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Survey of Leg Muscle Explosive Power among Unsika Sports Science Students and Female Athletes (Class of 2025)

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Abstract

This study aims to describe the lower-limb explosive power profile of student-athletes from the Sports Science Study Program at Singaperbangsa Karawang University (Unsika) Class of 2025 using the Vertical Jump Test. A quantitative descriptive survey was conducted involving 25 participants (17 males and 8 females). Vertical jump performance was assessed and classified using standardized norms. Descriptive statistical analyses were used, including minimum–maximum values, mean, and standard deviation, along with frequency and percentage distribution. The explosive power of the group was categorized in the Moderate classification, with a mean score of 3.12 (on a 1–5 scale) and a standard deviation of 0.726, indicating high homogeneity. Most participants (48%) were in the Moderate category, followed by 32% in the Good category and 20% in the Less category. No participant achieved the Excellent classification. The overall explosive power profile of Unsika Sports Science student-athletes in 2025 is at a Moderate level, suggesting the need for strengthened physical conditioning programs to enhance vertical jump performance.

Keywords: lower-limb explosive power, vertical jump test, descriptive survey, explosive power assessment.

Introduction

Explosive lower-limb power is one of the primary determinants of athletic performance in movements requiring rapid force production, such as jumping, sprinting, and changes of direction. For university student-athletes—particularly those enrolled in the Sports Science Department at Universitas Singaperbangsa Karawang (Unsika)—possession of strong explosive power is essential both for improving sport performance and for meeting academic competency expectations in applied sport science. Explosive power itself is defined as the muscle's capacity to generate maximal force within a very short time frame, enabling efficient vertical and horizontal movements (Asnaldi, 2020).

A significant body of research has emphasized the importance of lower-limb explosive power for athletic success. Numerous studies have specifically investigated how different training modalities influence vertical jump performance. For example, Amarseto et al. (2025) demonstrated that plyometric depth jump training contributed to measurable increases in vertical jump height among basketball athletes recovering from ankle sprain injury. Similarly, Mukti & Widodo (2025) found that plyometric training effectively improved vertical jump performance in volleyball athletes, reinforcing the role of neuromuscular adaptations triggered by high-intensity stretch-shortening cycle movements. Supporting this, Syabaruddin et al. (2025) also reported significant improvements in vertical jump ability following structured plyometric interventions in volleyball players. These findings collectively highlight that vertical jump ability is highly sensitive to training quality and serves as a key marker of explosive power.

Research focusing on younger athletes has shown parallel results. Anggreani & Setiawan (2024) observed that variations of hurdle jump training significantly enhanced leg explosive power in volleyball extracurricular students, while Ozon & Sistiasih (2023) confirmed that standing jump plyometric training improved vertical jump performance among volleyball athletes in Ponorogo. Additional evidence from Aisyah (2015) indicated that rope-jump interval training effectively increased lower-limb strength, reinforcing the strong relationship between specific leg-strengthening exercises and explosive performance outcomes.

Given its sensitivity to neuromuscular changes, the Vertical Jump Test is widely adopted as a valid and reliable instrument for assessing lower-limb explosive power. The test directly measures jump height and correlates strongly with the power output of the leg extensor muscles, particularly the quadriceps and gluteal muscles (Sugihartono & Ilahi, 2022). The use of standardized test norms allows researchers to categorize athlete performance levels, providing a comprehensive understanding of their physical capacity and readiness.

Despite the abundance of research demonstrating the effectiveness of plyometric and power-based training in improving lower-limb explosiveness, there is no publicly available or standardized baseline data describing the explosive power profile of Unsika Sports Science student-athletes for the cohort of 2025. This lack of data creates a critical gap for performance monitoring, program evaluation, and long-term athlete development. Without such baseline information, identifying weaknesses, designing targeted training programs, or making annual comparisons becomes difficult and less effective.

Therefore, this study aims to fill this gap by providing an accurate and updated profile of the lower-limb explosive power of Unsika Sports Science student-athletes (Class of 2025) using the Vertical Jump Test.

Methods

This study uses a quantitative descriptive method, with the main objective of surveying and describing the explosive power profile of leg muscle students of Unsika Sports Science athletes in 2025 through the results of the Vertical Jump Test. In detail, the specific objectives include: (1) Presenting descriptive statistics in the form of mean values, lowest and highest values, and data distribution (standard deviation) of vertical jumping ability; and (2) Classify the explosive ability level of the leg muscles of the subject group based on standard norms. These results are expected to provide real benefits, namely as evaluation materials for the Unsika academic curriculum and as a practical guide for trainers in optimizing strength and conditioning programs (Wiriawan, 2025).

Research Design

This study employed a quantitative descriptive research design with a cross-sectional survey approach. This design was chosen to objectively measure and describe the lower-limb explosive power profile of Unsika Sports Science student-athletes in 2025 based on the results of the Vertical Jump Test. The research was conducted in a single testing session at the Unsika Sports Laboratory. A structured flow of activities—beginning with participant briefing, warm-up, test execution, and data recording—ensured standardized procedures throughout the assessment.

Participants

A total of 25 student-athletes from the Sports Science Study Program at Universitas Singaperbangsa Karawang participated in this research, consisting of 17 males and 8 females, aged 17–19 years. The sampling technique used was total sampling, meaning that all available and eligible student-athletes from the 2025 cohort were included.

The inclusion criteria were:

1. active enrollment as a Sports Science student-athlete at Unsika,
2. being in healthy physical condition at the time of testing, and
3. absence of lower-limb injury in the last three months.

Participation was voluntary, and all students provided informed consent prior to testing. The study was approved by the Ethics Committee of Universitas Singaperbangsa Karawang, ensuring compliance with research standards for human participants.

Instrument

The primary instrument used for data collection was the Vertical Jump Test, administered using a standardized vertical measuring pole to record jump height in centimeters (cm). The Vertical Jump Test is widely recognized as a valid and reliable tool for assessing lower-limb explosive power, as it directly measures vertical jump height and is strongly associated with extensor muscle power, especially in the quadriceps and gluteus muscle groups (Sugihartono & Ilahi, 2022).

Performance scores were classified using standardized normative tables for male and female athletes, with categories ranging from 1 (Very Poor) to 5 (Excellent). These norms enabled researchers to interpret raw performance data and categorize participants according to established standards. The normative classification used in this study is presented in Table 1.

Procedure

All testing procedures were conducted in the Unsika Sports Laboratory using the same equipment for all participants to maintain consistency. Prior to testing, participants performed a 5–10 minute warm-up session consisting of light jogging, dynamic stretching, and activation exercises focused on the lower extremities to minimize injury risk.

Participants performed the Vertical Jump Test barefoot, starting from a standing position without an initial run-up. Each participant completed three jump attempts, separated by a 30–60 second rest interval to avoid fatigue. The highest recorded jump height from the three attempts was used as the final score.

All procedures — including technique instructions, measurement recording, and supervision — were overseen by trained laboratory personnel to ensure testing accuracy and safety.

Data Analysis

Data were analyzed using descriptive statistical techniques to summarize and interpret the physical performance of the participants. The statistical measures calculated included:

1. Measures of central tendency: mean, median, and mode,
2. Measures of variability: standard deviation and range,
3. Frequency and percentage distributions based on normative categories.

Data classification followed the performance categories outlined in the Vertical Jump norms for male and female groups. Data processing and verification were conducted using Microsoft Excel, ensuring accurate calculation of descriptive statistics.

The analytic focus was descriptive in nature, aiming to present a clear profile of the athletes' explosive power without comparing treatment effects or conducting inferential tests.

Table 1

Jump High Norms

Men	Women	Value
≥63	≥59	5
59 – 62	35 – 58	4
35 – 58	27 – 34	3
20 – 34	19 – 26	2
≤ 19	≤ 18	1

Table 2

Jump High Frequency Distribution

Interval		Category	Frequency	Cumulative	Relative
Men	Women			Frequency	Frequency
> 60	> 68	Very good	0	0	
59 – 62	35 – 58	Good	8	8	32%
35 – 58	27 – 34	Keep	12	20	48%
20 – 34	19 – 26	Less	5	25	20%
< 19	<18	Less than once	0	25	
Total					100%

Results

This study involved 25 student-athletes from the Sports Science Study Program at Universitas Singaperbangsa Karawang, consisting of 17 males and 8 females, aged 17–19 years. The descriptive statistical results of the Vertical Jump Test are presented in Table 2.

Descriptive Statistics

The analysis showed that the participants' performance scores ranged from 2 (Less) to 4 (Good), with no individuals scoring in the Very Poor (1) or Excellent (5) categories. The mean score of the group was 3.12, indicating that the overall explosive power of the student-athletes falls within the Medium classification. The standard deviation (SD = 0.726) reflects relatively low variability, showing that most participants' scores were clustered near the group average.

Frequency Distribution

The classification of explosive power levels based on normative standards is presented in Table 2. The Medium category had the highest number of participants (n = 12; 48%). The Good category included 8 participants (32%), while 5 participants (20%) were categorized as Less. No participants were classified as Very Good or Very Poor.

Overall, 80% of the participants were distributed within the Medium and Good categories, indicating that the majority demonstrated adequate levels of lower-limb explosive power according to the applied normative standards.

Discussions

The findings of this study indicate that the lower-limb explosive power of Unsika Sports Science student-athletes is predominantly within the Medium classification, with an average score of 3.12. Although this value slightly exceeds the minimum threshold of moderate performance, it does not yet reach the Good (4) or Very Good (5) categories, which theoretically represent the expected performance level for university student-athletes who regularly participate in sport-specific training (Asnaldi, 2020). This suggests that while the athletes possess a basic level of neuromuscular capability, their explosive power has not yet fully developed to meet optimal athletic performance standards.

The frequency distribution further supports this interpretation, showing that 48% of the athletes fall into the Medium category, while 32% are in the Good category. The absence of participants in the Very Good classification is noteworthy. From a physiological standpoint, achieving the highest classification requires superior recruitment of fast-twitch (type II) muscle fibers, which is typically stimulated through high-intensity plyometric exercises such as depth jumps, squat jump variations, or other activities promoting a high rate of force development (Wiriawan, 2025). The current training routines may therefore lack the necessary intensity, specificity, or progression required to elicit maximal neuromuscular adaptations.

The relatively low standard deviation (SD = 0.726) indicates a high degree of homogeneity in performance among participants. While uniformity may initially appear positive, in the context of athlete development, it may reflect that the existing training program is generalized rather than individualized. Homogeneous results often occur when athletes undergo similar training loads regardless of their baseline abilities. Evidence from intervention studies demonstrates that structured, targeted, and progressive plyometric training tends to produce greater individual variation in explosive power outcomes due to differential adaptive responses (Mukti & Widodo, 2025; Syabaruddin et al., 2025; Ozon & Sistiasih, 2023). This suggests that personalized or position-specific training prescriptions may better optimize explosive power development.

Furthermore, multiple studies have shown that specific plyometric training modalities can substantially enhance vertical jump performance. Amarseto et al. (2025) reported improvements in vertical jump height following depth-jump interventions among basketball players recovering from ankle sprain, while Anggreani & Setiawan (2024) found that hurdle-jump variations effectively increased lower-limb power in volleyball athletes. These studies highlight that well-structured plyometric programs—featuring adequate intensity, variation, and progression—are capable of producing significant neuromuscular adaptations. The moderate performance levels observed in this study suggest that such training elements may not yet be fully integrated into existing conditioning routines at Unsika.

Given that 20% of athletes were categorized as Less, and none achieved the Very Good category, these results can serve as important baseline data for curriculum refinement and training program evaluation. The findings emphasize the need for strengthening the strength and conditioning curriculum, with a greater focus on high-intensity plyometric and power-oriented training. Incorporating exercises such as depth jumps, hurdle hops, and loaded jump-squat variations could help shift the group average toward the Good classification (>4.0) in future training cycles.

For further development, future research is recommended to implement experimental or quasi-experimental designs that compare different plyometric protocols to identify the most effective methods for improving explosive lower-limb performance among Unsika student-athletes. Supporting evidence from Ramadhan (2020) and Devi & Neldi (2019) suggests that sport-specific and skill-related training components also contribute to vertical jump improvements, reinforcing the importance of integrated and progressive conditioning programs.

Overall, the results of this study underline the necessity for more targeted, intensive, and evidence-based training interventions to elevate the explosive power capabilities of Unsika Sports Science student-athletes to higher performance standards.

Conclusions

This quantitative descriptive survey found that the lower-limb explosive power profile of Unsika Sports Science student-athletes in 2025 is predominantly classified as Medium, with an average score of 3.12 and a relatively homogeneous distribution of performance (SD = 0.726). Although most athletes achieved performance levels within the Medium and Good categories, none reached the Very Good classification, indicating that the current training practices have not yet optimized explosive power development.

These findings provide essential baseline data for evaluating and improving Unsika's strength and conditioning programs. The absence of top-tier performance highlights the need for training strategies that emphasize high-intensity power development and structured plyometric training. Future conditioning programs should incorporate more targeted, progressive, and sport-specific power exercises to elevate the athletes' explosive performance toward the Good or Very Good categories. Continued monitoring and further experimental research are recommended to identify the most effective training approaches for enhancing vertical jump ability in this population.

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