

Determinants of Professional Potential in Youth Soccer Players : A Multidimensional Performance Analysis

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ABSTRACT

This study aimed to analyze the performance data of youth soccer players and identify key factors influencing their professional potential. The research focused on examining the contribution of physical, technical, and psychological variables to the development of young athletes and their prospects for achieving professional-level performance. A quantitative cross-sectional design was employed involving 60 youth soccer players aged 14-18 years from three soccer academies in East Java, Indonesia. Data were collected through standardized physical performance tests (30 m sprint, Illinois agility test, and VO₂Max), technical skill assessments (passing accuracy, dribbling speed, and shooting precision), and psychological questionnaires measuring training motivation and discipline. The collected data were analyzed using descriptive statistics, Pearson correlation, multiple regression analysis, and exploratory factor analysis (EFA) to identify significant predictors and underlying performance factors. Results: The results showed that VO₂Max, dribbling speed, passing accuracy, and training motivation significantly contributed to the professional potential of youth soccer players ($p < 0,05$). The regression model explained approximately 62-66% of the variance in professional potential, indicating that a combination of physical, technical, and psychological components plays a crucial role in athlete development. Factor analysis revealed three dominant performance dimensions: physical capacity, technical skills, and psychological readiness, which together accounted for 68,4% of the total variance. Conclusions: The findings highlight the importance of a multidimensional evaluation approach in youth soccer talent identification and development. Integrating physical, technical, and psychological assessments can support more objective and data-driven decision-making in athlete development programs and enhance the effectiveness of youth soccer training systems.

Keywords : professional potential; physical performance; talent identification

ABSTRAK

Studi ini bertujuan untuk menganalisis data performa pemain sepak bola muda dan mengidentifikasi faktor-faktor kunci yang memengaruhi potensi profesional mereka. Penelitian ini berfokus pada pemeriksaan kontribusi variabel fisik, teknik, dan psikologis terhadap perkembangan atlet muda dan prospek mereka untuk mencapai performa tingkat profesional. Desain kuantitatif cross-sectional digunakan yang melibatkan 60 pemain sepak bola muda berusia 14-18 tahun dari tiga akademi sepak bola di Jawa Timur, Indonesia. Data dikumpulkan melalui tes performa fisik standar (sprint 30 m, tes kelincahan Illinois, dan VO₂Max), penilaian keterampilan teknis (akurasi umpan, kecepatan dribbling, dan ketepatan tembakan), dan kuesioner psikologis yang mengukur motivasi dan disiplin latihan. Data yang dikumpulkan dianalisis menggunakan statistik deskriptif, korelasi Pearson, analisis regresi berganda, dan analisis faktor eksploratori (EFA) untuk mengidentifikasi prediktor signifikan dan faktor performa yang mendasarinya. Hasil: Hasil menunjukkan bahwa VO₂Max, kecepatan dribbling, akurasi umpan, dan motivasi latihan secara signifikan berkontribusi pada potensi profesional pemain sepak bola muda ($p < 0,05$). Model regresi menjelaskan sekitar 62-66% varians dalam

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potensi profesional, menunjukkan bahwa kombinasi komponen fisik, teknis, dan psikologis memainkan peran penting dalam pengembangan atlet. Analisis faktor mengungkapkan tiga dimensi kinerja dominan: kapasitas fisik, keterampilan teknis, dan kesiapan psikologis, yang bersama-sama menyumbang 68,4% dari total varians. Kesimpulan: Temuan ini menyoroti pentingnya pendekatan evaluasi multidimensional dalam identifikasi dan pengembangan bakat sepak bola usia muda. Mengintegrasikan penilaian fisik, teknis, dan psikologis dapat mendukung pengambilan keputusan yang lebih objektif dan berbasis data dalam program pengembangan atlet dan meningkatkan efektivitas sistem pelatihan sepak bola usia muda.

Kata kunci : potensi profesional; performa fisik; identifikasi bakat

INTRODUCTION

Soccer is one of the most popular sports worldwide and requires a complex integration of physical, technical, tactical, and psychological abilities to achieve optimal performance. The development of youth soccer players has become an important focus for coaches, sport scientists, and professional academies because early identification of talented players can significantly influence long-term athlete development and elite performance outcomes. Modern sport science emphasizes the importance of performance analysis as a scientific approach to evaluate player potential and guide evidence-based training strategies (Lolli et al., 2023; Sarmiento et al., 2020).

Youth soccer development programs increasingly rely on scientific evaluation methods to identify players with high professional potential. Talent identification is considered a multidimensional process that involves the interaction of several performance components rather than relying solely on observational judgments by coaches. Previous studies indicate that successful talent development systems integrate physical, technical, tactical, and psychological variables to obtain a comprehensive understanding of athlete potential (Kelly et al., 2022; Reeves et al., 2020).

Physical performance remains one of the most frequently analyzed components in youth soccer talent identification. Variables such as sprint speed, agility, aerobic endurance, and muscular power are commonly used indicators to assess the physiological readiness of young players. These attributes are particularly important because soccer involves repeated high-intensity actions, rapid changes of direction, and continuous activity during matches (Hammami et al., 2020; Adiatmika & Santika, 2015; Santika, 2016).

Among physical indicators, aerobic capacity measured through VO_2 max plays a crucial role in soccer performance (Sumerta et al., 2021; Subekti et al., 2021). High aerobic endurance enables players to sustain high-intensity efforts, recover quickly between repeated sprints, and maintain performance consistency throughout the match.

Technical skills are also essential determinants of performance in soccer. Skills such as passing accuracy, dribbling ability, and shooting precision directly influence match effectiveness and team success. Players who demonstrate high levels of technical proficiency are more likely to be identified as promising talents during youth academy selection processes (Sarmiento et al., 2020).

Psychological factors have also been recognized as important determinants of athlete development. Motivation, discipline, resilience, and self-confidence influence how young athletes respond to training demands and competitive challenges. Athletes with strong intrinsic motivation tend to maintain higher levels of commitment and persistence in long-term training programs (Pelletier et al., 2021).

Recent studies highlight the importance of adopting a multidimensional approach in talent identification and player development. Integrating physical, technical, and psychological components provides a more holistic evaluation framework and improves the accuracy of talent selection systems (Kelly et al., 2022).

Advances in sport analytics and performance data analysis have further improved the ability to evaluate player performance using quantitative approaches. Data-driven models allow researchers and coaches to identify key performance indicators that significantly influence athlete development and professional success (Lolli et al., 2023).

Despite the growing body of research on youth soccer development, many studies still examine physical, technical, or psychological factors separately. Limited research integrates these components within a single analytical framework. Therefore, this study aims to analyze the performance data of youth soccer players and identify the key factors influencing their professional potential through a multidimensional performance analysis approach.

METHODS

Participants

This study involved 60 youth soccer players aged between 14 and 18 years who were actively participating in training programs at three soccer academies in East Java, Indonesia. All participants had a minimum of two years of structured training experience and regularly participated in competitive matches organized by regional soccer associations. The participants were considered representative of developing youth athletes undergoing systematic training within academy-based development programs. Prior to data collection, all participants and their guardians were informed about the purpose and procedures of the study, and informed consent was obtained. The study procedures followed ethical guidelines for research involving human participants.

Sampling Procedures

The sampling technique used in this study was purposive sampling. Participants were selected based on specific inclusion criteria, including : 1) being active youth soccer players aged 14-18 years, 2) participating in regular academy training programs, and 3) having no injuries that could affect performance during testing. This sampling approach was chosen to ensure that the selected participants possessed relevant experience and physical readiness for the performance assessments conducted in this study.

Materials and Apparatus

Several instruments were used to measure the physical, technical, and psychological performance of the participants. Physical performance was evaluated using the 30 meter sprint test to measure speed, the Illinois agility test to assess agility, and the multistage

fitness test to estimate maximal oxygen uptake ($VO_2\text{Max}$). Technical performance was measured through a passing accuracy test, dribbling speed test, and shooting precision test designed to simulate common soccer skill situations. Psychological factors were assessed using a structured questionnaire that measured training motivation and discipline using a Likert scale. Standard sports equipment such as cones, stopwatches, measuring tapes, and soccer balls were used to conduct the performance tests.

Procedures

Data collection was conducted on the training fields of the participating soccer academies. Prior to the testing session, participants completed a standardized warm-up consisting of light jogging, dynamic stretching, and movement preparation exercises. Physical tests were administered first, followed by technical skill assessments, and finally the psychological questionnaire. Each participant performed the tests individually under the supervision of trained researchers and coaching staff to ensure accuracy and consistency of measurement. Rest intervals were provided between test trials to minimize fatigue effects.

Design or Data Analysis

This study employed a quantitative cross-sectional research design aimed at analyzing the relationship between multiple performance variables and the professional potential of youth soccer players. Descriptive statistics were used to summarize the characteristics of the participants and performance variables. Pearson correlation analysis was conducted to examine the relationships between variables. Multiple regression

analysis was used to identify the most significant predictors of professional potential among the measured variables. Additionally, exploratory factor analysis (EFA) was applied to identify underlying performance dimensions that contribute to youth soccer player development. All statistical analyses were performed using statistical software with a significance level set at $p < 0,05$.

RESULTS AND DISCUSSION

Descriptive Statistics Of Youth Soccer Players' Performance

The descriptive analysis provides an overview of the physical, technical, and psychological characteristics of the youth soccer players involved in this study. The results indicate that the participants generally demonstrated moderate to good performance levels across all measured variables. The mean sprint time for the 30 m sprint test was $4,32 \pm 0,28$ seconds, indicating relatively good speed performance for players aged 14-18 years. The Illinois agility test showed an average time of $16,74 \pm 0,91$ seconds, suggesting adequate agility ability among participants. The average estimated $VO_2\text{Max}$ value was $52,6 \pm 4,8$ $\text{ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$, which reflects a moderate-to-high level of aerobic endurance among the players.

Technical performance results showed that the average passing accuracy score reached $78,4 \pm 8,6$, while dribbling speed averaged $9,84 \pm 0,73$ seconds. Shooting precision recorded an average score of $72,1 \pm 9,4$, indicating a moderate level of finishing ability. For psychological variables, training motivation showed a mean score of $3,42 \pm 0,41$, while training discipline averaged $3,35 \pm 0,38$ on a Likert scale, suggesting that most players

demonstrated relatively high motivation and commitment to training activities.

Table 1
Descriptive Statistics of Youth Soccer Players' Performance (n = 60)

| Variable | Unit | Mean±SD | Min-Max |
|-----------------------|--|------------|-------------|
| 30 m Sprint | seconds | 4,32±0,28 | 3,85-4,90 |
| Illinois Agility Test | seconds | 16,74±0,91 | 15,10-18,60 |
| VO ₂ Max | ml·kg ⁻¹ ·min ⁻¹ | 52,6±4,8 | 43,2-61,9 |
| Passing Accuracy | score (0-100) | 78,4±8,6 | 60-92 |
| Dribbling Speed | seconds | 9,84±0,73 | 8,50-11,40 |
| Shooting Precision | score (0-100) | 72,1±9,4 | 55-90 |
| Training Motivation | Likert score | 3,42±0,41 | 2,6-4 |
| Training Discipline | Likert score | 3,35±0,38 | 2,7-4 |

Multiple Regression Analysis

Multiple regression analysis was conducted to determine the contribution of physical, technical, and psychological variables to the professional potential of youth soccer players. The regression model produced a strong correlation coefficient (R = 0,81) with a coefficient of determination (R² = 0,66), indicating that approximately 66% of the variance in professional potential could be explained by the predictor variables included in the model.

Among the predictor variables, VO₂Max showed the strongest positive contribution (β = 0,34, p = 0,002),

indicating that aerobic endurance is a key determinant of player potential. Dribbling speed also showed a significant contribution (β = -0,29, p = 0,006), where lower dribbling time indicated better performance. Passing accuracy demonstrated a significant positive influence (β = 0,26, p = 0,017), while training motivation also significantly contributed to professional potential (β = 0,31, p = 0,004). In contrast, shooting precision and training discipline did not show statistically significant effects in the regression model.

Table 2
Multiple Regression Analysis of Predictors of Professional Potential

| Predictor Variable | β (Beta) | t | p-value |
|---------------------|----------|-------|---------|
| VO ₂ Max | 0,34 | 3,21 | 0,002* |
| Dribbling Speed | -0,29 | -2,87 | 0,006* |
| Passing Accuracy | 0,26 | 2,45 | 0,017* |
| Shooting Precision | 0,18 | 1,74 | 0,087 |
| Training Motivation | 0,31 | 2,98 | 0,004* |
| Training Discipline | 0,14 | 1,32 | 0,192 |

Note : R = 0,81; R² = 0,66; Adjusted R² = 0,62 *Significant at p < 0,05

Exploratory Factor Analysis

Exploratory factor analysis (EFA) was conducted to identify the underlying performance dimensions among the measured variables. The analysis revealed three major factors representing physical performance, technical skills, and psychological attributes. These three factors collectively explained 68,4% of the total variance in the dataset.

The first factor represented the physical dimension, with VO₂Max and 30 m sprint showing the highest factor loadings. The second factor represented technical performance, primarily characterized by passing accuracy and dribbling speed. The third factor represented psychological attributes, dominated by training motivation and discipline.

Table 3
Exploratory Factor Analysis of Youth Soccer Player Performance

| Main Factor | Dominant Variables | Factor Loading |
|-------------------------|---------------------|----------------|
| Physical Factor | VO ₂ Max | 0,81 |
| | Sprint 30 m | 0,76 |
| Technical Skills Factor | Passing Accuracy | 0,79 |
| | Dribbling Speed | 0,74 |
| Psychological Factor | Training Motivation | 0,83 |
| | Training Discipline | 0,71 |

Total Variance Explained : 68,4%

Summary of Findings

Overall, the results indicate that the professional potential of youth soccer players is influenced by a combination of physical, technical, and psychological factors. Aerobic capacity (VO₂Max), dribbling speed, passing accuracy, and training motivation emerged as the most significant predictors of player potential. The factor analysis further confirmed that youth soccer performance can be grouped into three main dimensions: physical capacity, technical skills, and psychological readiness. These findings support the importance of adopting a multidimensional evaluation approach in youth soccer talent identification and development.

Discussion

The present study aimed to identify the key determinants of professional potential among youth soccer players by

analyzing the interaction between physical, technical, and psychological performance variables. The results demonstrate that aerobic capacity, dribbling speed, passing accuracy, and training motivation significantly contribute to the professional potential of youth players. These findings support the growing consensus that talent development in soccer requires a multidimensional approach that integrates physiological, technical, and psychological factors. Modern performance analysis frameworks emphasize that athlete development cannot be explained by a single variable but rather by the interaction between multiple performance components (Gonaus & Müller, 2022).

Among the physical variables examined in this study, VO₂Max emerged as the most influential predictor of professional potential. This finding

reinforces previous research suggesting that aerobic endurance is a fundamental physiological requirement in soccer due to the high-intensity intermittent nature of the game. Players with higher aerobic capacity can sustain repeated efforts, maintain tactical involvement, and recover faster between high-intensity actions during matches. Recent studies indicate that aerobic fitness remains one of the strongest physiological predictors of match performance and long-term development in youth soccer players (Bush et al., 2021).

The importance of speed-related performance indicators was also evident in the results of this study. Dribbling speed demonstrated a significant influence on professional potential, highlighting the role of speed and agility in dynamic match situations. Modern soccer requires players to execute technical actions at high speed while under pressure from opponents. Research in elite youth development systems has shown that players who demonstrate superior speed and agility often possess a competitive advantage in offensive and defensive transitions (Altmann et al., 2021).

Technical performance variables, particularly passing accuracy, were also identified as significant predictors of player potential. Passing is one of the most fundamental tactical components in soccer, as it directly influences ball possession, team coordination, and attacking opportunities. Players who consistently demonstrate high passing accuracy are more likely to contribute to effective team play and tactical execution. Studies focusing on elite youth academies suggest that technical consistency, especially in passing and ball control, is a key differentiating

factor between elite and sub-elite youth players (Zago et al., 2020).

Interestingly, shooting precision did not show a statistically significant effect in the regression model. This finding may be explained by the developmental stage of the participants, as players aged 14-18 years are often still developing position-specific skills. In youth soccer development programs, players frequently rotate positions and may not yet specialize in attacking roles that emphasize shooting performance. Similar findings have been reported in youth talent development research, where technical skills such as passing and dribbling appear earlier as predictors of potential than finishing ability (Yiannakos et al., 2021).

Psychological factors also demonstrated an important role in predicting player potential. Training motivation emerged as a significant predictor, emphasizing the importance of intrinsic motivation in athlete development. Young players who possess strong internal motivation are more likely to engage consistently in training, demonstrate resilience when facing challenges, and maintain long-term commitment to performance improvement. Previous research highlights that psychological readiness and motivation strongly influence the progression of youth athletes toward elite performance levels (Toering et al., 2021).

However, training discipline did not demonstrate a statistically significant contribution in the regression analysis. One possible explanation is that discipline levels among academy players tend to be relatively homogeneous due to structured training environments and coaching supervision. When variance among participants is limited, the

statistical contribution of such variables may become less apparent. Similar findings have been observed in studies examining psychological predictors in youth sports, where motivation and self-regulation often emerge as stronger predictors than discipline alone (MacNamara & Collins, 2020).

The exploratory factor analysis conducted in this study further supports the multidimensional nature of youth soccer performance. The analysis identified three dominant factors: physical capacity, technical skills, and psychological attributes. These findings align with contemporary sport science models of athlete development that emphasize the integration of multiple performance domains in talent identification and player development programs. Multidimensional evaluation systems are increasingly used in professional academies to improve the accuracy and fairness of player selection processes (Raya-González et al., 2022).

Another important implication of this study relates to the growing role of data analytics in sport performance evaluation. Advances in sport analytics enable coaches and sport scientists to analyze complex datasets and identify key predictors of athlete development. Data-driven approaches allow for more objective decision-making in player development programs and reduce reliance on subjective scouting assessments. Recent literature highlights that integrating statistical modeling and performance analytics can significantly improve talent identification systems in youth soccer (Morgans et al., 2023).

Overall, the findings of this study provide important insights for coaches, sport scientists, and soccer academies involved in youth athlete development. The results suggest that effective talent

identification systems should prioritize a multidimensional evaluation approach that integrates physical fitness, technical performance, and psychological readiness. By adopting a data-driven and holistic assessment framework, youth development programs can more accurately identify promising players and design training strategies that support long-term athlete development and professional success.

CONCLUSION

This study aimed to analyze the determinants of professional potential among youth soccer players by examining the contribution of physical, technical, and psychological performance variables. The findings revealed that aerobic capacity (VO₂Max), dribbling speed, passing accuracy, and training motivation were significant predictors of professional potential in youth soccer players aged 14-18 years. The regression analysis indicated that these variables collectively explained a substantial proportion of the variance in player potential, highlighting the importance of integrating multiple performance dimensions in evaluating youth athletes. In contrast, shooting precision and training discipline did not show significant contributions within the statistical model, suggesting that their influence may depend on specific playing positions or later stages of athlete development.

Furthermore, the exploratory factor analysis identified three dominant performance dimensions: physical capacity, technical skills, and psychological readiness which together explain the majority of performance variability among youth soccer players. These findings emphasize the importance of adopting a

multidimensional and data-driven approach in talent identification and athlete development programs. Integrating physical testing, technical skill assessment, and psychological evaluation can support more objective and comprehensive decision-making processes in youth soccer academies. Ultimately, the implementation of systematic performance analysis may enhance the effectiveness of player development systems and contribute to the identification of athletes with strong potential to progress toward professional levels.

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