

Comparison of Speed-Related and Power-Related Variables Between First-Division and Second-Division Professional Soccer Players

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Abstract

Loturco, I, Requena, B, Tavares, LD, Mercer, VP, Moura, TBMA, Alexandre, MGA, Oliveira, LP, Nakamura, FY, and Pereira, LA. Comparison of speed-related and power-related variables between first-division and second-division professional soccer players. *J Strength Cond Res* XX(X): 000–000, 2026—This study investigated whether speed-related and power-related variables differ between professional soccer players competing in the first and second divisions within the same regional federation, where training conditions and testing procedures are standardized. One hundred fifty male players (first division: $n = 78$; second division: $n = 72$) performed countermovement jumps; linear sprints over 5, 10, and 20 m; a curvilinear sprint test; and jump squat (JS) assessments to determine peak velocity and peak power using a load corresponding to 40% body mass. Players from the first division consistently demonstrated superior performance across all tests, including higher jump height, greater JS peak velocity and JS peak power, and faster linear and curvilinear sprint speeds compared with second-division soccer players ($p < 0.05$; effect sizes = 0.40–0.89). These predominantly moderate differences indicate that speed and power meaningfully differentiate competitive levels in professional soccer, even when testing procedures and training environments are comparable. For coaches and performance staff, the findings highlight the practical value of routinely monitoring sprinting and power-related metrics and reinforce the importance of prioritizing the identification and selection of fast and powerful players, particularly in contexts where opportunities to substantially improve these neuromuscular qualities are limited.

Key Words: football, team sports, athletic performance, sprint speed, curved sprints

Introduction

Modern soccer is characterized by its intermittent and high-intensity nature, in which decisive situations (e.g., goal scoring and assists) frequently emerge from maximal or near-maximal efforts (18,41). Although overall match play is predominantly aerobic (41,51), critical actions such as sprints, accelerations, decelerations, changes of direction, jumps, and explosive technical skills (e.g., ball-related accelerative events) are underpinned by speed and power capacities (18,41). Indeed, match analyses consistently demonstrate that goals, defensive recoveries, and match-defining transitions are strongly associated with high-speed running and effective acceleration mechanics (2,13). Therefore, speed-related and power-related activities have become key determinants not only of match outcomes but also of individual career progression and collective team success within a tournament (3,18,27).

At the individual level, players with higher speed and power profiles are more frequently involved in decisive actions and are more likely to assume prominent roles in elite soccer leagues (14,25). When technical proficiency is comparable across professional soccer teams, sprinting speed and power may become

decisive factors underpinning effectiveness in key offensive and defensive transitions during matches and soccer-specific training sessions, with implications for competitive success across major tournaments (3,5). In elite soccer, where technical and tactical differences among top-level teams are often minimal, these physical characteristics may represent marginal advantages capable of differentiating winning teams from losing ones (13,18,41). Hence, speed and power capacities should not be viewed solely as complementary traits, but rather as foundational components of soccer performance (3,18,41).

The increasing recognition of the importance of speed-power variables has driven researchers and practitioners to explore and test innovative training strategies aimed at optimizing rapid force production, neuromuscular efficiency, and sprinting speed in soccer players (25,32,34). Over the past 2 decades, substantial efforts have been devoted to refining resistance training, power-oriented exercises, sprint-specific methods, and combined training methods (e.g., plyometric drills combined with strength-speed or resisted sprint training) (33,36,40). However, these attempts occur within the current context of elite soccer, characterized by congested fixture schedules and high match-related demands. Modern calendars, particularly in the most competitive leagues (e.g., Premier League and La Liga) (2,5,29), are increasingly congested, with limited recovery windows and reduced time available for adequate physical preparation

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(12,17). As a result, coaches face the challenge of implementing strategies that are not only effective but also time efficient and compatible with the practical requirements and realities of contemporary soccer.

These constraints and limitations have critical consequences for the proper assessment and prescription of neuromuscular training and its associated adaptations (8,12,22). In contemporary soccer, the available time for speed-power testing and development is often restricted, increasing the importance of tailored interventions, integrated training approaches, and precise athlete profiling (42). Accordingly, the identification of meaningful benchmarks and understanding of how these capacities differ across competitive levels may serve as a basis for informed decision-making (42,47). Identifying which neuromechanical qualities can potentially differentiate players competing at distinct levels may inform training priorities, talent identification, and squad composition across real-world settings.

Despite the growing body of literature on physical demands and performance characteristics in soccer (7,50), an important gap remains. To date, no study has directly compared the speed and power measures of players competing in different divisions affiliated with the same soccer federation and exposed to comparable coaching principles and structural conditions. This distinction is crucial because interleague comparisons are often confounded by differences in competitive formats, training culture and processes, and access to sport science research and knowledge (9,14,47). Evaluating athletes within a single regional federation, where methodological standards, testing protocols, and support facilities are relatively consistent, offers a unique opportunity to isolate performance-related variables that are usually attributable to competitive level.

In practical terms, these comparisons may have substantial implications for athlete selection, recruitment strategies, and team composition. Several studies have shown that improvements in sprinting speed and power tend to stabilize with increasing age and competitive level, indicating that the scope for further enhancement becomes progressively smaller in highly trained athletes (23,24,30). In this context, even relatively modest differences in sprint speed or power production may reflect meaningful performance distinctions associated with inherited characteristics rather than training-induced responses (30,31). Determining whether these characteristics clearly distinguish first-division from second-division soccer players could provide valuable insight for head coaches and their staff when selecting athletes with the attributes required for a given tournament.

Thus, the primary purpose of this study was to compare the speed-related and power-related variables between professional soccer players competing in the first and second divisions within the same regional federation. This regional federation provides consistent scientific and technical support to all teams, regardless of division, thereby minimizing potential confounding factors related to testing and training practices. Within this standardized environment, the present investigation is aimed at determining whether athletes playing at different competitive levels exhibit distinct physical profiles. Based on the decisive role of these capabilities in modern soccer and their relevance for high-level performance (3,5,18,41), it was hypothesized that first-division soccer players would demonstrate superior speed and power qualities when compared with their second-division counterparts.

Methods

Experimental Approach to the Problem

This cross-sectional correlational study investigated the differences between professional soccer players of distinct competitive levels. After a general and specific warm-up, consisting of 10 minutes of light-to-moderate running, dynamic stretching, and submaximal attempts at each test, players performed the following assessments in the same order: countermovement jumps (CMJs), linear sprints (5, 10, and 20 m), a curvilinear sprint test, and the measurement of peak power (PP) and peak velocity (PV) in the jump squat (JS) exercise using a load corresponding to 40% body mass (BM). All assessments were conducted on the day of the players' return to training, starting precisely at 9:00 AM, at the beginning of the preseason. Given their professional routines, players were already familiarized with all testing procedures. The protocols were previously defined by the scientific department of the Paulista State Football Federation (PSFF), the most important regional football federation in Brazil. Such routines are part of a collaboration between the PSFF and soccer clubs lacking the resources and facilities necessary to establish their own sport science departments. This cooperation involves not only the execution of physical measurements but also the development of a detailed and structured strength-power training program conducted in conjunction with the coaching staff of the clubs participating in this study. Therefore, despite some differences in training facilities, the training principles related to exercise type, loading conditions, training frequency, and training modalities were highly consistent across the clubs. Furthermore, the players included in the sample (mean age of ~23 years) had accumulated at least 5–6 years of experience in structured strength-power training programs. Importantly, several players had already competed in both divisions (i.e., the first and second divisions), which further reinforces the similarity in training background among the athletes evaluated. All players involved in the study, irrespective of soccer division (i.e., first or second division), were assessed after a transition period (i.e., off-season) lasting between 30 and 35 days, thereby ensuring that all subjects experienced the same detraining period.

Subjects

A convenience sample of 150 male soccer players from 3 first-division ($n = 78$; age: 22.8 ± 4.7 years; age range: 18–35 years, height: 179.6 ± 7.2 cm; BM: 78.0 ± 8.0 kg) and 3 second-division ($n = 72$; age: 21.6 ± 5.0 years, age range: 18–36 years, height: 177.8 ± 6.9 cm, BM: 76.4 ± 7.6 kg) soccer clubs participated in this study. These athletes competed in the Paulista State Championship, the most important regional soccer tournament in the country (Brazil). The study was approved by the ethics committee of the Federal University of São Paulo, and all athletes provided written informed consent before participation.

Procedures

CMJ Test. Vertical jump height was assessed using the CMJ. Players executed a downward movement followed by full extension of the lower limbs, with the depth of the countermovement freely determined to avoid alterations in jumping coordination. All jumps were performed with hands on the hips. Each player performed 5 jump attempts, with 15-s intervals between trials. The tests were conducted using a contact platform

(Elite Jump System; S2 Sports, São Paulo, Brazil), and the best attempt was used for data analysis.

Sprinting Speed. Sprint speed was assessed on an indoor running track specifically designed for sprint testing. Four pairs of photocells (Elite Jump System; S2 Sports) were positioned at the starting line and at distances of 5, 10, and 20 m. Players performed 2 sprints, starting from a staggered stance position 0.5 m behind the first pair of timing gates. Sprint speed was calculated by dividing the distance traveled by the time taken over each respective distance. A 5-minute rest interval was allowed between trials, and the fastest sprint was used for analysis.

Curvilinear Sprint Test. The curvilinear sprint test was performed as previously validated and described (19). The sprint trajectory followed the semicircular arc of the goalkeeper area on an official soccer field, standardized as follows: a radius of 9.15 m (from the penalty spot), a straight-line distance of 14.6 m between the initial and final points, an amplitude angle of 105.84° from the penalty spot, and a curvilinear distance of 17 m determined through trigonometric analysis. The test was conducted outdoors on natural turf. During the assessments, players wore their own soccer cleats, which they routinely use for training and testing sessions under similar conditions. Two pairs of photocells (Elite Jump System; S2 Sports) were placed at the start and end of the curvilinear trajectory. Players performed 2 sprints to each side, and the fastest times from both the right and left sides were used for analysis. The best attempt on each side (right and left) was retained for analysis. Between these 2 attempts, the fastest time (or highest speed) was considered the “good side,” whereas the slowest time (or lowest speed) was defined as the “weak side” (19).

Bar Velocity and Power in the JS Exercise. PV and PP were assessed in the JS exercise using a load corresponding to 40% BM. The measurement was performed on a Smith machine (Hammer Strength Equipment, Rosemont, IL). Players executed 3 repetitions at maximal intended velocity, with 15-second intervals between attempts. A linear velocity transducer (T-Force, Dynamic Measurement System; Ergotech Consulting S.L., Murcia, Spain), sampling at 1,000 Hz, was attached to the barbell to measure bar velocity and calculate mechanical variables. Data were normalized by dividing the absolute power values by the athletes’ BM ($\text{W} \cdot \text{kg}^{-1}$). The highest value of each variable collected was used for analysis.

Statistical Analyses

Data are presented as means $\pm$ SDs. Data normality was checked through visual inspection of Q-Q plots and using the Shapiro-Wilk test. Comparisons between the first-division and second-division soccer players were performed using an independent samples *t* test. The significance level was set at $p < 0.05$. Cohen’s *d* (10) effect sizes (ES) were calculated to estimate the magnitude of significant differences and interpreted according to the thresholds proposed by Rhea (48) for highly trained subjects: <0.25 (trivial), 0.25–0.50 (small), 0.50–1.00 (moderate), and >1.00 (large). Absolute and relative reliability of the dependent variables were assessed using the coefficient of variation and 2-way random-effects intraclass correlation coefficient, respectively, using the different attempts of each test (within-session).

Results

All data were normally distributed and showed high levels of reliability (intraclass correlation coefficient and coefficient of variation = 0.97 and 3.1%, 0.94 and 1.0%, 0.91 and 1.1%, and 0.96 and 3.2% for CMJ, sprint speed, curvilinear sprint, and JS PV, respectively). Table 1 summarizes the comparison of CMJ height, JS PV, and JS PP between first-division and second-division soccer players. Players from the first division exhibited higher vertical jump performance as well as greater JS PV and JS PP compared with second-division soccer players ($p = 0.006$, $p = 0.004$, and $p < 0.001$, respectively; ES ranged from 0.46 to 0.89).

Table 2 shows the comparison of sprinting speed across the different distances tested and curvilinear sprint performance between first-division and second-division soccer players. Players from the first division demonstrated higher linear and curvilinear sprint speeds across all distances compared with second-division soccer players ($p < 0.05$; ES ranged from 0.40 to 0.63).

Discussion

The aim of this study was to compare speed- and power-related variables between professional soccer players competing in the first and second divisions within the same regional federation (i.e., PSFF), where strength and conditioning training practices, testing protocols, and scientific support are relatively standardized. The main finding was that, as expected, first-division players outperformed their second-division counterparts in all tested variables, including CMJ height, JS PV and JS PP, sprint speed over short and intermediate distances (i.e., 5–20 m), and curvilinear sprint speed on both the dominant and nondominant sides. These findings suggest that superior speed and power profiles might contribute to explaining not only the presence of these players in top soccer clubs but also the competitive positioning of their teams within the first division (7,13,50). From a practical standpoint, this is an important consideration for head coaches and their technical staff, given the accumulating evidence that improvements in speed and power capacities, especially sprint speed, are extremely limited both in adulthood and in older youth development programs (23,24,32).

Indeed, a growing body of literature has demonstrated that sprint speed and, to a lesser extent, power output in adult athletes from different sports (e.g., U20 and senior players) tend to plateau relatively early in their professional careers (1,23,32). Rather than exhibiting continuous or linear improvements, speed-related capacities seem to show markedly reduced trainability once athletes reach advanced competitive levels (23,24,32). It has been repeatedly reported that improvements in sprint performance are inversely related to training status, with highly trained soccer players showing substantially smaller gains than amateur or semiprofessional players exposed to similar training interventions (25,32,49). Furthermore, sprint performance has been shown to

Table 1
Comparison of countermovement jump (CMJ) height, jump squat peak velocity (JS PV), and jump squat peak power (JS PP) between first-division and second-division soccer players.

	1st division	2nd division	<i>p</i>	ES (95% CI)
CMJ (cm)	47.6 $\pm$ 4.5	45.3 $\pm$ 5.9	0.006	0.46 (0.13–0.79)
JS PV ($\text{m} \cdot \text{s}^{-1}$)	2.29 $\pm$ 0.16	2.20 $\pm$ 0.20	0.004	0.48 (0.15–0.80)
JS PP ($\text{W} \cdot \text{kg}^{-1}$)	16.1 $\pm$ 2.1	14.2 $\pm$ 2.3	<0.001	0.89 (0.54–1.24)

*ES = effect size; CI = confidence interval.

Table 2

Comparison of sprinting speed across the different distances tested and curvilinear sprint (CS) performance between first-division and second-division soccer players.

	1st division	2nd division	<i>p</i>	ES (95% CI)
5-m (m·s ⁻¹)	4.93 ± 0.17	4.79 ± 0.33	0.002	0.51 (0.18–0.84)
10-m (m·s ⁻¹)	5.80 ± 0.15	5.70 ± 0.27	0.005	0.46 (0.13–0.79)
20-m (m·s ⁻¹)	6.80 ± 0.16	6.72 ± 0.23	0.017	0.40 (0.07–0.72)
CSWS (m·s ⁻¹)	5.98 ± 0.29	5.80 ± 0.36	0.001	0.55 (0.21–0.96)
CSGS (m·s ⁻¹)	6.19 ± 0.28	5.99 ± 0.35	<0.001	0.63 (0.29–0.96)

*WS = weak side; GS = good side; ES = effect size; CI = confidence interval.

decline relatively early, with reductions in sprint speed often observed from early adulthood onward (≈ 22 –28 years) (23,24), which may pose an additional challenge for squads composed of older, highly experienced players. This limitation becomes even more pronounced when considering that improvements in acceleration capacity (i.e., from 0 to 10 m) seem to be even more resistant to change than improvements in top-speed performance (23,24,32).

This issue is particularly relevant in soccer because most decisive actions, such as goals and assists, are typically preceded by short sprints, often ranging from 5 to 10 m (13,18). Within this context, several practical strategies may be essential to improve or, at least, preserve speed-related capacities throughout the competitive season. Among these recommendations, reducing excessive exposure to soccer-specific training volume (e.g., technical and tactical training, small-sided games)—characterized by high aerobic and metabolic loads—may represent a critical factor, as excessive volumes of endurance-based stimuli have been shown to interfere with neuromuscular qualities underpinning sprint speed and power performance (4,22,28). Nonetheless, these strategies are not always feasible, especially in teams with limited squad size or when older, key players are required to sustain high match exposure because of their technical and tactical roles (3,16,17).

Power development represents another major challenge faced by practitioners working in professional soccer environments, largely because of the limited time available for complementary training during congested fixture schedules (17,22,53). Consequently, the pursuit of effective and time-efficient training strategies becomes essential. In this regard, resistance training sessions characterized by a low number of sets and repetitions, light-to-moderate loads, and execution at high movement velocities may represent a viable and effective approach, including when integrated into warm-up routines preceding sport-specific training sessions (37,46,52). The consistent use of ballistic exercises (e.g., loaded JS), which naturally preclude a deceleration phase throughout the entire range of motion, may further enhance the effectiveness of these interventions because of their neuromechanical similarity to a range of sprinting and jumping tasks (11,35).

In addition, plyometric exercises performed on field or on alternative surfaces (e.g., sand or hard surfaces) may provide practical means to improve power output and other neuromuscular components, such as the stretch-shortening cycle and muscle stiffness, which are also fundamental to acceleration and sprint performance (38,44,45). Most plyometric drills are performed without external loading, facilitating their inclusion within warm-up routines, including on match days (44,46,52). These approaches, however, require appropriate prefamiliarization of players, adequate exercise selection, and correct

implementation by strength and conditioning coaches, emphasizing low volume, unloaded (e.g., hurdle jump and drop jump) or with light external loads (e.g., alternate bounds using light weighted vests), while maintaining maximal intended movement velocity across all repetitions (37,39,43). As a practical note, clubs participating in this scientific program receive individualized guidance on the implementation of ballistic and plyometric training strategies within regular training routines, based on evidence generated by studies conducted by the PSFF scientific department (32–36,44–46).

Despite continuous advances in training and monitoring methodologies, speed-related capacities seem to represent a relatively stable attribute, that is, an intrinsic performance characteristic of the athlete (23,26,31). Even in speed specialists such as elite sprinters, whose training is almost exclusively focused on speed development, long-term improvements tend to be minimal and nonlinear, often characterized by successive periods of stagnation or decline (23,26,31). This suggests that, irrespective of sport discipline, athletes may exhibit a relatively narrow window for relevant speed development. Similar trends have been reported for power-related capacities in highly trained athletes from numerous sports (1,15,49), although some acute and chronic strategies, such as the use of ballistic exercises as priming activities or combined training models, may still elicit positive but limited performance responses (20,21,37). In team sports, where congested calendars and concurrent training effects are frequently observed, these upper limits of adaptation are likely even more constrained because of cumulative training effects and competitive demands (12,22,42). Collectively, the present findings align with previous theoretical perspectives and empirical evidence, reinforcing the notion that selecting fast and powerful athletes, who are able, for example, to jump higher, accelerate faster, and perform agility maneuvers more effectively, represents a fundamental strategy for building competitive soccer teams (23,25,47). Finally, as mentioned earlier, it is worth noting that, during specific phases aimed at maximizing neuromechanical adaptations, the technical staff is also advised to appropriately adjust the overall volume of technical-tactical training to minimize potential interference effects associated with concurrent training demands (6,22,28). In this context, the strategic use of substitute or nonstarting players may be particularly important because excessive exposure to aerobic-based training and match demands may further compromise the development of speed and power capacities throughout the competitive season (6,22).

Some limitations of this study should be acknowledged. First, the cross-sectional design precludes causal inferences regarding the development of neuromuscular qualities across competitive soccer levels. In addition, playing position was not considered in the analyses, despite the well-established differences in positional demands and physical requirements in professional soccer. Nevertheless, the current findings reinforce previous evidence highlighting the important role of sprinting speed and power in soccer (18,25,32). Longitudinal studies are warranted to examine whether players from different divisions respond similarly or differently to specific speed and power training interventions. However, existing evidence, including data from specialized populations such as elite sprinters and long jumpers, provides reasonable support for the notion that these adaptations would likely occur with comparable magnitude across competitive levels (25,32). Future investigations are required to confirm these assumptions and further elucidate the long-term trainability of speed-related and power-related capacities in professional soccer.

Practical Applications

The present findings indicate that speed-related and power-related capacities may differentiate professional soccer players competing at distinct competitive levels. From an applied perspective, these results reinforce the importance of prioritizing the identification, selection, and development of fast and powerful players, particularly in environments where technical and tactical proficiency is relatively homogenous. Given the limited trainability of sprint speed and power at advanced competitive levels, even small interplayer differences in these physical attributes may translate into meaningful advantages during decisive match actions (2,18,29). For head coaches and technical staff, the data suggest that systematic monitoring of sprint speed, jumping performance, and power-related metrics may provide valuable information to support athlete profiling, talent identification, and recruitment strategies. In highly congested competitive calendars, where time for complementary training is extremely restricted, attempting to at least maintain speed and power qualities becomes fundamental in contemporary soccer. Accordingly, modern training interventions should prioritize time efficiency, low training volume, the use of light-to-moderate loads, and high movement velocity, without imposing excessive metabolic or mechanical loads on players who are already exposed to the high physical demands inherent to modern soccer (7,12,22). The results also highlight the need for careful selection and management of nonstarting players because the strategic use of these athletes to replace players accumulating greater training and match loads may represent an effective approach to preserving neuromuscular qualities throughout the competitive season (6,22,23). These complementary (yet relevant) practices and principles can be easily integrated into warm-up routines without negatively affecting technical performance in subsequent soccer-specific activities. Collectively, these findings support the adoption of a training approach in which speed and power are considered key qualities underpinning competitive success in professional soccer, informing both long-term athlete development and short-term squad planning and rotation decisions.

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