4971-Article Text-31825-1-2-20260627.docx

by Sheryar.baig64@gmail.com 1

Submission date: 03-Jun-2026 06:25AM (UTC-0400)
Submission ID: 2975587342
File name: 4971-Article_Text-31825-1-2-20260627.docx (91.37K)
Word count: 5885
Character count: 36481

ETDC Indonesian Journal of Research and Educational Review
Volume 5, No. 3, 2026, pp 1857 - 1870
e–ISSN 2809-3682
p–ISSN 2809-7505
https://doi.org/10.51574/ijrer.v5i3.4971

Accessibility of Sports Facilities and Its Impact on Skill Development Among Junior and Senior High School Student-Athletes

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Article Info

Article history:

Received March 24, 2026
Accepted June 02, 2026
Published June 03, 2026

Keywords:

Accessibility;
Skill Development;
Sports Facilities;
Student-Athletes;
Urban Area.

ABSTRACT

In rapidly developing urban areas like Makassar City, the commercialization of public spaces often limits school-aged athletes' access to standardized training infrastructure, presenting a structural barrier frequently overlooked in sports pedagogy. This study analyzes the relationship between sports facility accessibility and the skill development of junior and senior high school student-athletes in Makassar. Employing a quantitative correlational design with a cross-sectional approach, the study involved a purposive sample of 30 student-athletes aged 12–15 years with a maximum of two years of training experience. Facility accessibility was measured via a comprehensive questionnaire, while motor skills were assessed through a standardized basic sports skills test, controlling for training frequency and motivation. Data were analyzed using Pearson and partial correlation tests. The results revealed a positive, significant, and moderate relationship between sports facility accessibility and student-athlete skills ($r = 0.465$; $p = 0.001$). Training frequency ($r = 0.435$; $p = 0.002$) and motivation ($r = 0.413$; $p = 0.002$) also significantly correlated with skills. Crucially, partial correlation confirmed that the facility accessibility-skill relationship remained independently significant even after controlling for both frequency and motivation ($r = 0.405$; $p = 0.003$). This study proves that the physical environment acts as an independent determinant of motor performance within urban sports pedagogy and sociology. Practically, it provides an empirical foundation for policymakers to design school-centered, highly accessible sports infrastructures to secure sustainable youth athlete development.

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1. INTRODUCTION

The development of motor and technical skills in junior high and high school student athletes is a primary focus of the physical education and early childhood sports development system (Granacher & Borde, 2017; Kalaja et al., 2012). During this

adolescence, physical growth and cognitive maturity are at a crucial stage, requiring programmed stimulation through consistent training. Successful mastery of sports skills in student athletes is determined not only by internal factors such as innate talent and self-motivation but also by the supportive ecosystem within which they interact (Lee et al., 2026). As part of sports education, a structured and sustainable training environment plays a crucial role in facilitating the transition from beginner to competent student athlete (Linnér et al., 2022).

One environmental determinant of the effectiveness of sports learning, yet often overlooked in pedagogical studies, is the availability and quality of infrastructure (Sharifi et al., 2024). The accessibility of sports facilities, including geographic accessibility, availability of allocated training time, the physical condition of the facilities, and cost regulations, directly correlates with the consistency of student athlete participation (Crespo et al., 2024; Oliveira & Menayo, 2024). When sports facilities are difficult to access, the frequency of training for young athletes tends to decrease, which in turn disrupts the automation of motor movements that require constant repetition. Therefore, viewing sports facilities not simply as physical infrastructure but as contextual learning media is highly relevant in efforts to optimize athletes' talents in the school environment (Pratomo et al., 2025).

In a large city like Makassar, the dynamics of rapid urbanization present unique challenges for education and sports. The growth of public spaces is often not commensurate with the provision of child-friendly and accessible outdoor sports facilities for school students. Limited land in urban areas results in most sports facilities being concentrated in specific commercial areas. As a result, junior high and high school student athletes in Makassar often face high mobility constraints, long travel times after school hours, and scheduling conflicts with the general public. These logistical barriers potentially limit their opportunities for intensive training outside of school hours.

This situation is further exacerbated by global trends influencing the urban sports landscape in Makassar, namely the rise of new recreational sports such as padel, which are rapidly becoming part of the urban lifestyle. This phenomenon indirectly degrades the existence of traditional competitive sports facilities such as tennis courts due to the conversion of tennis courts into new sports fields with higher economic value for managers (Hakim et al., 2025; Filipcic, 2024). The impact of this shift is the increasingly limited availability of affordable training space for novice tennis students. Furthermore, this shift in market interest affects the distribution of local coaches, who shift focus for economic reasons, thus depriving student athletes of crucial technical guidance to provide feedback in the early stages of mastering their tennis skills.

Despite the real challenges of urban infrastructure, most previous research in the field of competitive sports and physical education in Indonesia has been dominated by the evaluation of factors internal to athletes (Komalasari, 2023; Ma'mun et al., 2022; Widiyatmoko et al., 2025). Research into biomechanics, physical training methods, coach competence, and psychological aspects such as competition anxiety are the most frequently explored topics. Conversely, quantitative studies examining the causal relationship or correlation between the accessibility dimensions of urban sports facilities

and performance outcomes or actual motor skill levels of student athletes are still very rare. Furthermore, analytical models involving environmental control variables in sports ecosystems outside Java, particularly in Eastern Indonesia such as Makassar, have not been empirically documented.

The novelty of this research lies in the integration of urban sociological dimensions (accessibility of urban facilities) with sports pedagogical outcomes (tennis skill development), which are empirically tested using a quantitative correlational approach. Unlike previous research that treats facilities as a constant (Peranita et al., 2025; Setiawan & Wibowo, 2023), this study positions variations in accessibility—distance, time, condition, and cost—as the primary independent variables, measuring their impact on the basic technical skills of student athletes aged 12–15 (junior high school/high school). Furthermore, the originality of this research is strengthened by the application of control variables in the form of training frequency and intrinsic motivation, to ensure that the relationship between environmental variables and skills found is truly genuine and not biased by factors internal to the athletes.

Building upon this background, this study aims to analyze in-depth the relationship between the accessibility of sports facilities and the skill development of junior high and senior high school athletes in Makassar City. The results are expected to provide theoretical contributions to the development of sports sociology and physical education teaching methods in urban areas. Practically, the empirical data generated from this research is expected to serve as a policy basis for the Youth and Sports Agency (Dispora), education agencies, and sports administrators in designing inclusive, affordable, and school-based sports facility layouts to support the sustainable development of novice student athletes in the future.

2. METHOD

This study employed a quantitative approach with a correlational cross-sectional design. This approach was chosen to empirically investigate and analyze the relationship between the independent variable, namely accessibility of sports facilities, and the dependent variable, namely the development of basic technical skills in student athletes. Data collection from all variables was conducted simultaneously over a specific time period to provide a factual picture of how urban environmental factors correlate with the subjects' motor performance. To produce a pure and accurate analysis, this study also integrated training frequency and training motivation as control variables to minimize bias from other internal and external factors.

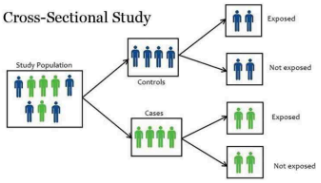

Figure 1. Cross-sectional design

The target population in this study was student athletes at the junior high school and senior high school levels in Makassar City. Sampling was conducted using a purposive sampling technique based on strict inclusion criteria to maintain homogeneity of subject characteristics. The sample consisted of 30 student athletes aged 12–15 who resided and actively trained in the urban area of Makassar City. The specific criteria established included: (1) being registered as an active junior high/high school student, (2) having a maximum of two years of training experience (beginner category), and (3) committing to attending regular training sessions at least twice a week.

The entire series of experiments and data collection were conducted over eight weeks, following a systematic research protocol. Initially, the researchers explained the study's objectives and obtained written informed consent from the student athletes' parents or guardians. The procedure continued with participants completing a sports facility accessibility questionnaire and a motivation questionnaire independently under the supervision of the research team. In the next stage, participants underwent a series of field tests to measure their basic sports skills competency. All collected data was then tabulated and verified for completeness before entering the statistical data processing stage.

Data collection utilized three instruments that had been tested for validity and reliability. First, a sports facility accessibility questionnaire adopted a Likert scale (total score range 16–80) to measure geographic distance, schedule availability, physical conditions of the field, and affordability. Second, a standardized basic sports skills test assesses movement accuracy, performance consistency, and motor coordination with a score range of 0–100. Third, instruments for control variables consisted of a weekly training frequency recording sheet (categories 2, 3, or 4 times a week) and a sports motivation questionnaire (total score range 15–75) on a scale of 1–5, which measured enjoyment of training, orientation toward improvement, and persistence among student athletes.

The data obtained were statistically analyzed using SPSS. Descriptive statistical analysis was applied first to present the mean, standard deviation, minimum, and maximum values for each variable. Data normality was tested using the Kolmogorov-Smirnov test. To test the hypothesis of a direct relationship between facility accessibility and student athlete skills, the Pearson Product-Moment correlation test was used. Next, a partial correlation test was applied to evaluate the strength of the relationship between the two main variables after controlling for the contribution of training frequency and training motivation. All statistical significance levels in this test were set at $p < 0.05$.

3. RESULTS AND DISCUSSION

Results

This study involved 30 junior and senior high school student-athletes actively participating in sports training in Makassar City. Sample characteristics based on age, training experience, and training frequency are presented in Table 1.

Table 1. Respondent Characteristics

Characteristics	Category	N	Percentage (%)
Age (Year)	12–13	14	46.66
	14–15	16	53.33
Practice experience	< 1 year	12	40
	1–2 years	18	60
Exercise frequency	2x/week	8	26.66
	3x/week	13	43.33
	4x/week	9	30

Table 1 shows the characteristics of the study respondents based on age, training experience, and training frequency. Based on age group, the majority of junior and senior high school student-athletes were in the 14–15 year range (16 people (53.33%)), while student-athletes aged 12–13 years numbered 14 people (46.66%). In terms of training experience, most respondents had 1–2 years of training experience, namely 18 people (60%), while 12 people (40%) had less than one year of experience. Furthermore, based on training frequency, most student-athletes participated in training three times per week (13 people (43.33%)), followed by those who trained four times per week (9 people (30%)), and those who trained twice per week (8 people (26.66%)). This distribution indicates that respondents were in the early phase of development with relatively varied training frequencies but dominated by regular training at least three times per week.

Descriptive analysis was conducted on the main variables and control variables, including accessibility of sports facilities, student-athlete skills, training frequency, and training motivation.

Table 2. Descriptive Statistics of Research Variables

Variables	Mean	SD	Min	Max
Accessibility of training facilities	54.34	6.24	41	66
Athlete skills	52.35	6.86	39	64
Exercise frequency (x/week)	2.33	0.45	2	3
Motivation to practice	42.88	5.1	36	54

Table 2 presents descriptive statistics of all research variables, which include accessibility of sports facilities, student-athlete skills, training frequency, and training motivation. The sports facility accessibility variable has an average value of 54.34 with a standard deviation of 6.24, indicating a level of accessibility that tends to be in the moderate category, with a minimum score of 41 and a maximum of 66. The student-athlete skills variable shows an average value of 52.35 and a standard deviation of 6.86, indicating that the skill level of junior and senior high school student-athletes is generally in the sufficient category, with a score variation between 39 and 64.

Furthermore, the training frequency has an average of 2.33 times per week with a standard deviation of 0.45, indicating that the majority of student-athletes train between two and three times per week. Meanwhile, the training motivation variable shows an average value of 42.88 with a standard deviation of 5.10, with a minimum score of 36 and a maximum of 54, indicating that the level of student-athlete training motivation is in the moderate to high category. Overall, these descriptive statistical data provide an overview that junior and senior high school student-athletes have relatively limited access to facilities but are still supported by quite good training motivation.

After the data was declared normally distributed through a normality test, the next step was to conduct inferential statistical analysis to examine the relationship between the research variables. The Pearson Product Moment correlation test was used to determine the strength and direction of the relationship between the accessibility of sports facilities, as the independent variable, and the skills of junior and senior high school student-athletes, as the dependent variable.

Table 3. Pearson Correlation Test Results

Variables	r	P
Accessibility of facilities × Skill of athletes	0.465	0.001

Table 3 shows the results of the Pearson correlation test between the accessibility of sports facilities and student-athlete skills. The analysis results show a correlation coefficient value of r = 0.465 with a significance value of p = 0.001. A p-value smaller than 0.05 indicates that there is a statistically significant relationship between the two variables. A positive correlation coefficient value indicates that the relationship is unidirectional, where the higher the level of accessibility of sports facilities, the better the skill level of junior and senior high school student-athletes. The magnitude of the correlation coefficient indicates that the relationship is in the moderate category, confirming that access to sports facilities is an important environmental factor contributing to the development of junior and senior high school student-athletes' skills.

In addition to analyzing the relationship between the primary variables, this study also examined the relationship between the control variables—training frequency and motivation—and the skills of junior and senior high school student-athletes. This analysis was conducted to obtain a more comprehensive picture of the factors that support student-athlete skill development and to ensure that these variables make a statistically significant contribution to athlete skills.

Table 4. Correlation of Control Variables with Athlete Skills

Variables	r	p
Training frequency × Athlete skill	0.435	0.002
Motivation to practice × Athlete skills	0.413	0.003

Table 4 shows the results of the Pearson correlation test between the control variables and student-athlete skills. The analysis shows that training frequency has a positive and significant relationship with student-athlete skills (r = 0.435; p = 0.002). This indicates that the more frequently student-athletes train in a week, the better the skill level achieved. Furthermore, training motivation also showed a positive and significant

relationship with student-athlete skills (r = 0.413; p = 0.003). This finding indicates that student-athletes with higher levels of training motivation tend to have better skills. The magnitude of the correlation coefficient values for both variables indicates a moderate relationship, confirming that training frequency and training motivation are important factors supporting the skill development of junior and senior high school student-athletes.

To ensure that the relationship between the accessibility of sports facilities and the skills of junior and senior high school student-athletes is not influenced by other factors, this study conducted a partial correlation analysis by controlling for the variables of training frequency and training motivation. This analysis aims to determine the strength of the pure relationship between the main variables after the influence of the control variables has been statistically eliminated.

Table 5. Partial Correlation Results

Variable Relationship	Controlled Variables	r	p
Accessibility × Skills	Frequency & Motivation	0.405	0.003

Table 5 shows the results of the partial correlation analysis between the accessibility of sports facilities and student-athlete skills, controlling for training frequency and training motivation. The analysis results show a partial correlation coefficient value of r = 0.405 with a significance value of p = 0.003. A p-value smaller than 0.05 indicates that the relationship between the two main variables remains statistically significant, even after the confounding influences of training frequency and training motivation have been statistically controlled. This positive correlation coefficient confirms a stable, unidirectional relationship, meaning that enhanced accessibility to sports facilities is directly associated with a higher level of mastery in basic sports skills among junior and senior high school student-athletes.

The magnitude of the partial correlation value indicates that the relationship remains in the moderate category, despite the elimination of control variables. This finding provides strong empirical evidence that the accessibility of sports facilities has a distinct and independent contribution to the skill development of student-athletes in urban settings. These statistics underscore that while internal factors like motivation and training habits are critical, physical environment variables—such as facility proximity, scheduling, and structural quality—exert a significant, standalone impact on the pedagogical outcomes of school-aged athletes.

Discussion

The results of this study indicate that accessibility to sports facilities has a positive and significant relationship in the moderate category (r = 0.465; p = 0.001) with the skill levels of junior high and high school student athletes in Makassar City. This finding indicates that student athletes with better access to sports facilities—whether in terms of relatively close geographic distance from school or home, availability of after-school training schedules, suitable field conditions, or ease of administrative access and costs—

tend to demonstrate better mastery of basic motor skills (Liu et al., 2024; Xiao et al., 2025; Aprilo et al., 2025).

Descriptive data indicate that athlete skills are in the adequate category (Mean = 52.35) and facility accessibility is in the moderate category (Mean = 54.34). This indicates that access to adequate facilities provides opportunities for adolescent athletes to train more consistently, thus supporting the gradual and systematic learning of basic sports techniques (Parry et al., 2024; Putri & Riyadi, 2024; Piquer-Piquer et al., 2025). Furthermore, adequate facilities create a safe and conducive learning environment, which is crucial for minimizing the risk of injury and improving students' focus and concentration. In the context of school-age development, limited physical access—as reflected in a relatively low minimum accessibility value (Min = 41)—can hinder repetition frequency and reduce training quality, ultimately slowing the skill development curve of student athletes (Meer et al., 2024; Aprilo, Arfanda, Mappaompo, et al., 2025; Liu et al., 2024).

The findings of this study strongly align with motor learning principles that emphasize the importance of consistent practice opportunities, frequent repetition, and a conducive training environment (Han et al., 2022; Luo et al., 2025; Starzak et al., 2022). Easily accessible urban sports environments allow junior and senior high school student athletes to participate in regular training without the constraints of distance and physically exhausting travel time, thus optimally accommodating motor adaptation.

Furthermore, the majority of respondents in this study trained regularly at least 3 to 4 times per week (73.33% of the total sample). Maintaining consistent training at this pace provides student athletes with greater opportunities to receive intensive technical feedback from coaches or sports teachers, a crucial aspect in correcting movement errors and increasing technique automation (Vuong et al., 2022; North et al., 2019; Zhu et al., 2024). Consistent training supported by good facilities also contributes significantly to improved coordination, movement precision, and performance stability in novice athletes. Therefore, the accessibility of sports facilities serves not only as a mechanical support factor but also as a crucial pedagogical component in creating an effective learning ecosystem in the early stages of sports talent development (Angelo et al., 2023; Han et al., 2022; Sánchez-Alcalá et al., 2025).

The moderately significant relationship between training frequency and student athlete skill ($r = 0.435$; $p = 0.002$) confirms that the number of training sessions per week remains a key foundation in school-age sports development. Student athletes who train at a higher frequency (up to 4 times per week) have a greater opportunity to commit the required movement repetitions to motor memory, thereby stimulating gradual and sustained neuromuscular adaptation (Song et al., 2024; Kang & Liu, 2023; X. Liu, 2022). Adequate training frequency also allows adolescent athletes to evaluate technical errors through trial and error, while reinforcing correct movement patterns. In sports that require complex coordination, footwork, and object control, regular training is key to improving performance consistency. Therefore, student athletes with a high training frequency demonstrate significantly more mature skill performance compared to those

with limited training time (Koopmann et al., 2020; North et al., 2019; Müller et al., 2024).

In addition to physical and infrastructure factors, findings regarding the role of training motivation, which fell in the moderate to high category (mean = 42.88), indicate that psychological aspects contribute significantly and positively to improving the skill quality of novice student athletes ($r = 0.413$; $p = 0.003$). High training motivation encourages students to actively engage during training sessions, demonstrate optimal effort, and maintain long-term training persistence. Student athletes with strong intrinsic motivation tend to be more receptive to feedback from coaches, persistent when facing technical difficulties, and resistant to giving up when experiencing failure in the movement learning process. In the context of developing junior and senior high school student athletes, training motivation also plays a crucial role in maintaining the continuity of their sports participation, thereby preventing the risk of burnout or early dropout (Shi & Feng, 2022; Lochhead et al., 2024; Deng et al., 2024). Motivation functions not only as an internal driver but also as a catalyst that strengthens the effectiveness of training programs and supports the achievement of optimal athlete skills.

The partial correlation analysis showed that after controlling for the influence of training frequency and motivation, accessibility of sports facilities remained significantly related to student athlete skill, although the strength decreased slightly but remained in the moderate category ($r = 0.405$; $p = 0.003$). This finding provides strong empirical evidence that accessibility of sports facilities is not merely an indirect supporting factor that overlaps with athlete motivation, but rather a significant independent contributor to the successful development of student athlete skills. A stable and accommodating facility environment allows for effective and continuous learning of basic techniques. The availability of space, comfort of facilities, and efficiency of training time provide opportunities for young athletes to optimize the quality of their training without relying solely on fluctuations in individual motivation or simply increasing the number of sessions. This suggests that even if a student athlete has high motivation and a planned training frequency, limited physical access to facilities will remain a structural barrier that prevents them from achieving their maximum performance potential (Mölenberg et al., 2020; Wibowo et al., 2023; Bazzanella et al., 2023).

In the context of urban spatial planning, such as in Makassar City, these findings are highly relevant given the increasingly limited public open spaces and intense competition for sports facilities. The commercialization of urban land and the rise of new recreational sports trends based on urban lifestyles often shift the availability of traditional, school-friendly sports facilities. This situation has the potential to limit student athletes' access to training facilities that meet coaching standards, both in terms of time allocation and the technical quality of the facilities. Furthermore, economic dynamics in urban areas also influence the distribution of qualified coaches, which tend to shift to the commercial sector, thus reducing the intensity of technical assistance for novice student athletes at the school level. Therefore, the accessibility of sports facilities

needs to be designated as a strategic variable in the formulation of regional sports development policies. Synergistic collaboration between educational institutions (schools) and the Youth and Sports Agency (Dispora) is absolutely necessary to ensure the availability of inclusive, affordable, and sustainable sports facilities for the future of student athlete development in Makassar City.

4. CONCLUSION

This study concluded that there is a positive and significant relationship in the moderate category between the accessibility of sports facilities and the skill development of junior high and senior high school students in Makassar City ($r = 0.465$; $p = 0.001$). This unidirectional relationship indicates that the better the level of facility accessibility perceived by student athletes—especially in relation to proximity, suitability of training schedules, quality of field conditions, and affordability—will be followed by an increase in their mastery of basic sports skills optimally. In addition, control variables including training frequency ($r = 0.435$; $p = 0.002$) and training motivation ($r = 0.413$; $p = 0.002$) were proven to have a statistically significant positive relationship with the skill level of the research subjects. More deeply, the results of the partial correlation analysis confirmed that the relationship between the accessibility of sports facilities and the skills of student athletes remained independently significant even though the influence of the variables of training frequency and training motivation had been statistically controlled ($r = 0.405$; $p = 0.003$). These findings provide strong empirical evidence in the field of urban sports pedagogy and sociology that the physical environment, in the form of accessibility to infrastructure, is an independent determinant factor that provides a significant and independent contribution to the motor performance achievements of school-age athletes. Therefore, the effectiveness of developing novice student athletes in urban areas does not only rely on increasing the athletes' internal motivation or the intensity of the training schedule alone, but also depends heavily on policies for arranging and providing sports infrastructure that is inclusive, integrated, and easily accessible to school-age groups.

As a recommendation, it is recommended that the Makassar City Youth and Sports Agency (Dispora), the Education Agency, and relevant sports administrators work together to develop spatial planning policies and development regulations that ensure equitable distribution and easy accessibility of sports facilities for school-age groups. Practically, urban sports facility managers need to prioritize or allocate special schedules that are friendly to student athletes after school hours, as well as cost subsidy policies to minimize structural barriers in the training process. For coaches and sports instructors, it is recommended to continue optimizing the frequency of routine training (at least three times a week) and maintaining the intrinsic motivation of novice student athletes, while utilizing available facilities effectively to achieve movement automation and sustainable mastery of basic motor skills.

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