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ORIGINAL ARTICLE

Aerobic Fitness Profile of University Soccer Players: A Descriptive Study in Airlangga University

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Abstract:
Background: Soccer/football is a sport that requires a high level of physical fitness, one of which is aerobic fitness. Aerobic fitness plays an important role in maintaining match intensity, accelerating recovery, and sustaining players' performance throughout the game. Studies describing the aerobic fitness profile of university students involved in soccer student activity units remain limited, particularly within the Airlangga University Soccer Club Student Activity Unit (UKM). **Purpose:** This study aimed to describe the aerobic fitness profile of members of the Airlangga University Soccer Club Student Activity Unit (UKM). **Design:** This study used a descriptive analytic design with primary data collection. The sample consisted of 40 students from the Airlangga University Soccer Club Student Activity Unit (UKM), selected using a total sampling technique. Aerobic fitness was measured using the Bleep Test to obtain VO_2max values. Data were analyzed using descriptive statistics with the Statistical Program for Social Science (SPSS) to present mean values and percentage distributions. **Result:** The results showed that VO_2max values ranged from 33.25 to 53.75 ml/kg/min, with an average of 43.50 ± 4.96 ml/kg/min. Most players were classified in the good (50%) and very good (30%) categories, while 10% were in the moderate category and 10% in the poor category, with no players categorized as very poor. Players with an ideal body mass index (BMI) tended to demonstrate better VO_2max values than those in the overweight category. Based on playing position, central midfielders showed the highest aerobic capacity, whereas goalkeepers tended to have lower aerobic capacity. All players trained more than twice per week with a duration of two hours per session, with agility training being the most dominant type of exercise. **Conclusion:** The findings indicate that the aerobic fitness level of players in the Airlangga University Soccer Club Student Activity Unit (UKM) is generally categorized as good, with most players classified in the good to very good category. Aerobic fitness varied according to body mass index (BMI) and playing position, where players with an ideal BMI and those playing as central midfielders tended to have higher VO_2max values compared to other positions.
Keywords: Aerobic Fitness; VO_2max; Football Players, University Soccer Club.

1. Introduction

Soccer is a high-intensity intermittent sport that requires a combination of technical skills, tactical understanding, and optimal physical fitness. Among the components of physical fitness, aerobic capacity plays a fundamental role in sustaining performance throughout a match, supporting repeated high-intensity efforts, and accelerating recovery between activities (Modric, Versic, dan Sekulic, 2020). Aerobic fitness, commonly expressed as maximal oxygen uptake (VO_2max), is widely recognized as a key physiological indicator that influences a player's ability to maintain work rate and overall match performance.

Previous studies have demonstrated that higher VO_2max levels are associated with greater total distance covered during matches, as well as improved endurance and recovery capacity (Pratama dan Imanudin, 2018). In addition, aerobic capacity is influenced by various factors, including age, body composition, training intensity, and playing position. Players with optimal body composition tend to exhibit better aerobic efficiency, while excess body mass

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has been shown to negatively impact oxygen utilization and physical performance (Trioclarise, Kurniawan, dan Anggreani, 2022).

Furthermore, positional demands in soccer contribute to variations in aerobic fitness. Midfield players, particularly central midfielders, are required to cover greater distances and maintain continuous movement during matches, resulting in higher aerobic demands compared to other positions. In contrast, positions such as goalkeepers typically demonstrate lower aerobic requirements due to the nature of their role. Previous research has reported variability in aerobic capacity across positions, although findings may differ depending on team strategy and level of competition (Liu et al., 2021; Wahyudi et al., 2024).

Despite the growing body of literature on aerobic fitness in soccer, most studies have focused on elite or professional athletes. Limited research has examined university-level players, particularly those involved in student activity units (UKM), who may have different training characteristics, intensity, and monitoring systems compared to professional teams. As a result, baseline data on aerobic fitness in this population remain insufficient.

Therefore, this study aims to describe the aerobic fitness profile of players in the Airlangga University Soccer Student Activity Unit (UKM). The findings are expected to provide baseline data that can be used to support the development of more effective and structured training programs, as well as to contribute to the existing body of knowledge on aerobic fitness in non-elite soccer players.

2. Materials and Methods

This study employed a descriptive analytic design using primary data collection to evaluate the aerobic fitness profile of university soccer players. The study was conducted on members of the Airlangga University Soccer Student Activity Unit (UKM). A total of 40 male players were recruited using a total sampling technique, ensuring that all eligible participants were included. Inclusion criteria consisted of active UKM soccer players who were physically fit to participate in testing. Prior to data collection, all participants underwent preliminary screening, including assessment of vital signs (pre and post test), *an assessment form containing information related to the participant's* injury history, smoking history, exercise habits, *and current condition before performing the Bleep Test,* and musculoskeletal condition (special test knee and ankle) to ensure safety during testing procedures.

Aerobic fitness was assessed using the Bleep Test (multistage shuttle run test), a standardized and widely accepted field test to estimate maximal oxygen uptake (VO_2max). VO_2max values were calculated using the Léger equation based on the final level and shuttle reached by each participant. The Bleep Test protocol followed established guidelines to ensure consistency and reliability of measurements.

All participants performed a standardized warm-up before testing. The test was conducted under controlled conditions, and participants were instructed to perform at maximal effort until exhaustion. Data collected included VO_2max values, body mass index (BMI), injury history, smoking history, exercise habits, and playing position.

Statistical analysis was performed using the Statistical Program for Social Science (SPSS). Descriptive statistics, including mean values, standard deviation, and percentage distributions, were used to present the data.

This study received ethical approval from the Health Research Ethics Committee of Universitas Airlangga. All participants provided informed consent prior to participation. The data used in this study are available upon reasonable request, with no restrictions that would limit replication or further analysis.

Study Design

This study employed a descriptive analytic design using primary data collection.

Subjects

A total of 40 male players from the Airlangga University Soccer Student Activity Unit were recruited using total sampling.

Research Instruments

Aerobic fitness was measured using the Bleep Test, a shuttle run protocol widely used to estimate VO_2max. VO_2max was calculated using the Léger equation.

Procedure

Participants underwent baseline measurements including vital signs (pre test), musculoskeletal screening (special test knee and ankle), an assessment form containing information related to the participant's injury history, smoking history, exercise habits, and current condition before performing the Bleep Test. All subjects completed a standardized warm-up prior to testing. After completing the bleep test, participants will have their vital signs measured (post test).

Statistical analysis

Data were analyzed using descriptive statistics (mean and percentage distribution) with SPSS

Ethics

This study has been submitted to the Health Research Ethics Committee of the Faculty of Dentistry at Airlangga University in Surabaya under number 0092/HRECC.FODM/I/2026.

3. Results

The characteristics of participants are presented in Table 1

Table 1 Characteristics of Participants

Karakteristik	Jumlah Subjek	Minimum	Maksimum	Rata-Rata (Mean±SD)
Usia (tahun)	40	19	23	19.73±0.933
Berat Badan (kg)	40	51	83	66.29±8.586
Tinggi Badan (cm)	40	157	194	167.38±6.698
IMT (kg/m²)	40	18	28	23.250±2.7988

Kategori IMT	
Berat Badan Ideal	26 (65%)
Overweight	14 (35%)
Posisi Bermain	
CM	6 (15%)
CD	7 (17.5%)
CF	6 (15%)
WF	10 (25%)
FB	8 (20%)
GK	3 (7.5%)

The VO_2max values of the participants ranged from 33.25 to 53.75 ml/kg/min, with a mean value of 43.50 ± 4.96 ml/kg/min.

Based on categorical classification, the distribution of aerobic fitness levels showed that 50% of players were in the good category and 30% in the very good category. Meanwhile, 10% of players were categorized as moderate and 10% as poor, with no participants classified as very poor. The distribution of aerobic fitness levels is shown in Table 2.

Table 2 The distribution of aerobic fitness levels.

Hasil VO_2Maks	**Jumlah Subjek**	**Persentase**
Baik Sekali	12	30%
Baik	20	50%
Sedang	4	10%
Kurang	4	10%
Kurang Sekali	0	0%
Total	40	100%

When analyzed according to playing position, central midfielders demonstrated the highest mean VO_2max values (47.90 ml/kg/min). Other positions showed lower mean values, with goalkeepers having the lowest average VO_2max (40.09 ml/kg/min). The comparison of VO_2max based on playing position is presented in Table 3.

Table 3 Comparison of VO_2max based on playing position

Posisi Bermain	Mean	Standar Deviasi	N (Jumlah sampel)
CD	43.71	5.57	7
CF	46.92	2.39	6
CM	47.90	2.62	6

FB	42.04	4.95	8
GK	40.09	6.77	3
WF	40.87	3.96	10
TOTAL	43.50	4.96	40

Based on body mass index (BMI), players with normal BMI had higher mean VO_2max values compared to those classified as overweight.

All participants reported engaging in training more than twice per week, with an average duration of approximately two hours per session. In terms of training type, agility training was the most frequently performed.

4. Discussion

The findings of this study indicate that the majority of players in the Airlangga University Soccer Student Activity Unit (UKM) fall within the good to very good aerobic fitness categories. This result suggests that the players have developed an adequate level of aerobic capacity to support the physical demands of soccer, particularly in maintaining match intensity, accelerating recovery, and sustaining performance throughout the game (Modric, Versic dan Sekulic, 2020).

The average VO_2max obtained in this study is consistent with previous research conducted among university-level soccer players. For instance, studies have shown that aerobic fitness in non-elite athletes generally falls within moderate to good categories, which reflects differences in training intensity and structure compared to professional athletes (Budiansyah et al., 2024). Furthermore, aerobic capacity is strongly associated with match performance, particularly in terms of distance covered during play, as demonstrated by Pratama dan Imanudin (2018), who reported a significant positive correlation between VO_2max and players' movement capacity.

When analyzed based on body mass index (BMI), players with normal BMI demonstrated higher VO_2max values compared to those classified as overweight. This finding aligns with previous research indicating a negative relationship between BMI and aerobic capacity, where increased body mass can reduce efficiency in oxygen utilization and increase physiological workload during physical activity (Trioclarise, Kurniawan, dan Anggreani, 2022).

In terms of playing position, this study found that central midfielders exhibited the highest VO_2max values. This is consistent with the physiological demands of the position, which require continuous movement, high work rate, and involvement in both offensive and defensive phases of play. Previous studies have also reported similar findings, although some variations exist depending on team strategy and level of competition. For example, Liu et al. (2021) found higher VO_2max values in central defenders, while Wahyudi et al. (2024) reported that midfielders tend to have superior aerobic capacity. These differences indicate that aerobic fitness profiles may vary depending on tactical roles and training emphasis.

Training patterns also play an important role in influencing aerobic fitness. In this study, all players reported engaging in regular training more than twice per week, with a duration of approximately two hours per session. However, the predominance of agility-focused training suggests that aerobic conditioning may not have been optimally emphasized. Previous studies have shown that training duration and consistency are

positively associated with VO_2max, indicating that more structured and endurance-focused training programs could further improve aerobic capacity (Trioclarise, Kurniawan, dan Anggreani, 2022).

Additionally, aerobic fitness is not only related to performance but also to injury risk. Lower aerobic capacity may contribute to fatigue, which can increase the likelihood of decreased concentration and higher injury risk during matches. Therefore, maintaining optimal aerobic fitness is essential not only for performance enhancement but also for injury prevention.

Despite these findings, several limitations should be acknowledged. This study did not assess additional variables such as body fat percentage, nutritional intake, and detailed physical activity prior to testing, which may influence VO_2max outcomes. Future studies are recommended to incorporate these factors to provide a more comprehensive understanding of determinants of aerobic fitness in soccer players.

Research Limitations

Strength, this study represents the first investigation describing the aerobic fitness profile of university-level soccer players within the Airlangga University Student Activity Unit (UKM), providing essential baseline data. The use of total sampling enhances the representativeness of the findings by including all team members. Additionally, the Bleep Test was employed as a measurement tool, offering movement characteristics similar to soccer-specific activity, thereby improving the relevance of the estimated VO_2max values.

Limitation, this study did not assess additional physiological variables such as thoracic expansion, body fat percentage (e.g., skinfold measurements), or daily nutritional intake, which could provide a more comprehensive profile of participants. Physical activity prior to data collection was not controlled, potentially influencing test outcomes. Furthermore, injury history was only recorded in general terms without detailed analysis of injury severity or recovery status (e.g., return to sport), limiting the ability to determine its specific impact on aerobic capacity.

Directions for Future Research

Future studies are recommended to incorporate additional physiological and performance-related variables, such as body fat percentage, thoracic expansion, and nutritional intake, to provide a more comprehensive assessment of factors influencing aerobic fitness. It is also important to control pre-test physical activity to minimize potential bias in performance outcomes. Furthermore, more detailed analysis of injury history, including severity and recovery status such as return to sport (RTS), is needed to better understand its impact on aerobic capacity. Expanding the sample size and including comparisons across different levels of competition or training programs may also enhance the generalizability of findings and provide deeper insights into performance determinants.

5. Conclusions

Based on the findings of this study, the aerobic fitness profile of players in the Airlangga University Soccer Student Activity Unit (UKM) is generally categorized as good, with no participants classified in the very poor category. The majority of players were aged 19–20 years, with VO_2max values at age 19 ranging from poor to very good categories, while players aged 20–23 years were predominantly classified as good to very good. Most participants had a normal body mass index (BMI), and those within this category demonstrated a more favorable distribution of VO_2max levels compared to overweight

players. Variations in aerobic capacity were observed across playing positions, with central midfielders (CM) exhibiting the highest performance, as all players in this position were categorized as very good, whereas goalkeepers (GK) tended to have lower aerobic capacity. All participants had been actively playing soccer for more than one year and engaged in regular training more than twice per week with a duration of two hours per session, with agility training identified as the most dominant type of exercise.

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Conflict of Interest

The authors declare no conflict of interest.

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