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*Corresponding author:
Khansa Dwi Chantika

email:
khansadwicantika29@gmail.com

Profil of Leg Muscle Power and Sprint Speed of Physical Education, Health, and Recreation Students of FIKK UNM Based on Vertical Jump and Sprint Tests

Khansa Dwi Chantika[1], Ahmad Junaidi[2], Kevin[3], Nurhasfina Febneaina[4], Ahmad Furqon[5]*

[1,2,3,4,5]*Physical Education, Health, and Recreation Study Program, Faculty of Sports and Health Sciences, Universitas Negeri Makassar, Makassar, Indonesia*

Abstract: This descriptive cross-sectional study characterized vertical jump performance and 50-m sprint time among students enrolled in a physical education program. Twenty students (11 men and 9 women; mean age approximately 20 years) were recruited purposively. Following a standardized warm-up, participants completed three Sargent vertical-jump trials and two 50-m sprint trials separated by five minutes; the best performance was retained. The author-supplied classification placed 11 participants (55%) in the moderate vertical-jump category, six (30%) in the good category, and three (15%) in the low category. For the 50-m sprint, 10 participants (50%) were classified as moderate, six (30%) as good, and four (20%) as low. These distributions describe this small, non-probability sample only. Interpretation is limited by the absence of reported raw performance statistics, sex-stratified results, and a documented source for the category thresholds. Complete reporting of continuous outcomes and transparent classification criteria is required before the findings can support benchmarking or programming decisions.

Keyword : *leg muscle power, sprint speed, vertical jump test, sprint test, physical fitness*

Introduction

Physical preparedness should be regarded as a core professional competency for physical education students, rather than merely an adjunct to practical coursework. Within this context, neuromuscular qualities such as strength, power, and speed underpin the effective execution and demonstration of many sport-specific movements. These qualities are important because students are expected not only to understand movement theoretically but also to perform, analyze, and teach it safely and effectively. Evidence from sports-performance research shows that muscular strength supports force production, rate of force development, jumping, sprinting, and change-of-direction performance across a wide range of physical tasks (Suchomel et al., 2016).Therefore, profiling selected neuromuscular outcomes provides a defensible starting point for evaluating the physical readiness of students enrolled in a physical education program.

Vertical jump performance offers a practical window into rapid lower-limb force production when sophisticated laboratory equipment is unavailable(Claudino et al., 2017). The Sargent jump-and-reach test directly quantifies vertical displacement by subtracting standing reach height from maximal jump reach height. This distinction is necessary because jump height is a performance outcome and should not be interpreted as mechanical power unless force-time data or a validated prediction equation incorporating relevant variables is used (Morin et al., 2019; Tessier et al., 2013). Reviews and validation studies indicate that vertical-jump assessment can be reliable, but its absolute values depend on the jump technique, arm-swing instructions, measurement system, familiarization, and trial-selection procedure(Mendes De Salles et al., 2012). Accordingly, explicit terminology and standardized administration are essential when vertical jump results are used to characterize student performance.

Sprint performance is an equally relevant but conceptually distinct indicator of neuromuscular capacity. A 50-m sprint integrates the start, acceleration, transition, and near-maximal-velocity phases rather than representing a single expression of lower-limb power. Its multidimensional nature arises because sprint time is shaped by force application, intermuscular coordination, running mechanics, step characteristics, and the testing protocol. Methodological research has shown that start procedures, timing systems, running surfaces, environmental conditions, and recovery intervals can materially affect sprint measurements and their comparability (Haugen & Buchheit, 2016). Thus, sprint time should be treated as an independent performance outcome obtained under clearly documented conditions.

Although vertical jumping and sprinting are distinct tasks, examining them within the same performance profile is theoretically justified. Both require the neuromuscular system to generate and transmit substantial force within short time intervals, although the direction and temporal organization of force differ between tasks. This shared requirement provides a plausible basis for an association, but it does not mean that vertical jump height can explain sprint performance without direct statistical testing. Studies involving trained sprinters have reported meaningful relationships between selected vertical-jump metrics and different sprint phases, with the magnitude of association varying by jump variable and sprint distance (Washif & Kok, 2022). Consequently, the two measures can provide complementary descriptive information while remaining analytically separate.

Performance data derived from athletes or foreign reference populations cannot automatically be generalized to physical education students at a specific institution. Students differ in sex, training history, sport specialization, anthropometry, and exposure to practical coursework, all of which may influence jump and sprint outcomes. Furthermore, comparisons across studies can be misleading when different jump techniques or measurement devices produce systematically different absolute values. For example, field-based research has demonstrated that jump-height estimates obtained with different systems may be consistent yet not interchangeable, reinforcing the need for protocol-matched interpretation (Yingling et al., 2018). Hence, institution-specific descriptive evidence is needed before meaningful evaluation criteria or targeted conditioning programs can be considered.

Against this background, a clearly defined descriptive profile is needed for students in the Physical Education, Health, and Recreation Study Program at Universitas Negeri Makassar. The present study therefore aimed to describe vertical jump height and 50-m sprint time in this student sample and to summarize the distribution of participants across the performance categories used by the authors. A descriptive design was selected because the available data were intended to characterize observed performance rather than establish causality or test a training effect. By reporting the two outcomes separately and interpreting them within the limits of the sampling and testing procedures, the study can provide preliminary evidence for local evaluation and future hypothesis-driven research. In this way, the study addresses the identified contextual gap while maintaining conclusions that are proportionate to the data.

Method

Study Design and Participants

This study employed a quantitative descriptive research design to describe the level of leg muscle explosive power and sprint speed of students in the Physical Education, Health, and Recreation Study Program. The quantitative descriptive approach was used to obtain an objective overview of the participants' physical condition without providing any treatment or intervention (Permadi & Yuliastrid, 2021) .

The participants were students from the Physical Education, Health, and Recreation Study Program, Faculty of Sports and Health Sciences, Universitas Negeri Makassar. The sampling technique used was purposive sampling, in which participants were selected based on specific criteria, including being physically healthy, actively enrolled in the study program, and willing to participate in the testing procedures (Andrade, 2021). A total of 20 students participated in the study.

The sample characteristics included a mean age of approximately 20 years, an average height of 165 cm, an average body weight of 60 kg, and a body mass index (BMI) within the normal category. Prior to participation, all participants were informed about the purpose and procedures of the study and voluntarily signed an informed consent form. The research procedures were conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Research Instruments

Data were collected using two field-test instruments. Leg muscle explosive power was assessed using the Vertical Jump Test, while sprint speed was measured using the 50-meter Sprint Test. These instruments were selected because they are widely used in sports science research and have demonstrated acceptable validity and reliability for measuring lower-body explosive performance and running speed.

For the Vertical Jump Test, participants performed three maximal jump attempts after a standardized warm-up procedure. The vertical jump score was calculated as the difference between standing reach height and maximum jump reach height and was expressed in centimetres (cm). The highest score obtained from the three attempts was recorded as the final result.

For the 50-meter Sprint Test, participants completed two sprint trials with a five-minute recovery period between attempts. Sprint performance was recorded in seconds using a stopwatch, and the fastest time was used as the participant's final score.

Supporting equipment included a measuring tape attached to a wall, chalk for marking jump reach height, a stopwatch, cones for sprint-track marking, and standardized recording sheets.

Table 1. Research Instruments and Variables

Variable	Indicator	Instrument	Measurement Output
Leg Muscle Power	Ability to generate maximal force in a short time	Vertical Jump Test	Jump height (cm)
Sprint Speed	Ability to cover a 50-meter distance in the shortest time	50-meter Sprint Test	Running time (s)
Participant Characteristics	Age, height, weight, BMI	Anthropometric measurements	Descriptive data

Data Analysis

The collected data were analyzed using descriptive statistical techniques. The analysis included the calculation of mean, standard deviation, minimum value, maximum value, frequency distribution, and percentage distribution. The results were subsequently categorized into performance levels (low, moderate, and good) to facilitate interpretation of participants' leg muscle explosive power and sprint speed.

All statistical analyses were conducted using IBM SPSS Statistics Version 25 and Microsoft Excel. The findings were presented in tables and percentage distributions to provide a comprehensive description of the physical performance profile of the participants.

Results

Participants Characteristics

The participants consisted of 20 students from the Physical Education, Health, and Recreation Study Program, Faculty of Sports and Health Sciences, Universitas Negeri Makassar. The sample comprised 11 males (55%) and 9 females (45%), with an average age of approximately 20 years. Figure 1 provides more detailed information regarding the gender distribution of respondents.

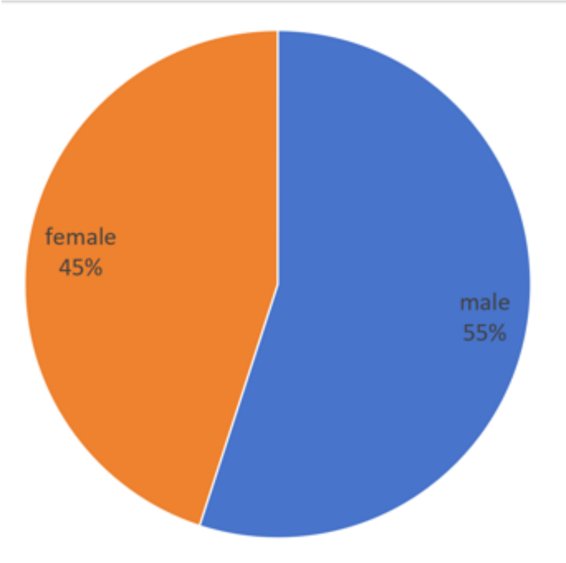

Figure 1. Qualities of Participants

The composition of these respondents may reflect various factors, such as the level of student participation in the Physical Education and Health Study Program, interest in the physical activities and sports that are the focus of the study, or even social and cultural factors that influence participation in this research. Despite the larger number of male students, the data analysis can still provide strong insights into the physical performance of the male group, while the female group still provides an important perspective in understanding differences in physical performance by gender, especially on the variables measured in this study.

Leg Muscle Explosive Power Categories

Leg muscle explosive power, measured in this study using the vertical jump indicator, is a crucial component of physical performance. This ability reflects the combination of muscle strength and optimal contraction speed. The distribution of leg muscle explosive power categories for students in the Physical Education and

Sports Sciences (PJKR) Study Program at the Faculty of Sports and Health Sciences, Universitas Negeri Makassar is presented in Figure 2 below:

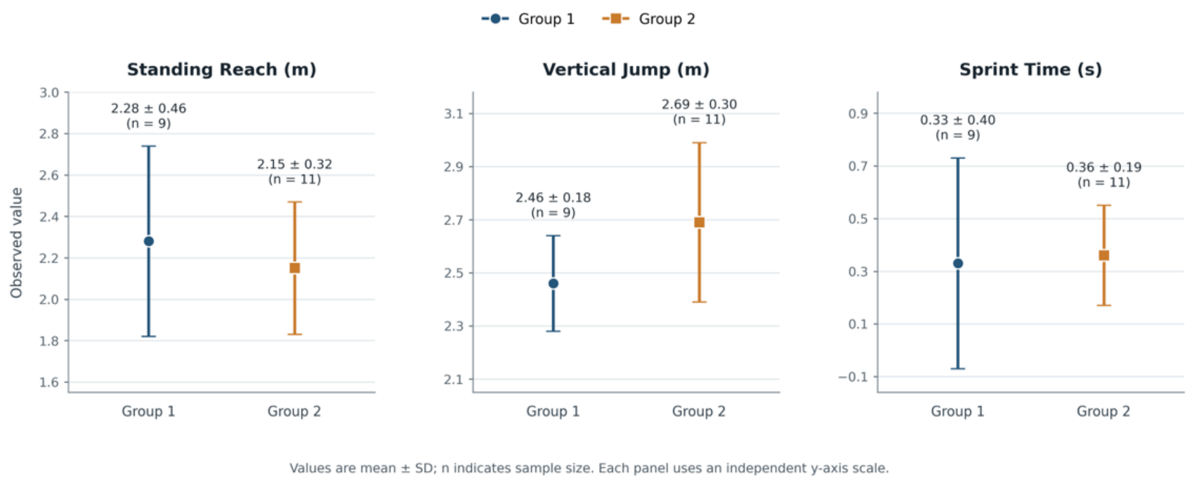

Figure 2. Physical well-being

Based on the research findings presented in Figure 2, the majority of participants (students) were in the moderate category in terms of explosive leg muscle power. Eleven respondents (55%) demonstrated performance at this moderate level. The Vertical Jump Test was used to assess leg muscle explosive power. Based on the results, 11 students (55%) were classified in the moderate category, 6 students (30%) in the good category, and 3 students (15%) in the low category. These findings indicate that the majority of students possess adequate lower-limb explosive power to support sports-related activities.

Sprint Speed Categories

Sprint speed was assessed using the 50-meter Sprint Test. Based on the data obtained, 10 students (50%) were classified in the moderate category, 6 students (30%) in the good category, and 4 students (20%) in the low category. These findings suggest that most participants demonstrated adequate sprint performance, although further improvement remains necessary. The distribution of sprint speed categories among students of the Physical Education, Health, and Recreation Study Program, Faculty of Sports and Health Sciences, Universitas Negeri Makassar, is presented in Table 2.

Table 2. Distribution of Sprint Speed Categories

Sprint Speed Category	Frequency (n)	Percentage (%)
Low	4	20
Moderate	10	50
Good	6	30
Total	20	100

Based on the data presented in Table 2, the majority of students were classified in the moderate category of sprint speed. A total of 11 respondents (50%) were categorized as moderate, followed by 6 respondents (30%) in the good category and 3 respondents (20%) in the low category. These findings indicate that most students possess adequate sprint performance to support physical and sports-related activities. Nevertheless, improvement is still needed, particularly among students in the low and moderate categories, through structured sprint training, plyometric exercises, and lower-limb strength development programs.

These findings indicate that most students possess adequate sprinting ability to support sports participation and physical activity(Alt et al., 2024; Clark, 2022; Papoutsakis, 2012; Salinas-Santander et al., 2024; Votruba & Jensen, 2007). However, the predominance of the moderate category suggests that sprint performance can still be improved through structured training programs emphasizing acceleration, lower-limb power development, running mechanics, and neuromuscular coordination. Such training interventions may contribute to enhanced sprint performance and overall physical fitness among university students.

It should be noted that the classification of performance categories was based on the Vertical Jump Test results. Therefore, the unit of measurement and the calculation procedure used to determine jump performance should be clearly described in the Methods section to ensure the validity and interpretability of the findings.

Discussion

The findings of the present study indicate that most students demonstrated moderate levels of leg muscle explosive power and sprint speed. These results suggest that the participants possess sufficient physical fitness to support sports-related activities; however, there remains considerable room for improvement through systematic and structured training programs.

The Vertical Jump Test results revealed that the majority of participants were categorized as having moderate leg muscle explosive power. It should be noted that the reported average value of 2.59 m represents the maximum jump reach height obtained during the Vertical Jump Test rather than the actual vertical jump height. The actual vertical jump height was calculated as the difference between standing reach height and jump reach height and expressed in centimeters (cm). Therefore, the value should not be interpreted as a jump height of 2.59 m.

Leg muscle explosive power is a critical component of athletic performance because it reflects the ability to generate force rapidly in a short period of time. This capacity is required in various sports activities involving sprinting, jumping, acceleration, and rapid changes of direction. Previous studies have demonstrated that athletes with greater lower-limb explosive power generally exhibit superior performance in explosive movements and sprint-related tasks (Nagahara, 2014).

The sprint performance results also showed that most participants were categorized as moderate. Sprint speed is influenced by several factors, including lower-limb power, neuromuscular coordination, acceleration ability, and running mechanics. The predominance of moderate sprint performance suggests that participants have sufficient physical readiness but have not yet achieved optimal speed capabilities.

The findings of this study are consistent with previous research indicating that lower-limb explosive power contributes substantially to sprint performance. (Zainuddin et al., 2026) reported that leg muscle explosive power was significantly associated with sprint ability among adolescent football players. Similarly, (Möck et al., 2021). found that vertical jump performance was positively related to short-distance sprint performance. These findings support the importance of developing lower-limb power through appropriate training interventions.

From a practical perspective, the findings suggest that Physical Education, Health, and Recreation students would benefit from structured training programs emphasizing plyometric exercises, resistance training, speed-strength development, and sprint-specific conditioning. Such interventions may improve both explosive power and sprint performance while supporting overall physical fitness development.

Several limitations should be acknowledged. First, the sample size was relatively small, limiting the generalizability of the findings. Second, the study employed only descriptive statistical analyses and did not investigate gender differences or correlations between variables. Third, other factors influencing physical performance, such as nutritional status, training history, motivation, and recovery status, were not examined. Future studies are encouraged to include larger samples and more comprehensive statistical analyses.

Conclusions

The results indicate that most students of the Physical Education, Health, and Recreation Study Program at Universitas Negeri Makassar demonstrated moderate levels of leg muscle explosive power and sprint speed. Based on the Vertical Jump Test results, 55% of participants were classified in the moderate category of leg muscle power, while 50% were classified in the moderate category of sprint speed. These findings suggest that although students possess adequate physical fitness to support sports participation, structured and continuous training programs are still required to optimize lower-limb power and sprint performance.

Future studies should involve larger samples and apply inferential statistical analyses to examine differences between groups and the relationship between leg muscle explosive power and sprint performance.

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