest time. The higher the leg muscle power, the higher the jump to attack smash and the easier it is to carry out attacks that direct to the opponent's field. Leg muscle power in a volleyball game helps skills in blocking and attacking smash. Meanwhile,

according to Ridwan & Sumanto (2018), flexibility is the ability of the joints or wrists for optimal movements. The better the flexibility of an athlete, the greater the angle of direction of movement in performing skills in volleyball games. A programmed training program through training, athletes can improve physical condition abilities such as flexibility and leg muscle power to increase progress. Plyometric training used for physical conditions such as leg muscle power and flexibility is knee tuck jump and jump to box training.

Increase jumps for athlete leg muscle power in volleyball games in Plyometric exercises that are of great interest to coaches. According to Donald A. Chu, PhD Gregory D. Myer, (2013) in Puspita (2020) Explaining Plyometric exercises are very popular exercises used by coaches for athlete performance. The types of exercises that are programmed are exercises such as Knee Tuck Jump and Jump To Box. This exercise is very good for doing exercises for leg power, the exercise is a series of fast explosive jumps.

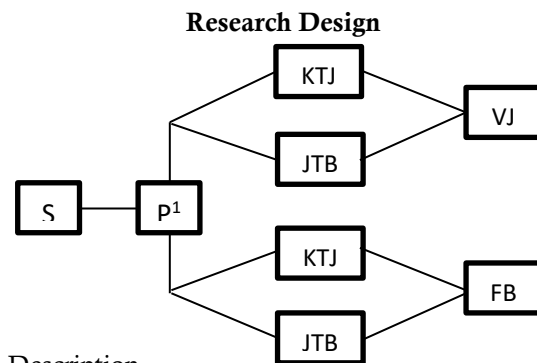
Sports achievement is the highest achievement of an athlete and coach in a sport that is practiced. According to Irawan, et al. (2023) one way to improve performance is to always practice with the correct technique or movement and have maximum results in volleyball games. Sports achievements also have benefits for someone such as self-confidence, to achieve achievement targets in sports requires high and consistent discipline and good sports management and maximum coaching. Andriani, et al. (2019) Explains that the pretation coaching system must be well organized so that it is appropriate and on target to the realm of achievement. Plyometric exercise is one of the sports exercises for muscle strength and explosive power, to improve sports performance requires a

training process. Techniques in volleyball games really require jumps that require explosive power (Perikles, Mintarto, & Hasan, 2016).

The purpose of this study was conducted to determine the effect of plyometric knee tuck jump and Jump to box training on the jump height of volleyball athletes.

**METHODS**

This study uses an experimental method with a two group pre-test post-test design. The population in this study were 35 male volleyball athletes PBV.Kapila Tanjungpinang using probability sampling technique in determining the number of samples so that a sample of 30 people was obtained. The instruments in this study used vertical jump and sit and reach tests. The data analysis technique uses hypothesis testing (t-test) to determine the difference in the effect of pretest and post test.



- Description
- S = Subject
  - P1 = Pre-test
  - KTJ = Kne Tuck Jump
  - JTB = Jump To Box
  - VJ = Post Test Vertical Jump
  - FB = Post Test Flexibility

**RESULT AND DISCUSSION**

The implementation of this study, from 30 subjects of PBV.KapilaTanjungpinang athletes were divided into 2 groups, namely the first group of 15 athletes doing training with the knee tuck jump method and 15 athletes doing training with the jump to box method. In this study, 3 stages of the test were carried out, the first was to conduct

an initial test (pretest) which had the aim of finding the subject's initial data, the second was that athletes were given treatment or training treatment with the knee tuck jump and jump to box methods, and the third was the final test (posttest) to find out the aim of finding the final data after the PBV. Kapila Tanjungpinang subject was given Plyometric exercise treatment for the first group of knee tuck jump exercises and the second group of jump to box exercises for 14 meetings. The results are as follows:

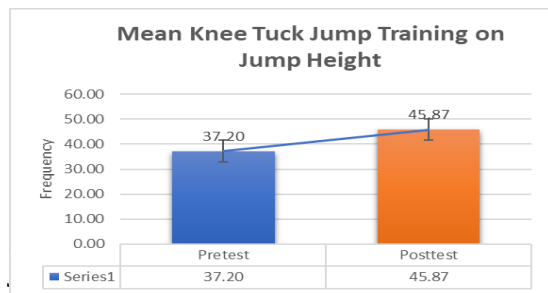
**1. Effect of Plyometric Training knee tuck jump on jump height.**

The average results and standard deviation of the effect of knee tuck jump training on jump height with 15 subjects. The results of the pre-test and post-test research are presented in the following table:

**Table 1. Descriptive Data of Knee Tuck Jump on Jump Height**

N= 15	Mean±Sd	Min	Max
Pre-test	37.20±1.568	35	40
Post Test	45.87±3.226	42	52

Based on table 1 above, it shows that the knee tuck jump exercise on jump height before being given the pre-test treatment has a mean value of 37.20 with a standard deviation of 1.568, a minimum value of 35 and a maximum value of 40. After being given the treatment, get a post test mean value of 45.87 with a standard deviation of 3.226, a minimum value of 42 and a maximum value of 52. For more details, it can also be seen in the histogram displayed below:



The data above shows the pretest and posttest comparison values on knee tuck jump training on jump height.

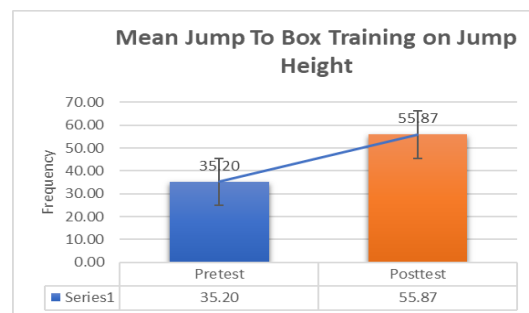
**2. Effect of Plyometric Jump To Box Training on Jump Height.**

The average results and standard deviation of the effect of jump to box training on jump height with 15 subjects. The research results of the initial test (pre-test) and the test are presented in the following table:

**Table 2. Descriptive Data Jump To Box Against Jump Height**

N= 15	Mean±Sd	Min	Max
Pre-test	35.20±2.808	30	40
Post test	55.87±6.532	46	72

Based on table 3 above, it shows that the jump to box exercise on jump height before being given the Pres test treatment has a mean value of 33.20 with a standard deviation of 2.808, a minimum value of 30 and a maximum value of 40. After being given the treatment, get the final test posttest mean value of 55.87 with a standard deviation of 6.532, a minimum value of 46 and a maximum value of 72. For more details, it can also be seen in the histogram displayed below:



**Figure 2. diagram of the effect of jump to box training.**

The data above shows the pretest and posttest comparison values on jump to box training on jump height.

### 3. Differences in the Effect of Plyometric Training Knee Tuck Jump and Jump To Box on Jump Height.

The average and standard deviation results of the comparison of the differences in the effect of knee tuck jump and jump to box training on jump height with 30 subjects, the results of the pre-test and post-test research are presented in the following table:

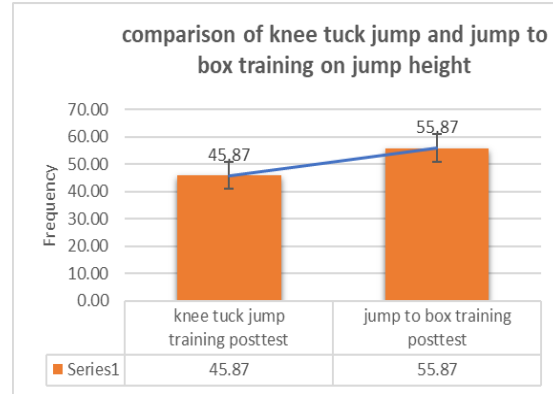
**Table 3. Results of Descriptive Data Analysis of Knee Tuck Jump and Jump To Box Data on Jump Height.**

Knee Tuck Jump Training on Jump Height			
N= 15	Mean±Sd	Min	Max
Pre-test	37.20±1.568	35	40
Post Test	45.87±3.226	42	52

Jump To Box Training on Jump Height			
N= 15	Mean±Sd	Min	Max
PrenTest	35.20±2.808	30	40
Post Test	55.87±6.532	46	72

From the results of descriptive analysis data in table 3, the difference in the effect of knee tuck jump training groups and jump to box training groups on jump height in PBV.Kapila Tanjungpinang athletes can be proven by looking at the pre-test of the jump to box training group obtained an average value of 55.87 greater than the average post test of the knee tuck jump training group 45.87 ( $\mu_{B2} 55.87 \geq \mu_{A2} 45.87$ ). With these results showing the difference in average values that have a difference in value of 10 after the final test (posttest) the jump to box exercise group is better than the knee tuck jump group for jump height. After that, to find out the difference in the effect of knee tuck jump and jump to box training on jump height. For more details, it can also be seen in the histogram displayed between the posttest comparison of knee tuck jump and jump to box exercises on jump height below:



**Figure 3. Comparison diagram of knee tuck jump and jump to box exercises on jump height.**

The data above shows the comparative value between the knee tuck jump posttest and the jump to box posttest on jump height.

### DISCUSSION

Plyometrics are exercises that shorten the cycle and produce more energy. exercises in which the muscles direct maximum strength and short time intervals, with the aim of increasing speed and strength. Plyometric exercise is a type of explosive strength training that is characterized by very fast muscle contractions, that is, the muscles always contract both when extending (eccentric) and when shortening (concentric) in a fast time, so that during muscle training there is no relaxation time (Muehlbauer et al., 2019). When doing knee tuck jump training has its own rules, the movement of knee tuck jump training emphasizes the maximum height that is carried out by rejecting the legs up simultaneously quickly, especially the flexors and extensors of the thighs and hips involving muscles such as sartorius, iliacus, gracilis, bicep femoris, semitendinosus, semimembranosus, glutues maximus, and gluteus medius. This repetitive jumping movement will provide contractions in the human leg muscles (Frontera & Ochala, 2014).

In Mulyana (2019) states that in Plyometric exercises with the knee tuck jump method the

pressure experienced by the leg muscles is not too great because they only jump in place. When looking at the movement, knee tuck jump training emphasizes maximum jumping while execution speed is a secondary factor and horizontal distance is not taken into account when jumping. So to get explosive or explosive results or get the power of the leg muscles must use high intensity so as to get power and speed simultaneously in one movement (Utama, Winaya, Dinata, & Sugiritama, 2019). With this, Plyometric training with the knee tuck jump method is more effective in increasing flexibility, while Plyometric training with the jump to box method is more effective in increasing jump height. The limitations in this study are as follows, Erratic weather caused the training to be postponed because the field used for treatment is out door so reschedule the delayed training. The implementation of the treatment of all samples was not collected or left behind, so there was no control over the activities carried out by the samples outside of training, instead the samples stayed at their respective homes, which could indirectly affect the results of the study. The researcher did not control further when the research was completed, so these results were obtained temporarily, this exercise needs to be routinely carried out.

Based on the research findings, it can be concluded that plyometric exercises, knee tuck jump training groups and jump to box training, have a significant and positive effect on leg muscle strength in PBV.Kapila Tanjungpinang volleyball athletes. Although both showed significant positive effects, jump to box training was more effective in increasing leg muscle strength compared to knee tuck jump training.

Based on the results and data analysis in table 1, we can see that there is an effect of knee

tuck jump training on jump height significantly in the initial test and final test after treatment is given with the results of the P value ( $0.000 < 0.05$ ). So with this, the knee tuck jump exercise on jump height has an effect on jump height for volleyball athletes significantly. In this data, the initial test is obtained with an average of  $\pm 32.20$  cm and the final test gets an average of  $\pm 45.87$  cm. This is in line with previous research conducted by Rahmad, Ramadi, & Juita (2015) with a study entitled "The Effect of Knee-Tuck Jump Training on Explosive Power of Limb Muscles in the Pendor Putra Volleyball Team". In knee tuck jump training can increase explosive power of leg muscles with the results of the study showing that this exercise increases leg muscle strength and quick reaction ability. In this research exercise program, the first meeting was 3 sets of 10 repetitions with a rest time of 1 minute with the next meeting, both repetitions and sets increased and also the results of data analysis in table 2 can be seen that there is an effect of jump to box training on jump height significantly in the initial test and final test after being given treatment obtained with the results of the P value ( $0.000 < 0.05$ ). So with this, the jump to box exercise on jump height has an effect on jump height for volleyball athletes significantly. In this data, the initial test is obtained with an average of 35.20 and the final test gets an average of 55.87. This is in line with previous research conducted by dos Santos et al (2023) with a study entitled "Influence of Box Height on Inter-Limb Asymmetry and Box Jump Performance". With jump to box training on jump height in athletes significantly increases athlete performance. This study focuses more on the effect of box height used in box jump training. The results show that variations in box height can affect how well a

person can balance the use of both limbs and overall jump performance.

Research shows that between Plyometric exercises between knee tuck jump and jump to box methods on jump height have the influence of each method. However, jump to box Plyometric training has a better effect than knee tuck jump Plyometric training.

## CONCLUSION

Based on the results of the study, it can be concluded that knee tuck jump training and jump to box training have a significant and positive influence on leg muscle strength in PBV Kapila Tanjungpinang volleyball athletes. Although both show a significant positive effect, jump to box training is more effective in increasing leg muscle strength compared to knee tuck jump training. Jump to box training involves explosiveness of the leg muscles, as well as good coordination between various muscle groups of the body, all of which are important for increasing strength and speed and also jumping. Performing jump to box drills consistently will result in more significant improvements in jumping ability directly because the drills simulate movements that are more similar to actual jumps, allowing the relevant muscles to be trained more specifically to jump greater heights.

## REFERENCES

- AAP Karo-karo, LP Sari, R. D. (2020). The effect of plyometric training on leg muscle power, 75–83.
- Abidin, K. Z., & Yuwono, C. (2021). Development of National Paralympic Committee of Indonesia Paracycling Athletes in Surakarta. *Indonesian Journal for Physical Education and Sport*, 2(1), 130–136.
- Abrian, A. R., & Nasuka. (2021). The Effect of One Leg Jump and Lateral Jump Over Barrier Training on Limb Muscle Power Volleyball Smash Ability. *Unnes Journal of Sport Sciences*, 5(2), 70–75.
- Achmad, R. F., & Yuwono, C. (2021). Coaching Patterns of Satria Kencana Serasi Football Academy in Semarang Regency, 2(1), 65–71.
- Andriani, A., Nasuka, & Irawan, F. A. (2019). Coaching Evaluation for Women ' s Volleyball Sports Year 2018 Semarang City, 8(1), 11–18.
- Aryadi, M. D. (2022). physical condition of men's volleyball athletes in the arthro transportation of pekanbaru city, 2003–2005.
- Asdi, F., & Rifki, M. S. (2020). The Effect of Limb Muscle Explosive Power, Hand Eye Coordination and Concentration on Bolavoli Block Ability. *Sporta Saintika*, 5(2), 176–190. <https://doi.org/10.24036/sporta.v5i2.142>
- Bakar, A., Nasuka, & Santosa, I. (2019). the effect of plyometric training and leg length on smash of volleyball UKM Tadulako University. *Journal of Sport Coaching and Physical Education*, 4(79), 66–74.
- Dawi, F. K., Soegiyanto, & Irawan, F. A. (2020). The Coaching Management of Boxing Achievement in PERTINA East Nusa Tenggara Province, 9(3), 226–232.
- Donald A. Chu, PhD Gregory D. Myer, P. (2013). *Plyometrics*. Amerika: Amerika: Human Kinetics.
- dos Santos, M. L., Berton, R., Shields, J. C., Bishop, C., Dinyer-McNeely, T., Anderson, O., & Dawes, J. (2023). Influence of Box Height on Inter-Limb Asymmetry and Box Jump Performance. *Symmetry*, 15(7). <https://doi.org/10.3390/sym15071359>
- Fauzi, M., & Raharjo, H. P. (2023). Badminton Club Development in Blora Regency. *Indonesian Journal for Physical Education and Sport*, 4(2), 443–450. <https://doi.org/10.15294/inapes.v4i2.52769>
- Frontera, W. R., & Ochala, J. (2014). Skeletal Muscle : A Brief Review of Structure and Function, (November). <https://doi.org/10.1007/s00223-014-9915-y>
- Irawan, F. A., Nurrahmad, L., & Pernama, D. F. W. (2020). The Association of Arch Height Index and Arcus Pedis on Agility: An Overview of Sport Science College Students. *International Journal of Innovation, Creativity and Change*, 14(11), 669–676.
- Irawan, F. A., Pernama, D. F. W., Akromawati, H. R., & Yang-Tian, H. (2019). Biomechanical Analysis of Concentration and Coordination on The Accuracy in Petanque Shooting, 8(2), 96–100.



- Irawan, F. A., Pernama, D. F. W., Hadi, & Romandhoni, S. (2023). Kinematics Analysis of Volleyball Open Spike in the Elite Athletes, (2009). <https://doi.org/10.4108/eai.29-6-2022.2326123>
- Irawan, F. A., & Prasetyo, F. E. (2019). Sport Infrastructure for Physical Education in Senior High School, (3), 66–70.
- Irawan, F. A., & Sandiyudha, T. B. (2018). Development of Push-Up Counting Tool as an Alternative Physical Fitness Device. Development of Push-Up Counting Tool as an Alternative Physical Fitness Device, 8(1), 26–30.
- Kusuma, D. W. Y., Raharjo, H. P., & Taathadi, M. S. (2015). Introducing a New Agility Test in Badminton. *American Journal of Sports Science*, 3(1), 18. <https://doi.org/10.11648/j.ajss.20150301.14>
- Latif, A. A., Rahayu, S., & Raharjo, H. P. (2023). Sport Development Index Analysis of Sukoharjo Regency, 12(2), 59–65.
- Mapato, M. S. D., Nasuka, & Soeyoto, T. (2018). The Effect of Leg Length Plyometric Exercise on Increasing Volleyball Jump Power at Public Senior High School 1 Parigi Motong, 7(3), 274–279.
- Muehlbauer, T., Wagner, V., Brueckner, D., Schedler, S., Schwiertz, G., Kiss, R., & Hagen, M. (2019). Effects of a blocked versus an alternated sequence of balance and plyometric training on physical performance in youth soccer players. *BMC Sports Science, Medicine and Rehabilitation*, 3–9, 1–10. <https://doi.org/doi.org/10.1186/s13102-019-0131-y>
- Mulyana, D. (2019). Comparison of the Effect of Knee Tuck Jump Training with Barrier Hops on Increasing leg muscle power. *Sport, Physical Education, Organization, Recreation, Training*, 3(1).
- Nasuka, N. (2020). The Anthropometric Profile and Motor Skill of Men Elite Volleyball Players, 21(Icsshpe 2019), 34–37.
- Nasuka, N., & Pradana, A. W. (2019). Squat Jump Exercise Increased Spike Jump and Block Jump Reach of Junior Volleyball Athletes. *KnE Social Sciences*, 2019, 422–426. <https://doi.org/10.18502/kss.v3i18.4733>
- Nasuka, & Priambodo, E. N. (2017). Relationship between Arm Length and Limb Length with Vertical Jump, Spike Jump Reach and Block Jump Reach of Teenage Boys, 7.
- Nopiyantri, Y. E., & Raibowow, S. (2019). Philosophy of Physical Education & Sport. Bengkulu: Bengkulu: Zara Abadi.
- Perikles, E. Y., Mintarto, E., & Hasan, N. (2016). The Effect of Jump To Box, Front Box Jump, and Depth Jump Exercises on Increasing Explosive Power of the Limb Muscles and Speed. *Media Ilmu Keolahragaan Indonesia*, 6(1), 8–14.
- Puspita, P. A. (2020). Effectiveness of Plyometric Training in Increasing Power. *Universitas Negeri Malang*, 93–101.
- Raharjo, H. P., Kusuma, D. W. Y., & Hartono, M. (2018). Personality Characteristics in Individual and Team Sports, 12(Isphe), 92–95.
- Rahmad, S., Ramadi, & Juita, A. (2015). The Effect of Knee-Tuck Jump Training on Explosive Power of Limb Muscles in the Pendor Men's Volleyball Team. *Doctoral Dissertation, Riau University*, 1–9.
- Ridwan, M., & Sumanto, A. (2018). Contribution of leg muscle explosive power, speed and flexibility with long jump ability. *Journal of Sports Performance*, 2(01), 69–81.
- Setiawan, I., Purnomo, E. P., Yuwono, C., & Dharmawan, D. B. (2017). Identification of Open Space Area Sport in Universitas Negeri Semarang, 6(2), 133–139.
- Subarjah, H. (2013). *Physical Condition Training. Educacion* (Vol. 53). Depok :kecana.
- Utama, A. A. G. E. S., Winaya, I. M. N., Dinata, I. M. K., & Sugiritama, I. W. (2019). The addition of Contract Relax Stretching of the Thigh Muscle and Slump Stretch after knee tuck jump training is Effective in Increasing Leg Muscle Explosive Power in Physiotearaoi Soccer Players FK UNUD. *FK UNUD. Jurnal Fisioterapi Indonesia*, 5(31–44.), 31–44.