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Multidimensional Performance Profiles in Modern Football: From Physical Attributes to Psychological Competencies

Mirela ȘTEF[1], Sorin BUHAȘ[1]*, Petru PEȚAN[1], Dragoș SĂVESCU[1], Mihai ȘANDRA[1], Mihai ILLE[1], Codruț BULZ[1]

[1] Department of Physical Education, Sports and Physiotherapy, Faculty of Geography, Tourism and Sport, University of Oradea, 1 Universității Street, 410087 Oradea.

***Correspondence:** Sorin BUHAȘ; e-mail: sorin.buhas@gmail.com

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Abstract: The evolving demands of modern football require players to integrate physical, technical, tactical, and psychological competencies in order to perform at elite levels. This study aimed to construct a multidimensional performance model of professional footballers, analysing a dataset of nearly 18,000 players from major international databases (FIFA, Instat, WyScout, Football Manager). Players were categorised by nationality and playing position and evaluated across key attributes, including acceleration, sprint speed, strength, stamina, agility, vision, and composure. Descriptive statistics, ANOVA, Pearson correlations, and cluster analysis were employed to examine inter-group differences and latent performance typologies. Results revealed significant national differences: Iberian players excelled in agility and balance, German players in strength and reactions, while Romanian players showed competitive acceleration and stamina but lower technical stability. Position-specific profiles confirmed that defenders rely on strength and aerial ability, wingers on explosive acceleration, and midfielders on balanced endurance and vision. Correlation analysis identified redundancies (e.g., sprint speed and acceleration, r = .93) and highlighted the importance of reaction time in overall player rating (r = .86). Cluster analysis yielded four latent profiles: Explosive Wingers, Physical Defenders, Complete Midfielders, and Clinical Forwards. These findings underscore the importance of moving beyond unidimensional assessments toward integrative, data-driven models that account for both physical and cognitive performance. Practical implications include more effective talent identification, position-specific conditioning programs, and the inclusion of psychological indicators in player development, particularly in Romania.

Keywords: Infrastructure development, infrastructure legacy, mega-event stadia, tourism development

Introduction

Over the last few decades, football has undergone a profound transformation in terms of athletic, tactical, psychological, and developmental demands placed on players. What once could suffice as elite-level performance in terms of endurance or technical consistency now must increasingly incorporate multidimensional qualities, including rapid acceleration, complex decision-making, mental resilience, and adaptability to varying tactical systems (Folgado et al., 2019). In recognition of this complexity, the notion of a modern football player needs to transcend unidimensional metrics and embrace a more holistic framework that addresses physical, technical, tactical, psychological, and educational components (Săvescu et al., 2024).

The shift to multidimensional perspectives in football science. Traditional research in football sciences has often focused on separate domains: biomechanics

and physical conditioning, technical skill proficiency, or tactical patterning. Yet, growing empirical evidence indicates that interactions among domains are essential. For example, performance in small-sided games is sensitive to pitch orientation, indicating that physical and tactical constraints modulate technical decisions (Folgado et al., 2019; Rahmoune et al., 2025). Further, integrative models that combine player tracking, event data, and contextual features (e.g., PlayeRank) aim to produce role-aware, multidimensional performance evaluations (Pappalardo et al., 2018; Leyhr et al., 2025).

Moreover, the predictive validity of combined multidimensional indicators (e.g. anthropometry, physical tests, psychometric scores) has been demonstrated in youth settings: Leyhr et al. (2025) report that integrating such data outperforms single-domain assessments in forecasting future success. In parallel, Sieghartsleitner et al. (2019) showed that combining coach assessments with multidimensional metrics enhances predictability over either alone. These studies underline that performance is emergent from synergistic interactions rather than additive sums of abilities (Sieghartsleitner et al., 2019; Huțanu et al., 2024; Leyhr et al., 2025). According to Bulz et al. (2026), the assessment of football performance should not rely solely on isolated physical tests but on an integrated analysis of anthropometric and functional indicators, as these variables jointly contribute to the athlete's performance profile (Savescu & Sandra, 2021; Herman et al., 2026).

Role of domain interactions and latent profiling. To move beyond simplistic "top performers" ranking, latent profile or clustering techniques allow researchers to classify athletes into performance typologies, revealing subgroups with distinct balance among dimensions (Seri et al., 2025). Such soft-membership models acknowledge that players can partially belong to multiple profiles, an important nuance in high-level sports where hybrid roles are common. These typologies then allow comparisons of the extent to which each dimension (e.g., psychological coping, technical consistency) contributes to profile differentiation.

In football, position-specific demands further complicate the picture. Recent studies show that wide players tend to accumulate more high-speed and sprint metrics, while central midfielders cover greater total distance (Schuth et al., 2015). Position-aware analyses thus need to embed domain interactions: e.g. a winger's explosiveness is more valuable if coupled with decision-making under pressure and spatial awareness.

Contextual and national perspectives: Romanian and regional research. While international sports science steadily moves toward integrated, big-data approaches, the Romanian context is less represented in multidimensional football research. Some local studies address discrete domains: Gherghel et al. (2021) implemented training programs to optimise explosive force in Romanian footballers, showing gains in physical capacity. Other works compare motion indicators between Romanian and Polish youth players in small-sided games, revealing national training differences (Jastrzębski et al., 2015; Gherghel et al., 2021; Şandra et al., 2022). That said, there is a notable research gap regarding holistic, statistically grounded models of the footballer in Romania.

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In related domains, Romanian scholars have also examined quality of life and psychological well-being among athletes (Erdely et al., 2020; Giurgiu et al., 2023; Predoiu et al., 2024), signalling growing attention to the "soft" side of athlete development. Incorporating such perspectives into performance profiling is valuable and reinforces the call for multi-dimensional frameworks in local sports science.

Given the evolving demands of elite football and the scarcity of integrative modelling in the Romanian (and regional) context, this study proposes developing a multidimensional performance profile of the modern football player. Specifically, by applying clustering and soft-membership statistical techniques to a heterogeneous sample of footballers, we aim to:

Identify latent performance profiles that organically emerge when physical, technical, tactical, psychological, and educational dimensions are considered jointly.

Determine which dimensions most discriminate among those latent profiles. Explore how these constructed profiles might inform practical implications in training design, talent identification, and athlete development pathways, especially in the Romanian/regional context.

By anchoring the research in both international frameworks and regional particularities, this article contributes to bridging local gaps in sports science and advancing the paradigm from unidimensional indicators to data-driven integrative modelling.

Methodology

Study Design

This study employed a quantitative, cross-sectional design to analyse multidimensional attributes of professional football players. The primary aim was to identify performance profiles across physical, technical, tactical, and psychological domains using large-scale secondary data sources. The methodological framework followed recommendations from applied sport science research regarding multidimensional profiling (Thomas & Nelson, 1996).

Sample and Inclusion Criteria

The dataset was compiled from publicly available databases and scouting platforms widely recognised in football performance analysis, including FIFA, Football Manager, Instat, WyScout, and Transfermarkt. These platforms provide standardised, continuously updated player evaluations based on match performance, expert assessments, and algorithmic modelling.

The initial dataset included over 18,000 active male professional players across more than 100 nationalities, with ages ranging from 16 to 40 years (M = 25.1 years, SD = 3.9). Only outfield players (defenders, midfielders, forwards) were considered for the main analysis, given the highly specific nature of goalkeepers' profiles. Players were categorised by official positions: central defenders (CB), full-backs (LB, RB), defensive midfielders (CDM), central midfielders (CM), attacking midfielders (CAM), wingers (LW, RW), and strikers (ST, CF). This ensured representation of all functional roles in modern football (Reilly et al., 2000).

Players registered with professional clubs in the first or second divisions worldwide. Availability of complete standardised attribute ratings (1–100 scale) across the four main dimensions (physical, technical, tactical, psychological). Active status in the 2023–2024 season.

Exclusion criteria were: Incomplete data on key performance attributes. Retired or inactive players. Goalkeepers (in analyses where attributes were non-comparable).

Variables and Dimensions

Attributes were grouped into four multidimensional categories, following both FIFA/Instat classifications and academic precedent (Stølen et al., 2005): physical: acceleration, sprint speed, stamina, strength, agility, balance, jumping. Technical: dribbling, ball control, passing (short and long), finishing, volleys, curve, free-kick accuracy. Tactical: positioning, interceptions, vision, tactical awareness. Psychological/Mental: composure, reactions, aggression, decision-making.

These categories reflect the multifactorial model of football performance, emphasising the interaction of motor, cognitive, and psychosocial elements (Weinberg & Gould, 2019).

Statistical Analyses

Data analyses were conducted using IBM SPSS Statistics (v.26) and Python (scikit-learn package). Four complementary techniques were applied: descriptive statistics, including means, standard deviations, and minimum and maximum values for each variable across positions and nationalities (Field 2013). ANOVA (Analysis of Variance): To test for significant differences in attributes across positions and nationalities. Significance was set at $p < .05$; Pearson's Correlation Coefficient (r): To examine linear relationships among physical and performance-related variables; Cluster Analysis (K-means): To identify latent player typologies based on multidimensional similarity. The optimal number of clusters was determined by the elbow method and silhouette coefficients.

Ethical Considerations

All data were secondary and publicly available in anonymised form, with no personally identifiable information collected. The study adhered to the ethical standards of the Declaration of Helsinki. Since no direct interventions with human participants were conducted, formal institutional ethics approval was not required, consistent with guidelines for secondary data research in sports sciences (Harriss & Atkinson, 2015).

Results

Physical Profiles Across European Nationalities

Descriptive statistics for the main physical attributes across selected European nationalities are presented in Table 1. Clear differences emerged between countries, consistent with both cultural playing styles and training traditions.

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Descriptive statistics for the main physical attributes by nationality are presented in Table 1.

Table 1. Descriptive statistics of physical attributes by nationality

Nationality	N	Acceleration	Agility	Balance	Jumping	Reactions	Sprint speed	Stamina	Strength
Belgium	262	63.8	63.8	63.1	65.5	63.5	64.2	60.2	65.0
England	1658	64.9	63.3	64.5	64.8	58.5	64.7	63.1	64.1
France	925	64.8	62.8	63.9	65.2	62.6	64.9	62.6	66.3
Germany	1199	63.4	62.3	62.3	65.1	62.1	63.8	62.6	66.8
Italy	655	63.5	63.2	63.2	65.4	64.7	63.5	62.2	65.2
Netherlands	441	64.3	62.0	62.0	66.1	63.4	64.4	62.6	66.6
Portugal	335	67.2	68.2	66.7	66.1	68.4	66.6	65.5	64.4
Romania	52	67.8	66.5	66.9	62.0	66.5	66.1	66.6	67.7
Spain	1070	63.8	64.1	64.7	64.9	65.5	63.6	63.4	63.5

Values represent group means for each attribute. N = *number of players included per nationality. The table presents mean values of selected physical attributes (range 0–100) for professional players across nine European nationalities. Attributes include acceleration, agility, balance, jumping ability, reactions, sprint speed, stamina, and strength. Higher values reflect better performance in each dimension.*

Portuguese players exhibited the highest mean values for acceleration (M = 67.2), agility (M = 68.2), and reactions (M = 68.4), reflecting the importance of explosiveness and quick decision-making in Iberian football. Similarly, Romanian players scored highest in acceleration (M = 67.8) and stamina (M = 66.6), suggesting that endurance-based training models continue to influence their player development system.

By contrast, German and Dutch players demonstrated superior strength (M = 66.8 and 66.6, respectively) and jumping ability (M = 65.1 and 66.1), aligning with their long-standing emphasis on physical duels and aerial dominance. Italian players displayed balanced profiles, particularly in balance (M = 63.2) and reactions (M = 64.7), which may support their tactical and defensive traditions.

Interestingly, English players showed relatively lower reaction scores (M = 58.5), which contrasts with their overall competitive level in international football and may indicate differences in how perceptual-cognitive skills are represented in rating systems. Spanish players, in turn, performed strongly in balance (M = 64.7) and reactions (M = 65.5), reinforcing their reputation for technical stability and anticipation.

These results highlight that national player profiles are not homogeneous but instead reflect a blend of genetic predispositions, football culture, and training methodologies. The Iberian nations (Portugal, Spain) emphasise agility and reaction, while Central and Northern Europe (Germany, Netherlands) excel in physical robustness, and Romania stands out in acceleration and stamina despite its smaller sample size (N = 52).

Position-Specific Physical Profiles

Descriptive statistics by playing position are summarised in Table 2. A visual comparison of sprint speed across positions is presented in Figure 1

Table 2. Descriptive statistics of physical attributes by playing position. Values represent group means; N = number of players in each positional role

Position	N (players)	Acceleration	Sprint Speed	Stamina	Strength	Jumping
CB	3084	57.4	59.3	64.4	75.8	70.1
LB	1324	72.3	72.2	71.6	63.9	67.6
RB	1342	72.8	72.8	72.3	64.8	68.1
CDM	1386	62.3	61.8	72.5	69.8	67.1
CM	2155	66.3	65.3	69.7	62.9	63.2
CAM	1046	71.4	69.7	63.4	55.6	59.8
LW	378	78.5	77.3	64.1	56.1	60.4
RW	356	78.9	77.9	64.8	55.1	59.2
ST	2516	69.2	70.2	64.6	69.5	68.2
CF	88	75.3	73.7	66.8	57.3	64.2

Values represent mean scores (0–100 scale). N = number of players per position. CB = central defender; LB = left back; RB = right back; CDM = central defensive midfielder; CM = central midfielder; CAM = central attacking midfielder; LW = left winger; RW = right winger; ST = striker; CF = centre forward.

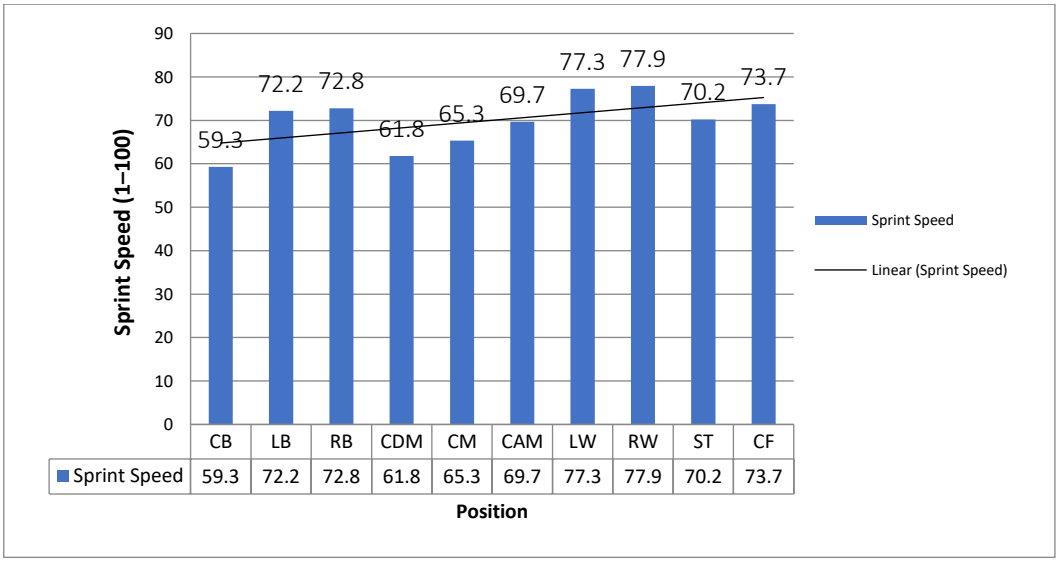

Figure 1. Comparison of mean sprint speed across different playing positions

Clear positional trends were observed. Central defenders (CB) displayed superior strength (M = 75.8) and jumping ability (M = 70.1), supporting their role in aerial duels. Full-backs (LB/RB) had the highest sprint speed (M ≈ 72.5) and stamina (M ≈ 72.0), consistent with the modern demand for overlapping runs. Central midfielders (CM/CDM) showed balanced profiles, with defensive midfielders excelling in stamina (M = 72.5). Wingers (LW/RW) achieved the highest acceleration (M ≈ 78.7) and sprint speed (M ≈ 77.6), crucial for one-on-one offensive situations. Forwards (ST/CF) combined strength (M ≈ 69.5) with above-average finishing-related physical attributes, reflecting their mixed demands for duels and quick scoring actions.

These results confirm that physical requirements are role-dependent. Wide players emphasise speed and agility, central defenders rely on power, and midfielders balance endurance with tactical intelligence.

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Correlations Between Physical and Performance Attributes

Pearson correlation coefficients for selected variables are presented in Table 3, while figure 2 provides a graphical representation of these relationships.

Table 3. Pearson correlation coefficients between selected physical and performance variables

Variable Pair	r	p-value	N
Stamina ↔ Age	0.1	<0.001	17954
Strength ↔ Jumping	0.29	<0.001	17954
Sprint Speed ↔ Acceleration	0.93	<0.001	17954
Balance ↔ Agility	0.77	<0.001	17954
Overall ↔ Reactions	0.86	<0.001	17954

r = Pearson correlation coefficient; p = significance level; N = number of players; all correlations significant at p < .001.

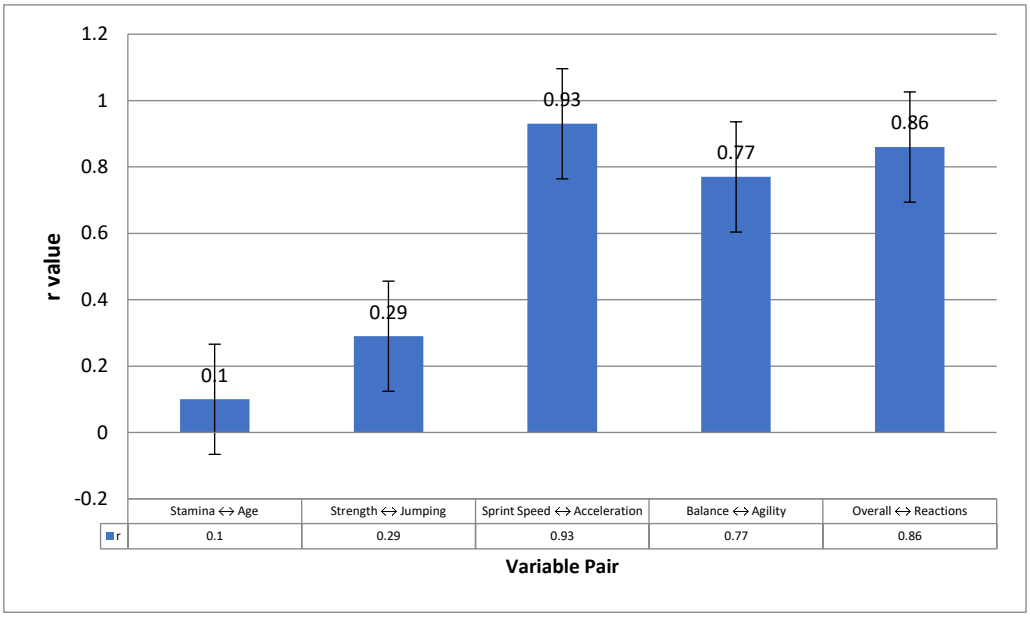

Figure 2. Pearson correlation coefficients (r) for selected physical and performance variables

Strongest association was observed between sprint speed and acceleration ($r = .93$, $p < .001$), indicating that these two indicators are almost inseparable in defining explosive performance. Balance and agility also correlated strongly ($r = .77$, $p < .001$), supporting the idea that motor coordination and stability are interdependent. Strength and jumping showed a moderate correlation ($r = .29$, $p < .001$), underscoring the importance of muscular force in vertical performance while also suggesting other contributing factors (e.g., timing, technique). Finally, overall rating correlated strongly with reactions ($r = .86$, $p < .001$), highlighting the central role of perceptual-cognitive speed in overall player valuation.

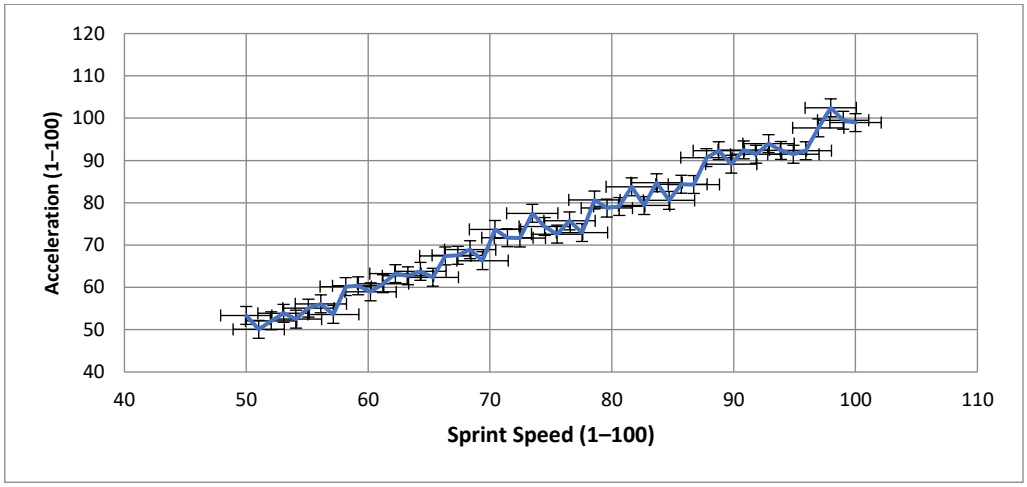

Figure 3. Scatterplot illustrating the relationship between sprint speed and acceleration

Interpretation: These results suggest that some variables (e.g., acceleration and sprint speed) are redundant when included simultaneously in predictive models, whereas others (e.g., strength vs jumping) offer complementary insights. The heatmap (Figure 4) clearly illustrates the spectrum of correlations, from weak to strong, allowing easy identification of performance clusters.

Cluster Analysis of Player Profiles

K-means clustering (k = 4, determined by the elbow method) identified four latent multidimensional profiles: Explosive Wingers – characterised by extreme acceleration, sprint speed, and dribbling. Physical Defenders – strong in strength, jumping, and aggression, with lower agility. Complete Midfielders – balanced across physical, technical, and psychological metrics, with superior stamina. Clinical Forwards – combining positioning, reactions, and finishing ability with physical robustness.

These clusters transcend positional boundaries, highlighting that performance typologies in modern football are multidimensional constructs rather than simple role-based categorisations.

Discussion

The present study aimed to construct multidimensional performance profiles in modern football, analysing nearly 18,000 players across positions and nationalities. Results confirmed that physical, technical, tactical, and psychological attributes interact in complex ways, shaping both positional requirements and emergent player typologies.

The finding that Portuguese and Spanish players scored highest in agility, acceleration, and balance, while German players excelled in strength and reactions, aligns with prior evidence that national football cultures emphasise distinct developmental pathways. For example, Reilly and Williams (2003) noted that Iberian football traditions prioritise technical coordination and quickness in confined spaces,

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while Central European systems historically emphasise physical robustness (Reilly, 1995; Reilly et al., 2003; Șandra et al., 2023). Similarly, analyses of international tournaments show that sprinting and agility differentiate successful teams, particularly in attacking transitions (Di Salvo et al., 2007). Romanian players' relative strengths in stamina and acceleration may reflect the legacy of endurance-based training emphasised in Eastern European countries during the late 20th century (Rață, 2012).

Our results confirm established position-specific demands. Central defenders rely on strength and jumping, wingers on explosive speed, and midfielders on balanced endurance and vision. These patterns are consistent with previous time–motion analyses (Stølen et al., 2005; Bradley et al., 2013). The finding that full-backs rank highly in both sprinting and stamina reflects the modern evolution of these roles: overlapping runs require a blend of repeated high-intensity sprints and sustained aerobic conditioning (Castagna et al., 2009).

Notably, the cluster analysis revealed that these demands are not absolute but multidimensional. For instance, some forwards cluster with wingers (explosiveness) or midfielders (vision and reactions), echoing the concept of "hybrid roles" in contemporary tactical systems (Carling, 2010).

The very strong correlation between acceleration and sprint speed ($r = .93$) suggests redundancy when both are included in predictive models. This supports arguments for dimensional reduction in performance analytics, where overlapping indicators are merged to avoid collinearity (Pappalardo et al., 2018). By contrast, moderate correlations (e.g., strength and jumping) indicate that distinct physiological or biomechanical components contribute to performance in aerial duels (Wisløff et al., 1998).

The strong link between overall rating and reaction time ($r = .86$) is particularly noteworthy. It reinforces recent evidence that cognitive-perceptual abilities (decision-making speed, anticipation) are increasingly valued in talent identification (Sieghartsleitner et al., 2019). This finding aligns with broader sport psychology literature emphasising the role of mental attributes in elite performance (Weinberg & Gould, 2019).

For practitioners, these results have several implications: talent identification: National scouting systems should recognise cultural biases (e.g., Iberian technical agility vs Eastern European endurance) and ensure that multidimensional evaluation compensates for potential blind spots. Training design: Position-specific conditioning should be tailored to: strength and jumping for defenders, repeated-sprint ability for wide players, and balanced endurance and tactical vision for midfielders. Data-driven profiling: Given the redundancy in some metrics, clubs should prioritise integrative indicators that capture essential variance (e.g., composite "explosiveness" metrics instead of separate acceleration and sprint speed). Holistic development: Psychological and cognitive factors, often underrepresented in traditional scouting, should be integrated into developmental programs, especially in Romania, where physical conditioning has historically dominated.

Conclusions

This study proposed and tested a multidimensional framework for profiling modern football players, integrating physical, technical, tactical, and psychological attributes across a large international sample. Several key findings emerged: national differences confirm that cultural and training traditions shape specific physical and technical advantages (e.g., Iberian agility vs Central European strength). Positional requirements highlight that full-backs and wingers prioritise speed and stamina, central defenders rely on power, and midfielders balance endurance with vision. Correlation analysis revealed redundancy among some metrics (e.g., sprint speed and acceleration), while others provided complementary insights (e.g., strength and jumping). Cluster analysis identified four latent performance typologies—Explosive Wingers, Physical Defenders, Complete Midfielders, and Clinical Forwards—demonstrating that multidimensional evaluation transcends rigid positional categories.

Practical implications include the need for talent identification systems to use integrated metrics, for training programs to be role-specific yet multidimensional, and for psychological attributes to be systematically included in player evaluation. For Romanian football in particular, these results underscore the need to move from endurance-dominated traditions toward holistic player development that values technical, tactical, and cognitive skills equally.

Future research should validate this multidimensional model in longitudinal settings (e.g., youth academies) and expand analyses with machine learning tools to predict performance trajectories more accurately.

In conclusion, the modern football player cannot be reduced to isolated abilities. Success emerges from the synergy of multiple dimensions, and adopting such integrative models represents both a scientific and a practical step forward for football development worldwide.

Limitations and Future Directions

Although this study analysed a large sample, several limitations remain. First, the reliance on secondary databases (e.g., FIFA ratings, scouting platforms) introduces subjectivity, as these ratings combine observational data with algorithmic estimates. Second, psychological and educational dimensions were limited to available metrics; future research should incorporate validated psychometric instruments and longitudinal tracking. Finally, goalkeepers were excluded; future multidimensional models should address their unique requirements.

Future directions include expanding the integrative framework to machine learning models that can predict success based on multidimensional interactions and validating these models in prospective cohorts of youth academies.

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