Jurnal SPORTIF: Jurnal Penelitian Pembelajaran
Vol. 8 No. 1, April 2022, pp. 131-144
https://doi.org/10.29407/js_unpgri.v8i1.17810

Effect of plyometric exercises on limb muscle power in volleyball players

Novita[1abc], Putra Oka Harahap[2ade], Ramlan Sahputera Sagala[3def], Ahmad Muchlisin Natas Pasaribu[4ef]

[1,2]Sports Coaching Education, Faculty of Sports Science, Universitas Negeri Medan, Willem Iskandar Street Psr.V 1589, Medan, Indonesia

[3]Physical Education health and recreation, Faculty of Teacher Training and Education, Universitas Pembinaan Masyarakat Indonesia, Integrated Campus Balai Desa Marindal Street II Medan, Indonesia

[4]Sports Coaching Education, Faculty of Education, Universitas Bhayangkara, Greater Jakarta. Harsono RM Street No.67, Ragunan, Pasar Minggu, South Jakarta City, Jakarta 12550, Indonesia

Authors contribution: a – Preparing concepts; b – Formulating methods; c – Conducting research; d – Processing results; e – Interpretation and conclusions; f - Editing the final version

Received: 28 March 2022; Revised: 23 April 2022; Accepted: 27 April 2022

Abstract

The necessity of power in volleyball is to support the game's technique. Volleyball players' leg muscles must be strong enough to sustain techniques like smashes, blocks, and serves. Proper workouts, such as plyometric exercises, should reinforce the importance of muscular leg power. This study aims to determine the impact of plyometric side-to-side box shuffle and leap to box exercises on leg muscle power and determine which workouts are more successful in developing volleyball participants' limb muscular explosiveness. This is an experimental study with a "Two Groups Prettest Posttest Design" as the research design. The sample size for this study was up to 30 female athletes, with Purposive Sampling being employed as the sampling strategy. The samples were randomly split into two groups. The vertical leap test was utilized to determine the strength of the limb muscles in this research. Normality tests, homogeneity tests, and t-tests are used in data analysis. The results revealed a sig value of 0.918, indicating a difference in enhancing muscular leg strength in footballers between side-to-side box shuffle and leap to box workouts. Jump to box training improves muscular leg strength more than side-to-side box shuffle training, with a ratio of rises of 22.00 percent and 16.73 percent, respectively.

Keywords: pliometric, power, leg muscles, volleyball

INTRODUCTION

Every sports player in diverse sports needs the power component of the limbs. In sports, explosive power refers to a muscle's capacity to direct maximal strength in a brief period of time. Further disclosed physical condition components such as limb power are essential aspects that any

Correspondence author: Novita, Universitas Negeri Medan, Indonesia.
Email: noviade@unimed.ac.id

athlete dominating with strength and speed must consider. Afif & Nasrullah, (2016) emphasized that leg power is required in athletes because methods must be performed in the power support, such as volleyball players who need arm power to conduct serve and smash techniques and leg muscle strength to do block techniques.

The capacity of muscles to direct their full strength in a short period of time is referred to as power. As previously said, power is critical in the game of volleyball. (Sugito, Allsabah, & Putra, 2020) That power is the utmost strength required by athletes while competing. The capacity of a muscle or set of muscles to overcome a load resistance at a fast rate of speed in a single movement is referred to as explosive power (Williams, 2020). Thus, explosive power refers to a muscle's capacity to endure weights at a high rate of speed in a single full movement (Bompa & Buzzichelli, 2019).

Muscle explosiveness is a component of physical condition that practically every sport demands (Jaya & Rohmat, 2019). Explosive power is employed in sports practice for explosive motions such as throwing, resisting, kicking, and striking. Power is not a new concept in sports, as practically all sports require it. Currently, any sport requiring a high level of skill is conducted using advanced instruments via circuit training facilities. However, in terms of enhanced power, greater strength and speed training must come first, as power may be produced through strength and speed training outcomes when applying maximum force to defeat convicts. (Putra, Kiyatno, & Siswandari, 2017) The physical condition of a player is the most critical component in determining their success in volleyball. Volleyball is a sport that demands a player to understand the methods used on the court, particularly while attacking and defending. (Khalid & Rustiawan, 2020; Toho Cholik Mutohir dan Muhammad Muhyi FaruqVoli, 2012). Additionally, physical condition elements such as power, muscle strength, and agility are aided by volleyball abilities.

Muscle explosiveness is a contributing component since it results in a feat of forceful and lethal strikes. Muscular explosive power results from

a multiplication of muscle strength and a person's speed. Thus, a volleyball athlete should possess strength and quickness (Indrayana, 2018). Additionally, the fundamental physical aspects of strength, speed, and explosive power of the limbs (power) and coordination of the game's basic methods must be encouraged and developed. Leg muscular power is one of the components that volleyball athletes must possess. The biomotor component of limb power is critical in volleyball. With athletes' advancing ages, the biomotor component of limb power must be developed gradually and continually since the parts of this biomotor component will deteriorate with age (Henwood, Riek, & Taaffe, 2008). In volleyball, the biomotor components of limb power are required to jump, both to attack (smash) and defend (block). It will be difficult for athletes who lack limb power to perform explosive motions in a short period of time (Sim, Byun, & Yoo, 2015).

Plyometric workouts are the most effective in increasing muscular power capabilities. In agreement with this (Husein & Nurkholis, 2018), Plyometric Exercises, he stated, may significantly boost one's power or endurance abilities. According to this study, the power capability of athletes' limbs may be significantly increased when plyometric training is performed using a variety of different approaches. Additionally, there is an improvement in athletes trained to utilize the side-to-side box shuffle to generate limb power (Kholil Halbatullah., Budaya Astra., 2019). Additionally, leaping to box exercises is believed that it can strengthen the physical ability of trained athletes' leg muscle power (Jaya & Rohmat, 2019). Thoiban & Tohidin, (2019) indicated that to increase the strength of the limbs, a plyometric workout regimen is expected to be used. Further explanation of workout techniques demonstrates a difference in results between those who receive therapy and those who do not receive treatment for limb power capacity (Bompa & Haff, 2009). This study took several types of plyometric methods that researchers or trainers less notice in performing plyometric exercises, this study uses jump to box groups that can increase power, research (Akhmad & Hasibuan, 2020)

states jump to box is a technique that can increase the strength of the limb muscles that can be seen from the characteristics of the exercise.

In terms of limb power, which is one of the components that volleyball players must possess, the issue discovered by the skin during observations is not maximum or still falls within the group of volleyball athletes with poor power capacity at Johar VC Deli Serdang. The importance of power in the physical component in women volleyball athletes used in their activities in volleyball to support their skills. Power in volleyball is used for a variety of techniques such as service and smash. Furthermore, research (Husein, M, Akbar, 2020) explains that the ability of power in athletes is very important because power is a component that every volleyball athlete must own. Thus, the author wishes to research how plyometric activities including the side-to-side box shuffle and leap to box models, may help Deli Serdang of Johor VC volleyball increase her limb strength.

METHOD

The study employed a quasi-experimental design with two groups receiving distinct treatments. According to (Haqiyah & Riyadi, 2018), an experimental study is conducted to ascertain whether a person is influenced by something. The design utilized is a two-group pretest-posttest design (Arikunto, 2010) a pretest-posttest design involving two groups is a study done on two comparison groups.

The research population consists of all athletes from Johor VC Deli Serdang Volleyball. Simple random sampling with inclusion and exclusion criteria was utilized as the sampling strategy. Female athletes aged at least 15 years and up to 25 years are eligible. They do not have any active athletes or those who are currently injured and do not engage in any other training programs. According to the technique, a total sample of 30 female volleyball athletes was employed. This study employed plyometrics side-to-side box shuffle and jump to box activities trained for 16 sessions, with an initial test to determine the leg muscle strength and a final test following

the treatment for around two months. In this study, the variable bound (dependent) is the power limbs of Johor VC volleyball athlete Deli Serdang. Data collection is accomplished by the administration of a vertical leap test, which generates research data that will be analyzed to evaluate hypotheses. Prior to hypothesis testing, the prerequisites of the distribution normality analysis are met. After the analytical conditions are satisfied, a hypothesis test using a different mean analysis approach is conducted (test t).

Research Prosedur

The research procedure used plyometric exercise methods to increase leg muscle strength in the study subjects of the female sex. The course of the research conducted initial tests to determine the power of the limb muscles using vertical jumps. After conducting the initial test, the study subjects in random divided to be given treatment into research treatment groups. Furthermore, after being given treatment for 16 research meetings, continued to post-test to find out the improvement of the treatment results.

RESULT

The average, standard deviations, and variance acquired from the results of exercise tests (treatment) provided to each group, namely the group that receives side-to-side box shuffle exercises and the group that receives leap to box exercises, are discussed in the data description. The test results will then be recorded and computed according to the group and form of exercise used. The results of the two groups will be examined using these data (side-to-side box shuffle group and jump to box group). For windows, analysis is performed using spss 25.0 calculations. Then the following table might be used to expound on the data from the study's findings:

ISSN : 2477-3379 (Online)
ISSN : 2548-7833 (Print)

Table 1. Pretest data description of the exercise group side-to-side box shuffle

A	N	Mean	SD	Variance
Pretest	15	30,27	9,41	88,50

Table 1 above can be described from the average value of the leg muscle power test using a vertical jump test before being treated in the form of side-to-side box shuffle (pretest) exercises of 30.37; with a variant value of 88.50; Standard deviation 9.41.

Table 2. Pretest data description of the Jump to box Exercise group

B	N	Mean	SD	Variance
Pretest	15	27,27	9,21	84,78

Table 2 above can be described from the average value of the leg muscle power test using a vertical jump test before being treated in the form of jump to box (pretest) exercises of 27.27, with a variant value of 84.78; Standard deviation of 9.21.

Table 3. Posttest data description of the exercise group side-to-side box shuffle

A	N	Mean	SD	Variance
Pretest	15	47	11,69	136,57

Table 3 above can be described from the average value of the leg muscle power test using a vertical jump test after being treated in the form of side-to-side box shuffle (posttest) exercises of 47, with a variant value of 136.57; Standard deviation 11.69.

Table 4. Posttest data description of the Jump to box exercise group

B	N	Mean	SD	Variance
Pretest	15	49,27	7,46	55,64

According to table 4, the average value of the leg muscle power test results obtained using vertical jump tests following treatment with leap to box (posttest) exercises is 49.27, with a variant value of 55.64; and a standard deviation of 7.46.

As a result, it is possible to deduce that the test results of the two treatment groups differ (side-to-side box shuffle and jump to box groups). This is demonstrated by the fact that the average post-test result for the

https://doi.org/10.29407/js_unpgri.v8i1.17810
8 (1) 2022 | 131-144

two types of workouts is greater than the average pretest value (treatment). This indicates that the therapy of each group (side-to-side box shuffle and leap to box groups) had an effect on limb muscular power development in ball athletes. The outcomes of enhancing the power capability of volleyball players' limb muscles are summarized below in terms of the average gain value gained.

Table 5. Results of calculation of increased muscle strength of volleyball players' limbs

Nama Kelompok	Jumlah
Kelompok Latihan side-to-side box shuffle	
Nilai Mean pretest	30,27
Nilai Mean Post test	47
Peningkatan	55,3%
Kelompok Latihan jump to box	
Nilai Mean pretest	27,27
Nilai Mean Post test	49,27
Peningkatan	80,7%

The things needed to know the analysis in this study are as follows :

1. Normality Test

   One of them is to test the normality of data distribution by using SPSS calculations, namely the One-Sample Kolmogorov-Smirnov Test. This test looks at the value of the difference obtained between the accumulative opportunities from observation and theoretical opportunities. To determine whether the distribution of data is normal, it can be seen from the Sig value compared to the α value. If the value > α, then the data is normal. More details can be seen in the normality test table according to spss calculations below.

Table 6. Description of Normality test results

Variabel	Sig.	α	Keterangan
Pretest side-to-side box shuffle	0,024	0,05	Normal
Pretest jump to box	0,200	0,05	Normal
PostTest side-to-side box shuffle	0,113	0,05	Normal
PostTest jump to box	0,120	0,05	Normal

2. Homogeneity Test

To find out whether the description of existing data is homogeneous or cannot be known by means of SPSS calculations as follows:

Table 7. Homogeneity test results of pretest data on limb muscle strength

Levene Statistic	df1	df2	Sig.
0,013	1	28	0,910

From the results of homogeneity analysis obtained the data used is homogeneous, because Sig is greater than α (0.910>0.05).

Tabel 8. Homogeneity test results of data posttest strength of the limb muscles

Levene Statistic	df1	df2	Sig.
2,262	1	28	0,144

From the results of homogeneity analysis obtained the data used is homogeneous, because Sig is larger than α (0.144>0.05).

3. Test t

Based on the results of the t-test (paired t-test) for each exercise against increased leg muscle power before pretest and after administration (posttest) showed that: Sig value for side-to-side box shuffle exercises by 0.000 smaller than α by 0.05, in other words, there was a significant influence on side-to-side box shuffle exercises for pretest and posttest against increased limb muscle power in footballers, and jump to box exercises of 0.000 smaller than α of 0.05, in other words, there is a significant influence on jump to box exercises for pretest and postest on the increased strength of the limb muscles in volleyball athletes.

Meanwhile, based on the percentage of increased muscle power of the jump to box training limbs is better than side-to-side box shuffle training, which is 22.00% and 16.73% and based on the two-group test (test) obtained a sig value of 0.918 greater than $\propto = 0.05$, in other words, there is a difference between side-to-side box shuffle

and jump to box exercises in increasing leg muscle power in footballers.

DISCUSSION

According to the research and analysis findings, there is a significant effect on side-to-side box shuffle exercises for pretest and post-test against increased leg muscle power in footballers and jump to box exercises for pretest and post-test against increased leg muscle power in volleyball athletes. According to two-group testing, jump to box exercise models are superior than side-to-side box shuffle training. This outcome is supposed to provide references or a theoretical foundation for determining the ability of each handball athlete's limbs, which can subsequently be used to construct or create training programs using plyometric training models.

Anwar et al., (2020) According to the research, plyometric workouts provide training outcomes by pitting a strength barrier against the limb power of SMAN 3 Banjarmasin futsal players. Additional information will be provided if the results compare the power limbs of futsal players trained using plyometric tuck jump models to those who do not. Saputra et al., (2019) revealed that box jump, burpee, and tuck jump exercises have a significant effect on increasing the strength and speed of the leg muscles, as determined by the sample paired t-test test, and that there is a significant difference in influence between box training and jumping, burpee, and tuck jump exercises on increasing the strength and speed of the leg muscles. (Jaya & Rohmat, 2019) found that tuck jump workouts can help players improve their smashes in volleyball games by improving their leaping ability and limb force. Lindblom et al., (2021) As a result, training involving tuck leaps can help athletes increase their capacity to perform limb power. (Di Cagno et al., 2018).

(Anwar et al., 2020; Parta, Wiria Dinata, Kesehatan, & Rekreasi, 2020) Additionally, it was shown that tuck jump workouts might help athletes recover from knee injuries even when they are performed in varied segments and under supervision. The practice of tuck jumping is

well-suited for inclusion in a fitness routine. Over 12 weeks, core stability training significantly improves the kinematic jump tuck in young soccer players with dysfunction (Mazurek et al., 2018). Saparia, (2020) found that limb muscle strength is a critical factor that has a significant impact on handball athletes' ability to attack and that tuck jump jumping workouts are capable of increasing limb power in handball athletes. The ability of handball athletes has increased as a result of the influence of plyometric and leaping workouts on physical performance in young male handball players (Mazurek et al., 2018). Saparia (2020) showed that plyometric activities such as tuck jump models can enhance volley athletes' limb power, which influences their smash outcomes compared to athletes who have not yet used plyometric workouts. Basketball and handball athletes' leaping ability has an effect on their performance on the court, which is beneficial if training is required to develop the limbs' power (Barrera-Domínguez et al., 2021).

Singh et al., (2019) revealed that plyometric training with a single tuck jump model in combination with sprint activities can improve handball athletes' looks. Additionally, the two components have an effect on athletes' performance. Arunsankar et al., (2020) demonstrated that training designed to increase leaping ability through the plyometric tuck jump model has a substantial effect on how an athlete's limb power performs on the field. The program's plyometric and stationary training components have a statistically significant effect on the development of the specified criterion variables, namely power ability and speed, in athletes (Joseph & Praveen, 2019). Plyometric workouts are frequently utilized in sports using big balls, such as volleyball and handball. To leap in large ball games, you must have strength. Thus, volleyball and basketball both require horizontal and vertical components. (Dharani, Wiriawan, & Mintarto, 2020). This study is limited in the number of samples and gender, researchers hope in the future to conduct similar studies by looking at the limitations of this study by increasing the number of samples and treating men and women so that the influence can be seen properly. Furthermore, researchers in

the future can develop other methods that can increase the strength of the limb muscles by adding other methods so as to improve other plyometric models.

CONCLUSION

The study's conclusion is that both types of training can help volleyball players improve their limb muscle strength. The improvement is remarkable when compared to the side-to-side box shuffle exercise model. This research can serve as a reference for developing limb muscle strength using plyometric training models combined with leap to box models.

REFERENCES

Afif., R. M., & Nasrullah, A. (2016). Pengaruh weight training dan body weight training. *Urnal of Physical Education and Sports*, *VX*(1), 97–107.

Akhmad, I., & Hasibuan, B. S. (2020). Contribution of saq exercises and pliometric exercises against smash in princess volleyball games. https://doi.org/10.2991/ahsr.k.200305.056

Anwar, M., Basuki, S., & Irianto, T. (2020). The effect of plyometric knee tuck jump and barrier hops training on explosive muscle explosion futsal player. *Advances in Social Science, Education and Humanities Research*, *407*(Sbicsse 2019), 98–100. https://doi.org/10.2991/assehr.k.200219.027

Arikunto, S. (2010). *Prosedur Penelitian Ilmiah*. *Rineka cipta, Jakarta*.

Arunsankar, S., Singh, J. P. J., & Murugan, A. (2020). Impact of ladder and drop jump training on speed for handball players. *Bharathiar National Journal Of Physical Education And Exercise Sciences Impact*, *11*(1), 32–37.

Barrera-Domínguez, F. J., Carmona-Gómez, A., Tornero-Quiñones, I., Sáez-Padilla, J., Sierra-Robles, Á., & Molina-López, J. (2021). Influence of dynamic balance on jumping-based asymmetries in team sport: A between-sports comparison in basketball and handball athletes. *International Journal of Environmental Research and Public Health*, *18*(4), 1–12. https://doi.org/10.3390/ijerph18041866

Bompa, T. O., & Buzzichelli, C. A. (2019). *Peridization: Theory and Methodology of Training*. *Journal of Chemical Information and Modeling*.

Bompa, T. O., & Haff, G. G. (2009). *Periodization: Theory and*

Methodology of Training. 5th ed. Champaign, Ill. : Human Kinetics;

Dharani, S., Wiriawan, O., & Mintarto, E. (2020). Pengaruh latihan pylometric terhadap performa olahraga : Kajian literatur. *Jurnal Ilmiah Mandala Education*, *6*(2), 182–189.

Di Cagno, A., Fiorilli, G., Iuliano, E., Tsopani, D., Buonsenso, A., Piazza, M., & Calcagno, G. (2018). Disordered eating behaviors in rhythmic gymnasts: A survey to investigate the coaches' point of view on the management. *Journal of Physical Education and Sport*. https://doi.org/10.7752/jpes.2018.03254

Haqiyah, A., & Riyadi, D. N. (2018). Pengaruh inteligensi, kelentukan, dan motor educability terhadap hasil belajar jurus tunggal pencak silat. *Perspektif Ilmu Pendidikan*. https://doi.org/10.21009/pip.321.2

Henwood, T. R., Riek, S., & Taaffe, D. R. (2008). Strength versus muscle power-specific resistance training in community-dwelling older adults. *Journals of Gerontology - Series A Biological Sciences and Medical Sciences*, *63*(1). https://doi.org/10.1093/gerona/63.1.83

Husein, M, Akbar, A. (2020). Perbandingan profil antropometri dan kondisi fisik pemain sepakbola pada klub sepakbola wanita kota dan kabupaten kediri. *Indonesia Performance Journal*, *4*(1).

Husein, A. A., & Nurkholis, M. (2018). Pengaruh latihan variasi ladder drill dan koordinasi mata-kaki terhadap peningkatan keterampilan menggiring bola pada permainan sepakbola. *Bravo's Jurnal*, *6*(1), 1–8.

Indrayana, B. (2018). Perbedaan pengaruh latihan knee tuck jump dengan latihan double leg bound terhadap peningkatan power otot tungkai dan kemampuan smash pada ekstrakurikuler bola voli putra SMKN 1 Kota Jambi. *Jorpres (Jurnal Olahraga Prestasi)*, *14*(1), 1–23. https://doi.org/10.21831/jorpres.v14i1.19977

Jaya, M. K., & Rohmat, D. (2019). Perbandingan latihan plyometric jump to box dan knee tuck jump terhadap peningkatan muscle power pada atlet dayung rowing. *Jurnal Kepelatihan Olahraga*, *11*(1), 68–76. https://doi.org/10.17509/jko-upi.v11i1.16828

Joseph, S., & Praveen, A. (2019). Persuade of plyometric training and stationary training on speed and explosive power of college female basketball players. *International Journal of Physiology, Nutrition and Physical Education 2019;*, *4*(1), 2213–2217.

Khalid, I., & Rustiawan, H. (2020). Dampak latihan box jump dengan tuck jump terhadap power tungkai. *Jurnal Wahana Pendidikan*, *7*(2), 113. https://doi.org/10.25157/wa.v7i2.3303

Kholil Halbatullah., Budaya Astra., S. (2019). Pengembangan model latihan fleksibilitas tingkat lanjut dalam pembelajaran pencak silat. *IKA*, *17*(2), 148–162. Retrieved from http://jurnal.globalhealthsciencegroup.com/index.php/JPPP/article/do

wnload/83/65%0Ahttp://www.embase.com/search/results?subaction=viewrecord&from=export&id=L603546864%5Cnhttp://dx.doi.org/10.1155/2015/420723%0Ahttp://link.springer.com/10.1007/978-3-319-76

Lindblom, H., Hägglund, M., & Sonesson, S. (2021). Intra- and interrater reliability of subjective assessment of the drop vertical jump and tuck jump in youth athletes. *Physical Therapy in Sport*, *47*, 156–164. https://doi.org/10.1016/j.ptsp.2020.11.031

Mazurek, K., Zmijewski, P., Makaruk, H., Mróz, A., Czajkowska, A., Witek, K., … Lipińska, P. (2018). Effects of short-term plyometric training on physical performance in male handball players. *Journal of Human Kinetics*, *63*(1), 137–148. https://doi.org/10.2478/hukin-2018-0014

Parta, R. S., Wiria Dinata, W., Kesehatan, J., & Rekreasi, D. (2020). Pengaruh latihan side to side box shuffle dan latihan split squad jump terhadap daya ledak otot tungkai atlet karate forki kota sungai penuh. *Jurnal Stamina*, *3*(6), 427–439.

Putra, R. T., Kiyatno, & Siswandari. (2017). Analisis Faktor Biomotor dan Psikomotor Dominan Penentu Kemampuan Groundstroke Forehand Tenis Lapangan. *Universitas Sebelas Maret*, *1*(1), 408–416. Retrieved from https://eprints.uns.ac.id/id/eprint/33222

SAPARİA, A. (2020). Plyometric training methods and hand eye coordination on volleyball smash skills in sport education students, tadulako university. *International E-Journal of Educational Studies*, *4*(8), 167–175. https://doi.org/10.31458/iejes.709841

Saputra, K. R., Nurkholis, & Januarumi, F. (2019). The different of box jump , burpee , and tuck jump exercise effects to enhance power of leg muscles and speed. *JOSSAE (Journal Of Sport Science And Education)*, *4*(2), 2–5.

Sim, Y. J., Byun, Y. H., & Yoo, J. (2015). Comparison of isokinetic muscle strength and muscle power by types of warm-up. *Journal of Physical Therapy Science*, *27*(5). https://doi.org/10.1589/jpts.27.1491

Singh, A., Choudhary, A., Shenoy, S., & Sandhu, J. S. (2019). Changes in physical performance variables in sprinters following sprint specific plyometric training program. *International Journal of Physiology, Nutrition and Physical Education*, *4*(1), 1463–1466.

Sugito, S., Allsabah, M. A. H., & Putra, R. P. (2020). Manajemen kepelatihan klub renang Kota Kediri tahun 2019. *Jurnal SPORTIF : Jurnal Penelitian Pembelajaran*, *6*(1). https://doi.org/10.29407/js_unpgri.v6i1.14021

Thoiban, H., & Tohidin, D. (2019). Pengaruh latihan single leg tuck jump dan jump to box terhadap kemampuan daya ledak otot tungkai atlet sepakbola seni olahraga saiyo koto baru (soska) football club (Fc). *Jurnal Stamina*, *2*(8), 118–131. https://doi.org/10.24036/jst.v2i8.426

Toho Cholik Mutohir dan Muhammad Muhyi FaruqVoli, P. B. (2012).

Permainan Bola Voli. Surabaya: Graha Pustaka Media Utama.

Williams, J. A. (2020). Effect of specific strength and power training on serving velocity in tennis players. *Journal of Australian Strength & Conditioning*, *28*(5).