ORIGINAL ARTICLE

Physical Therapy Journal of Indonesia (*PTJI*) 2024, Volume 5, Number 1: 5-8
E-ISSN : 2722-6034 ; P-ISSN : 2722-0125

Relationship between leg muscle explosive power and lay-up shoot ability

I Made Wahyu Pranatha Putra[1*], Anak Ayu Nyoman Trisna Narta Dewi[2], Nila Wahyuni[3], I Made Winarsa Ruma[4]

[1]Bachelor and Profession Program of Physical Therapy, Faculty of Medicine, Universitas Udayana, Indonesia;
[2]Department of Physiotherapy, Faculty of Medicine, Universitas Udayana, Indonesia;
[3]Department of Physiology, Faculty of Medicine, Universitas Udayana, Indonesia;
[4]Department of Biochemistry, Faculty of Medicine, Universitas Udayana, Indonesia.

*Corresponding author:
I Made Wahyu Pranatha Putra;
Bachelor and Professional Program of Physical Therapy, College of Medicine, Universitas Udayana, Indonesia;
adewahyupranatha@gmail.com

Received: 2023-08-02
Accepted: 2023-11-22
Published: 2023-12-25

ABSTRACT

Background: Lay-up shoot is one of the basic techniques that a basketball athlete must master to be a winner. The shooting technique involves jumping and dribbling the ball as close as possible into the ring. This study aimed to describe the relationship between leg muscle explosive power and lay-up shoot ability.

Methods: This research was a descriptive study with a correlational design that used a total sampling technique that targeted all students who were basketball club members at Public Senior High School 8 Denpasar concerning inclusion and exclusion criteria. A vertical jump test measured leg muscle explosive power, and the lay-up shoot ability was measured by doing a lay-up shoot ten times.

Results: The results showed a relationship between leg muscle explosive power and the lay-up shoot ability of the students. Most students have above-average legs, muscle explosive power, and good lay-up shooting skills. The better the leg's muscle explosive power, the better the lay-up shoot ability, which shows that the leg muscle explosive power is positively correlated with the lay-up shoot ability.

Conclusion: This study found a significant relationship between leg muscle explosive power and ability lay-up shoot students at the basketball club Public Senior High School 8 Denpasar.

Keywords: Basketball, explosive power, lay-up shoot, legs muscle.
Cite This Article: Putra, I.M.W.P., Dewi, A.A.N.T.N., Wahyuni, N., Ruma, I.M.W. 2024. Relationship between leg muscle explosive power and lay-up shoot ability. *Physical Therapy Journal of Indonesia* 5(1): 5-8. DOI: 10.51559/ptji.v5i1.168

INTRODUCTION

Sports are activities that maintain health and physical fitness and are also a means of providing entertainment. Sport is an essential need because every individual is doing daily movement activities, so it can be said that sport is a series of regular and planned physical activities that aim to maintain and improve a person's quality of life.[1] Sports have become a lifestyle or trend in some communities, even to become a job and a basic necessity in life, one of which is basketball. Basketball is one of the favorite sports in the community because the game is tactical and competitive. Therefore, some people apply basketball as a competitive sport. In addition to seeking achievement, basketball athletes make basketball their job.[2,3]

Basketball consists of 2 teams of 5 members each, where the two teams play to score as much as possible. Basketball is an attractive and dynamic game involving strategies and techniques like lay-ups, dribbles, passing, and shooting. Basketball in Indonesia country is the country's most prominent basketball game. Basketball in Indonesia is one of the most exciting sports. Various basketball matches support this at the provincial, national, and world levels.[4]

Although Indonesia has many enthusiasts, Indonesia's basketball achievements in the Asian arena tend to be low. Based on data from the FIBA World Basketball Sports Organization, Indonesia is ranked 28 out of 30 countries and has a winning percentage of 27.65%. The results show that basketball achievements in Indonesia are still low and have not been able to compete with countries at the Asian level. Basketball players in Indonesia do not have maximum skills. Reliable basketball players must master techniques, tactics, mentality, and mastery of several skills in playing basketball.[2] There are four techniques in playing basketball, namely lay-up shoot, dribbling, passing, and shooting, and one of the most important of the basketball game techniques is lay-up shoot because lay-up shoot is a technique in basketball games which is done by jumping and entering the ball as close as possible to the Basketball ring. Lay-up shoot is the most effective and safe shooting technique because players enter the ball as close as possible into the basketball basket to increase the opportunity to score.[3] The ability to perform a Lay-up shoot is influenced by five factors: distance, shooting attitude, opportunity to shoot, game situation, and mobility. The mobility factor in shooting lay-up shoots pays attention to the ability to run and jump. Muscle explosiveness is a support factor in making jumps.[5]

When starting a jump, explosive power from the leg muscles is needed for a fast and robust movement. Muscle explosiveness is the body parts' ability to contract quickly to carry out sudden activities. Leg muscle explosiveness is characterized by fast and maximum muscle movement.[6,7] In addition, muscle explosiveness is one of the elements of physical condition that

has an essential role in sports activities because muscle explosiveness contains explosive movements such as throwing, sprinting, jumping, and others.[8] Muscle explosiveness contributes to the success of lay-up shoots by 47%, which is greater than other factors, so it can be said that leg muscle explosiveness has an effect both as a supporting element and the main element to achieve a perfect movement and technique of lay-up shoot.[9]

Based on the above background as an effort to improve the achievements of basketball club athletes at Public Senior High School 8 Denpasar, the sample selection of basketball players of Public Senior High School 8 Denpasar is considered more effective because the results of interviews with players and coaches say, in the match players very rarely do lay-up shoots due to limited ability to jump. Still, at this time, research that examines the relationship between Limb Muscle Explosiveness and the ability to lay-up shoot is debated due to several studies, one of which is research from Sutisna. (2018)[9] said there was a link between Limb Muscle Explosiveness and lay-up shoot ability. Still, some studies said there was no link between limb muscle explosiveness and lay-up shoot ability, one of which was researched by Wendry et al. (2012).[10]

METHODS

This descriptive study aimed to determine the relationship between leg muscle explosive power and lay-up shooting ability in Public Senior High School 8 Denpasar students. The research sample from the population that was used should have met the inclusion and exclusion criteria. A population was a unit of individuals or subjects in an area and time with certain qualities to be observed or researched.[11]

This research was conducted on September 3, 2023, at Public Senior High School 8 Denpasar, North Denpasar sub-district, Denpasar City. The respondents in this study were Public Senior High School 8 Denpasar students aged 15-18 who met the inclusion and exclusion criteria by taking a total sample population of 43 students in the basketball club at Public Senior High School 8 Denpasar. Meanwhile, the sample is part of the number and characteristics of the population.[12] In determining the sample, if the population is small or less than 100, it is better to take all of them, so this research sampling technique is called the total sampling technique.[13] A bivariate correlation test was conducted using the chi-square data analysis technique to determine the relationship between explosive muscle power and lay-up shooting ability.

RESULTS

Table 1 shows that 43 data of the sample was included into the inclusion criteria, and 13 was excluded. The exclusion data was based on age that is not in the 16-18 year age range as many as 9 data and body mass index (BMI), which exceeds the standard limit between 18.5-22.9 as many as 7 data.

The data was then analyzed using bivariate *chi-square* analysis and obtained an Asymptotic Significance value of p=0.019 (p<0.05, declared significant), which shows that there is a relationship between leg muscle explosive power and the lay-up shooting ability of students who are members of the basketball club of Public Senior High School 8 Denpasar.

DISCUSSION

Optimal muscle explosive power occurs in this age group because it is during the physical growth period. Students with non-ideal BMI tend to have less muscle explosive power and lay-up shooting ability. Muscle explosive power is the ability to exert maximum strength quickly. To perform muscle explosive power, you need an ideal body mass index to obtain optimal muscle explosive power.[14]

The better the explosive power of your leg muscles, the better your lay-up shooting ability will be. The results of this research align with the findings of Candra (2018), who found that leg muscle explosive power significantly contributed to a lay-up shooting ability of 78.8%.[15,16] Fadiel et al. (2023) also obtained the same results: a significant relationship between the explosive power of leg muscles and the lay-up shooting ability of basketball athletes.[16] Interestingly, the same results were also obtained in research that examined other shooting techniques, named jump shots, because they both use muscle explosive power as a component in the jumping movements, and leg muscle explosive power significantly affected jump-shooting ability. These three studies can support the results of this research because the shooting techniques studied rely on jumping, hand-eye coordination, and agility.[1,4,17]

Leg muscle explosive power has a role in supporting lay-up shooting skills according to the intensity of the training given. In performing a lay-up shoot, muscle explosive power produces optimal jumping movements when putting the ball

Table 1. Subject characteristics

Variables	Total	Percentage (%)
Gender		
Male	34	79.1
Female	9	20.9
BMI		
Ideal	43	100.0
Age		
16	23	53.4
17	10	23.3
18	10	23.3

Table 2. Analysis results of leg muscle explosive power and lay-up ability

Variables		Lay-up shooting ability assessment			*P-value*
		well done	good	poor	
Evaluation power explosion muscle limbs	Very good	1	6	0	0.019
	Above average	4	18	4	
	Average	0	3	6	
	Below average	0	0	1	

into the basketball ring.[15] Research from Yulifri (2018) states that the explosive power of Leg muscles is caused by the contraction of several muscle fibers containing contractile elements. Then, the muscles contract to form a motor unit, which causes muscle contractions that play a role in jumping movements.[18]

A relationship exists between leg muscle explosive power and lay-up shoot ability. In fast and robust jumping movements, explosive power from the leg muscles is needed to produce faster lay-up shoot movement. Optimally, apart from that, explosive muscle power is one of the physical components required in playing basketball, one of which is the lay-up shoot technique. Without good leg muscle explosive power, an athlete cannot jump vigorously to get the ball as close to the ring as possible.[16] Apart from its function in making jumps, the explosive power of the leg muscles also functions to withstand the weight of the body, including the influence of gravity, so good muscular explosive power is needed to withstand this load so that the body's balance is maintained.[19]

The more often you do the exercise, the more explosive power your leg muscles will have, affecting the resulting Jump and directly affecting your lay-up shooting ability. Exercises that can be applied to increase leg muscle explosive power, according to the findings of Thariqi et al. (2023), are plyometric exercises such as Tuck jumps, Squad jumps, and Basic box jumps, which have a significant effect on increasing leg muscle explosive power.[18] Furthermore, the Depth jump exercise increased leg muscle explosive power in the sample group with high training motivation. Jump to the box was more effective in the sample group with low training motivation. Increasing the explosive power of the leg muscles is an essential focus in increasing specific desired outputs.[20] The differences in training methods given to the research sample did not influence the results obtained. Still, differences in the explosive power of the leg muscles owned by the research sample influence the training results obtained. Based on this description, exercises that focus on increasing the explosive power of the leg muscles must be given first to obtain maximum results in developing lay-up shooting abilities.[21]

The explosive power of the leg muscles is an internal factor that directly influences the results of the lay-up shoot because in executing a lay-up shoot, the player must jump and put the ball as close as possible into the basketball ring. Of course, taking a jump requires good muscular explosive power. Good muscle explosive power is determined by the muscle's ability to contract suddenly to create explosive power in jumping. Apart from that, Other factors also play a role.[22] According to a review study conducted by Chakraborty and Mondal (2019), factors influencing lay-up shoot performance are duration in the air, landing angle, level of motivation, previously learned skills, techniques used, environmental conditions, and physiological and psychological conditions. The endurance and strength of the leg muscles also influence the duration of the air and landing angle. An athlete's motivation and psychological condition positively influence lay-up shooting performance. Athletes with high self-confidence and motivation during the game will perform well because they have previously learned skills. External factors such as environmental conditions also influence the success of a shot. In a basketball game, each team will try to dribble the ball into the opponent's ring and score while preventing the opponent from putting the ball into the ring. It is not uncommon for one player to face two or more players to be able to break through the opponent's defense, so an athlete must have excellent physiological conditions to be able to support him physically and psychologically during the match.[23,24]

There were some limitations in this study. First of all, the sample size was relatively small. Second, this study did not control the factors that affect lay-up shoot ability, such as flexibility, hand-eye coordination, and confidence in skill. Suggestions for future researchers could be added to the number of respondents and other factors that could affect lay-up shoot ability.

CONCLUSION

Based on the research and analysis tests, it can be concluded that a relationship exists between leg muscle explosive power and students' lay-up shooting ability at the Public Senior High School 8 Denpasar basketball club.

ETHICAL CLEARANCE

The Research Ethics Commission, College of Medicine, Universitas Udayana, stated that this research is ethically feasible with number 2098/UN14.2.2.VII.14/LT/2023.

CONFLICT OF INTEREST

This study has no conflicts of interest.

FUNDING

This study received no grants from any institution.

AUTHOR CONTRIBUTIONS

DGGKP prepares study designs, collects data, processes data, and writes manuscripts. IPYPP, NLPGKS, and AANTND are directing data collection and revising the manuscript.

ACKNOWLEDGEMENT

The authors thank all parties involved in this study.

REFERENCES

1. Wahyuni D, Setia C. Hubungan daya ledak otot tungkai terhadap kemampuan jump shoot pada ekstrakurikuler bola basket SMP Negeri 3 Cirebon. IJPESS. 2021; 1(1):1 2–9.
2. Orlando R. Sumbangan daya ledak otot tungkai terhadap kemampuan jump shot atlet ekstrakurikuler bolabasket SMA Negeri 13 Palembang. Halaman Olahraga Nusantara: Jurnal Ilmu Keolahragaan. 2018; 1(2): 237–48.
3. Rahmadani A. Hubungan kekuatan otot lengan dengan keterampilan lay up shoot bola basket. Journal Sport Area. 2017; 2(2):1–9.
4. As J, Wulandari N. Hubungan daya ledak otot tungkai dan daya ledak otot lengan terhadap kemampuan jump shoot bola basket pada mahasiswa pendidikan jasmani semester IV di Universitas Pendidikan Muhammadiyah (UNIMUDA) Sorong. Jurnal Kepelatihan Olahraga Smart Sport. 2020; 16(1): 21–9.
5. Haryono S, Setio Pribadi F. Pengembangan jump power meter sebagai alat pengukur power tungkai. Jurnal Media Ilmu Keolahragaan Indonesia. 2012; 2(1): 15–27.
6. Pratama IGW, Tirtayasa K, Pinatih GNI, Adiatmika PG, Muliarta M, Griadhi PA. Pelatihan plyometric dengan depth jump meningkatkan daya ledak otot tungkai lebih besar daripada pelatihan standing jump pada

pemain bola voli putra. Sport and Fitness Journal. 2019; 6(3): 43–9.
7. Najmi M, Hamzah. Hubungan daya ledak otot tungkai dan kelentukan otot pinggang terhadap kemampuan heading sepakbola atlet klub Gama FC Tembilahan Kabupaten Indragiri Hilir. Jurnal Olahraga Indragiri (JOI). 2020; 6(1): 1–10.
8. Iqbal K, Abdurrahman, Ifwand. Kontribusi daya ledak otot tungkai dan keseimbangan terhadap ketrampilan jump shoot dalam permainan bola basket pada atlet unit kegiatan mahasiswa Universitas Syiah Kuala. Jurnal Ilmiah Mahasiswa Pendidikan Jasmani, Kesehatan dan Rekreasi. 2015; 1(2): 114–20.
9. Sutisna E. Hubungan power otot tungkai terhadap keterampilan lay up siswa ektrakurikuler bola basket SMAN 1 Cigombong. Seminar Nasional Pendidikan Jasmani UMMI. 2018; 168–72.
10. Wendry W, Hidayah TN, Rahayu SB. Sumbangan kekuatan otot jari, otot perut dan daya ledak otot tungkai dalam reverse lay up. Journal of Sport Sciences and Fitness. 2012; 1(2): 51–7.
11. Supardi. Populasi dan Sampel Penelitian. Jurnal Fakultas Hukum UII. 1993; 13(17): 100–108.
12. Sugiyono. Metode Penelitian Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta; 2013.
13. Hell P, Root C V. Arikunto, Suharsimi, Prosedur Penelitian: suatu pendekatan praktek. Jakarta: Rineka Cipta; 2007.
14. Alsyahbana M. Profil tinggi badan, daya ledak (power) otot tungkai, kelincahan (agility) dan daya tahan (endurance) atlet bulutangkis PB Surya Baja Surabaya usia 12-16 tahun. Jurnal kesehatan olahraga. 2014.
15. Candra O. Contribution of leg muscle explosive power and flexibility on lay-up shoot in basketball. Advances in Social Science, Education, and Humanities Research. 2018; 278: 479–83.
16. Fadiel A, Jonni, Yaslindo, Amra F. Hubungan daya ledak otot tungkai dan kelincahan terhadap kemampuan lay up shoot atlet bolabasket. Jurnal Pendidikan dan Olahraga. 2023; 6(5): 25–32.
17. Mukhtarsyaf F, Arifianto I, Haris F. Pengaruh daya ledak otot tungkai terhadap kemampuan jump shoot atlet klub bolabasket. Jurnal Menssana. 2019; 4(2): 180–5.
18. Thariqi Y, Wiriawan O, Muhammad M. Increasing leg muscle power and leg muscle strength with plyometric exercise variations. COMPETITOR: Jurnal Pendidikan Kepelatihan Olahraga. 2023; 15(2): 259-268.
19. Annuri U. Hubungan daya ledak otot tungkai dan otot lengan dengan kemampuan shooting atlet bola basket. Universitas Negeri Yogyakarta. 2014.
20. Anggoro B. Effects of plyometric exercise and motivation on the explosive power of volleyball players' limb muscles. JORPRES (Jurnal Olahraga Prestasi). 2023; 19(2): 86–96.
21. Buhari MR, Huda MS, Hamdiana H, Ruslan R. Interaction of training methods and explosive power on learning outcomes for running 100 meters. Kinestetik : Jurnal Ilmiah Pendidikan Jasmani. 2021; 5(1): 136–46.
22. Fathinita AR, Basyar E, Ardianto AA, Adrianto AA. Pengaruh latihan anaerobik terhadap daya ledak otot tungkai pada anak usia 10-14 tahun studi pada anak usia dini di Sekolah Sepak Bola Tugu Muda Semarang. Media Medika Muda. 2015; 4(4): 336–45.
23. Chakraborty S, Mondal Assistant Professor P, Sankarshan Chakraborty C, Mondal P. Biomechanical factors contributing to effective lay-up shot in Basketball: A review study. International Journal of Physical Education, Sports, and Health. 2019; 6(3): 86–9.
24. Bondeng V, Adhitya IP, Thanaya SA. The relationship between knee function and psychology on sports readiness, overuse conditions, and physical activity post anterior aruciate ligament reconstructions: a literature review. Kinesiology and Physiotherapy Comprehensive. 2023 Apr 1;2(1):24-7.