ORIGINAL ARTICLE

Analyzing physical determinants of sprint performance with the ball in semi-professional soccer

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ABSTRACT

Speed, strength, and the player's technical skills are among the essential attributes of soccer performance. This study aims to investigate the extent to which tests on selected physical components can predict performance in speed tests in the presence of a soccer ball. Thirty-four semi-professional soccer players participated in this study. Pearson's product-moment correlation was used to determine the relationship between variables. Linear multivariate regression was used to construct a model from the variables (3 speed and 12 strength variables) to predict the time for 10 m and 30 m sprints with the ball and the time for change of direction speed with the ball. Our selected predictors did not show a significant correlation between the 10 m sprint with the ball and the change of direction speed with the ball. The 30 m sprint with the ball was strongly correlated (r = 0.59) with the 30 m linear sprint without the ball. A regression model with independent variables was statistically significant and identified the 30 m sprint as the only predictor ($F1,32 = 17.332$, $p < .001$, Adj $R^2 = 0.331$, SEE = 0.157), which can explain 33.1% of the variability of the data in the 30 m sprint with the ball. Our study supports the claim that the development of running speed with the ball is justified in a soccer environment. Incorporating these exercises into the training process may positively impact match performance.
Keywords: Performance analysis, Technical skills, Team sports, Linear regression.

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INTRODUCTION

Soccer is a complex sport. From a physical performance point of view, one finds that the sport requires aerobic, anaerobic, speed, strength, and agility (Sporiš et al., 2011). These components require approximately 1300 movements during a match (Chaouachi et al., 2012). Therefore, the ability to perform quick movements together with changes of direction in soccer and other sports is one of the most critical skills to acquire to improve performance (Beato et al., 2018). Physical performance is accompanied by different factors, such as the technical component of performance (Brito Souza et al., 2020; Hoff, 2005; Konefał et al., 2019). In recent years, soccer has accelerated considerably, as shown by the progress made in the top leagues regarding speed of work with the ball, sprint distance, and number of sprints (Loturco et al., 2019; Wallace & Norton, 2014). Despite the proliferation of methods now available to assess game activity, it is generally accepted that elite players cover around 9–14 km per game, mainly at low intensities (Bradley et al., 2010; Di Salvo et al., 2009; Wisløff et al., 2004). Assuming that a soccer match is 100% of the distance travelled, the players' movement is around 7–12% at high intensity. When sprinting, it is slightly less, amounting to 1–4% (Bush et al., 2015). Di Salvo et al. (2010) also agree with the distance run at high intensity, around 10%; however, they also state that the distance covered in a sprint ranges from 1 to 12%.

One of the predictors of success in soccer matches is the technical indicator of ball possession (Bradley et al., 2013; Jones et al., 2004; Lago-Peñas & Dellal, 2010). Teams with less ball possession can still be successful, but match progression and related tactics are essential (Link & Hoernig, 2017). Several previous studies have shown that possession of the ball positively affects the team's success in the match. When the team is in possession during the match, it means that they can create more attacking plays, which is closely related to the creation of scoring opportunities and, ultimately, scoring the goal itself. Possession of the ball allows the team to initiate the flow of the match at the appropriate moment and also increases the psychological and physiological strain, which increases the chances of positive match outcome (Wang et al., 2022). Running with the ball is incredibly challenging, as the path taken with the ball changes with each touch. This process involves complex and subtle dynamics of the body's movements when interacting with the ball (Hong et al., 2019). In professional matches, only 1.2 to 2.4% of the total distance is covered in the presence of the ball, with the distance also depending on the playing position of the player (Carling, 2010; Di Salvo et al., 2007; Marzouki et al., 2023). Recently, many researchers have shown that running at any speed alone is not associated with a better result in a soccer match. On the contrary, the distance covered with the ball was related to the team's position in the league, which implies that the respective team must have achieved good results (Brito Souza et al., 2020). The speed of the ball is also of great importance, as this indicator is considered essential when trying to achieve a positive result in the match (Zago et al., 2016).

During a soccer match, the lower limbs have to produce a lot of force for the player to perform specific movements such as acceleration, deceleration, jumping, landing, rotational movements, sudden changes of direction, etc. (Maly et al., 2014). Muscle strength plays a vital role in sports performance and injury prevention. The knee extensors are mainly involved in sprinting, jumping, and kicking the ball. The knee flexors contribute to the flexion of the knee joint to improve athletic performance and stabilize the knee (Lehance et al., 2009). Therefore, predicting isokinetic muscle strength (predicting the state of muscle strength) is essential for performance in a soccer match (Eniseler et al., 2012; Śliwowski et al., 2017). Isokinetic dynamometry is used to predict strength components as one of the most reliable and commonly used methods to assess muscle strength levels (Juneja et al., 2012). A slower muscle contraction is used to engage most motor units. Therefore, isokinetic testing at slower angular velocities of 60°/s is a much better reflection of the composite strength component of the athlete (Fousekis et al., 2010). On the other hand, testing at an angular velocity of 240°/s reflects functional activity (Wilk et al., 2024).

In a study by Kabacinski et al. (2022), the investigators explored the correlation between the testing of soccer players' muscular strength using an isokinetic dynamometer and their performance in selected tests of speed abilities, including agility. The results of the Pearson correlation demonstrated a statistically significant relationship between the time taken to complete the agility T-test and the strength of the knee joint flexors, measured on an isokinetic dynamometer at an angular velocity of 300°/s (p = .017; r = 0.513) and 60°/s (p = .009; r = 0.557). Sporiš et al. (2011) investigated the relationships between speed, agility, and ball agility tests on a sample of 25 elite young soccer players. The correlation between the zigzag test and the ball zigzag test reached a value of r = 0.479. The specific variables were monitored using an isokinetic dynamometer, and tests were performed to determine the level of speed abilities in a study by Cometti et al. (2001). The aforementioned study also emphasized the maximum velocity of the ball at the point of impact during shooting, which is a significant aspect in the context of a soccer match, along with the respective variables. Makhlouf et al. (2022) demonstrated a relationship between the Illinois change-of-direction test with the ball and the countermovement jump and triple-hop test (r = -0.46 and r = -0.49). The results indicate that vertical and horizontal jump performance can significantly impact COD ability with the ball during the transition phase from deceleration to acceleration in elite soccer players. While the relationships between strength and speed abilities are well established, the strength and speed parameters of running with the ball are somewhat absent in the studies.

The aim of this study is to investigate the extent to which tests on selected physical components can predict performance in speed tests in the presence of a soccer ball. This study assumes that only the minimum time and distance covered during a soccer match are relevant when the ball is present. The ability to accurately detect and potentially predict the given performance (sprint with the ball) could be crucial in achieving a favourable outcome in a soccer match.

MATERIAL AND METHODS

Participants

A total of thirty-four soccer players (age: 21.62 ± 2.19 years, body height: 180.89 ± 6.41 cm, body mass: 76.5 ± 7.49 kg) competing at the semi-professional level (3rd to 5th divisions in the Czech Republic) participated in this study. Given the specific nature of goalkeeper roles, this study deliberately excluded them from the scope of its investigation. Participants must have been active soccer players for at least 10 years. Players completed 3–4 training units of 1.5–2 hours per week and one match per week. All participants were informed about the research and provided written informed consent to participate. The study was conducted in accordance with the Declaration of Helsinki and was approved by the Research Ethics Committee of Masaryk University (EKV-2016-096).

Procedures

The speed test was performed on a wooden surface within the indoor area. A period of 48 hours was observed prior to the commencement of the initial measurement, during which time the participants were prohibited from engaging in high-intensity physical activities. Single-beam photocells (Brower Timing Systems, Draper, Utah, USA) were used for the speed tests, with the resulting test time recorded with an accuracy of 0.01 seconds. The tests completed by the participants comprised a 10-metre sprint, a 30-metre sprint, as illustrated in Figure 1, and a 30-metre double 100° change of direction, as depicted in Figure 2 (Young et al., 2001). When changing direction, the players circumvented a cone measuring 30 cm in height and were instructed to run behind it. If a player touched the cone or dropped it, the test was terminated, and a new attempt was initiated following a two-minute rest period. The initial trials were completed without the ball, followed by subsequent trials with the ball. For the 30-meter tests to be successful, the participant had to make at least four ball contacts with his feet. In the 10-meter section, the participants were required to make at least two ball contacts. Before the commencement of the actual testing, a standardized warm-up was conducted, followed by two attempts from each test. The participants began each trial in a two-point stance. Each test was completed twice, with a two-minute interval between each attempt. The better time achieved in a given test was always used as the result.

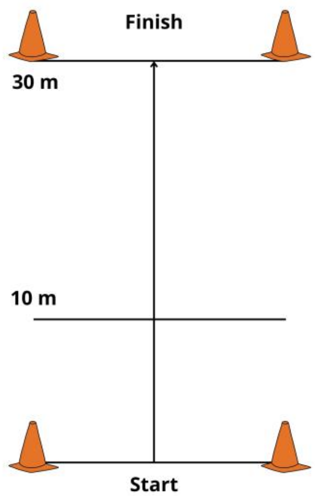

Figure 1. Sprint for 30 m with a split of 10 m.

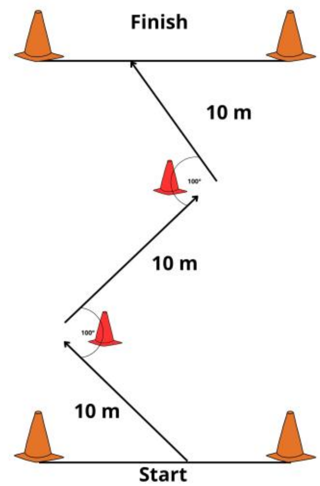

Figure 2. Sprint for 30 m with two changes of direction at an angle of 100°.

The knee flexors and extensor levels were determined using a Humac Norm CSMI dynamometer (Computer Sports Medicine Inc, Stoughton, MA, USA). The testing was conducted in a seated position, utilizing both isometric and isokinetic modes. In the isokinetic mode, an angular velocity of 60°/s and 240°/s was selected, with flexion and extension being measured. An angular velocity of 90°/s was employed in the isometric mode. The right limb was first tested in both modes, followed by the left. Only the trials with the highest achieved power were recorded as measured by angular velocity in degrees per second. Five submaximal repetitions were performed to achieve the maximum power output, with the movement's intensity increasing with each repetition. Each trial commenced with a familiarization phase, after which the subsequent five trials were conducted with a continuous increase in force output. The force exerted during each repetition was incrementally increased by 20% from the preceding attempt until the fifth attempt; at this point, the force reached precisely 100% of the subject's maximal output. A 30-second recovery period was then initiated, after which five repetitions were conducted at the maximum strength intensity. The data employed in the study comprise the maximum values attained in the five performed attempts for concentric flexion and concentric extension. Furthermore, the gravitational constant was also considered.

The following exercises were selected to determine the maximum strength value of the knee flexors and extensors. The lying leg curl workout machine was employed to assess the knee flexors. The seated leg curl workout machine was employed to determine the knee extensors. To ascertain the one-repetition maximum (1RM), the methodology depicted in Figure 3, known as the Baechle protocol, was employed (Baechle et al., 2008). Before the start of the testing, a standardized warm-up was conducted, comprising a warm-up and dynamic stretching. The weight selected was anticipated to enable the completion of five to ten repetitions. Following a one-minute interval, the load was increased, and three to five repetitions were performed, after which a two-minute rest period was initiated. The load was increased once more, and two or three repetitions were performed. This procedure was followed by a three-minute rest interval, after which the load was increased again, and a final attempt at the one-repetition maximum level was made. If this attempt succeeded, a three-minute interval was observed, and the load was increased again. At this point, the final value of the one-repetition maximum was approaching. If the attempt at the expected one-repetition maximum was unsuccessful, a three-minute interval was observed, and the load was reduced.

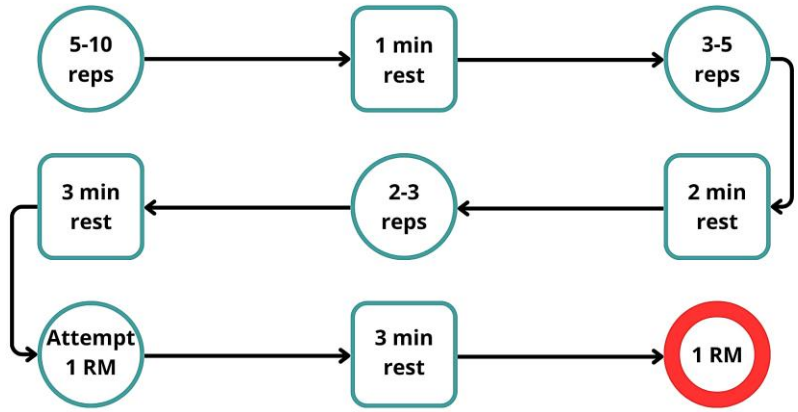

Figure 3. Baechle protocol for 1RM.

Statistical analysis

Data are presented as mean ± standard deviation. The Shapiro-Wilk's test was used to verify the normality of the data distribution, which detected a normal distribution. Pearson's product-moment correlation (r) determined the relationship between variables. The correlation coefficient was interpreted as: trivial (0–0.1), small (0.11–0.3), moderate (0.31–0.5), large (0.51–0.7), very large (0.71–0.9), and almost perfect (0.91–1.0) (Hopkins, 2000).

Linear multivariate regression (enter method) was used to calculate a model from the resulting variables to predict the time in 10 m and 30 m sprints with the ball and the time at the speed of changing direction with the ball. Based on the Pearson correlation, the independent variables with an intercorrelation higher than 0.7 were considered redundant and were removed from the model. Adjusted R squared (Adj R^2) showed us how much percent of the variability of the dependent variable is explained by the independent variables included in the model. The variance inflation factor (VIF) checked the data's multicollinearity. A VIF >10 indicates the presence of more severe multicollinearity (Vincent & Weir, 2012). The level of statistical significance was set at $p \leq .05$. All tests were performed using the statistical software IBM SPSS 28 (IBM Corporation, Armonk, NY, USA) and open-source software JASP (v. 0.19.1) (University of Amsterdam, Amsterdam, Netherlands).

RESULTS

The mean values (± standard deviation) of performances in all speed and power tests are presented in Table 1. The correlation matrix showing Pearson correlation coefficients (r) between all outcome variables is presented in Figure 4. Due to multicollinearity between independent variables (r > 0.7), the following variables were included in the resulting models for tests with the ball: 30 m sprint, change of direction speed, 1RM extension, flexion with the dominant leg in angular velocity of 60°/s, extension with dominant leg in angular velocity of 240°/s, and isometric extension dominant leg.

Table 1. Descriptive statistics of speed and strength performance tests.

Test	Mean	Std. Deviation
Speed tests with the ball		
Sprint_10m_B [s]	2	0.09
Sprint_30m_B [s]	4.73	0.19
CODS_B [s]	7.11	0.38
Speed tests without the ball		
Sprint_10m [s]	1.83	0.06
Sprint_30m [s]	4.33	0.13
CODS [s]	5.92	0.19
Strength tests		
EXT_1RM [kg]	73.5	10.1
FLEX_1RM [kg]	70.79	10.34
EXT_DOM_60 [°/s]	209.56	28.68
EXT_NDOM_60 [°/s]	202.09	30.9
FLEX_DOM_60 [°/s]	119.32	22.23
FLEX_NDOM_60 [°/s]	110.56	21.98
EXT_DOM_240 [°/s]	124.41	16.73
EXT_NDOM_240 [°/s]	123.74	16.78
FLEX_DOM_240 [°/s]	83.06	15.03
FLEX_NDOM_240 [°/s]	77.74	17.17
ISO_EXT_DOM	264.15	39.47
ISO_EXT_NDOM	263.15	45.74

Note. Sprint_10m_B – sprint 10-meters with the ball; Sprint_30m_B – sprint 30-meter with the ball; CODS_B – change of direction speed with the ball; Sprint_10m – sprint 10-meter; Sprint_30m – sprint 30-meter; CODS – change of direction speed; EXT_1RM – knee extension one-maximal repetition; FLEX_1RM – knee flexion one-maximal repetition; EXT_DOM_60 – isometric knee extension with dominant leg, in angular velocities of 60°/s; FLEX_DOM_60 – isometric knee flexion with dominant leg, in angular velocities of 60°/s; EXT_NDOM_60 – isometric knee extension with non-dominant leg, in angular velocities of 60°/s; FLEX_NDOM_60 – isometric knee flexion with non-dominant leg, in angular velocities of 60°/s; EXT_DOM_240 – isometric knee extension with dominant leg, in angular velocities of 240°/s; FLEX_DOM_240 – isometric knee flexion with dominant leg, in angular velocities of 240°/s; EXT_NDOM_240 – isometric knee extension with non-dominant leg, in angular velocities of 240°/s; FLEX_NDOM_240 – isometric knee flexion with non-dominant leg, in angular velocities of 240°/s; ISO_EXT_DOM – isometric knee extension dominant leg; ISO_EXT_NDOM – isometric knee extension non-dominant leg.

All selected predictors show a trivial to moderate relationship (r = -0.03–0.32) with the 10 m sprint with the ball. The regression model for the 10 m sprint with the ball was statistically insignificant with the above independent variables ($F_{6,27}$ = 0.583, p = .741, Adj R^2 = -0.82, SEE = 0.098). All independent variables included in the model were also statistically insignificant and, therefore, could not predict performance in the 10 m sprint with the ball. For the 30 m sprint with the ball, the selected predictors show a trivial to moderate relationship (r = -0.13–0.3), except for the 30 m linear sprint. The 30 m linear sprint was strongly correlated (r = 0.59) to the 30 m sprint with the ball. The regression model with the included independent variables was statistically significant and identified the 30 m sprint as the only predictor. Bivariate regression analysis with one significant independent variable (30 m sprint without the ball) indicates a statistically significant model ($F_{1,32}$ = 17.332, p < .001, Adj R^2 = 0.331, SEE = 0.157), which can explain 33.1% of the variability of the data in the 30 m sprint with the ball. Relationships for the change of direction speed with the ball were at the trivial to small level with predictors (r = 0.06–0.29). The regression model for predicting the change of direction speed with the ball was statistically insignificant, and none of the listed independent variables predict performance in this test ($F_{6,27}$ = 1.002, p = .444, Adj R^2 = 0, SEE = 0.38). Beta coefficients and their 95% confidence intervals, t values, statistical significance of individual predictors, and VIF are presented in Table 2.

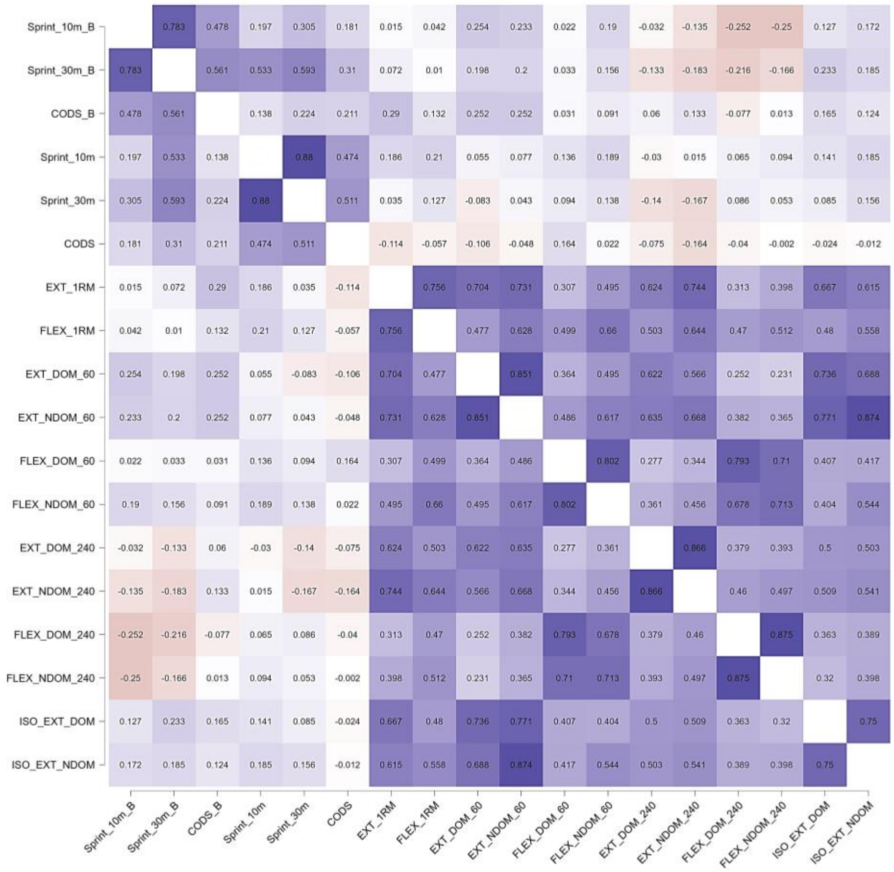

Figure 4. Correlation matrix of outcome variables.

Table 2. Predictors of 10 m sprint with the ball, 30 m sprint with the ball and change of direction speed with the ball.

Test	Unstandardized Coefficients		t	*p*	95% Confidence Interval for B		VIF
	B	Std. Error			Lower Bound	Upper Bound	
Sprint_10m_B							
Sprint_30m	0.191	0.154	1.243	.225	-0.124	0.506	1.467
CODS	0.022	0.106	0.203	.84	-0.197	0.24	1.457
EXT_1RM	-0.001	0.003	-0.351	.729	-0.006	0.004	2.343
FLEX_DOM_60	0	0.001	-0.292	.772	-0.002	0.002	1.26
EXT_DOM_240	0	0.001	-0.058	.955	-0.003	0.003	1.793
ISO_EXT_DOM	0	0.001	0.784	.44	-0.001	0.002	2.007
Sprint_30m_B							
Sprint_30m	0.85	0.204	4.163	<.001	0.434	1.266	1
CODS_B							
Sprint_30m	0.236	0.598	0.394	.697	-0.992	1.463	1.467
CODS	0.443	0.414	1.068	.295	-0.407	1.292	1.457
EXT_1RM	0.017	0.01	1.711	.099	-0.003	0.038	2.343
FLEX_DOM_60	-0.002	0.003	-0.519	.608	-0.009	0.005	1.26
EXT_DOM_240	-0.004	0.005	-0.675	.506	-0.014	0.007	1.793
ISO_EXT_DOM	0	0.002	-0.085	.933	-0.005	0.005	2.007

Note: B – beta coefficient; t: t value; p – statistical significance; VIF – variance inflation factor; Sprint_10m_B – sprint 10-meters with the ball; Sprint_30m – sprint 30-meter; CODS – change of direction speed; EXT_1RM – knee extension one-maximal repetition; FLEX_DOM_60 – isometric knee flexion with dominant leg, in angular velocities of 60°/s; EXT_DOM_240 – isometric knee extension with dominant leg, in angular velocities of 240°/s; ISO_EXT_DOM – isometric knee extension dominant leg; Sprint_30m_B – sprint 30-meter with the ball; CODS_B – change of direction speed with the ball.

DISCUSSION

Our study examined the relationship between selected strength and speed tests and speed tests with the ball. The regression model for the 10 m sprint with the ball was statistically insignificant. Similar results were obtained for the change of direction speed test. The 30-meter test with the ball strongly correlated with the 30-meter sprint without the ball. The regression model with the included independent variables was statistically significant and identified the 30-meter sprint as the only predictor capable of explaining 33.1% of the variability in the 30-meter sprint with the ball data.

We encountered a slight difference in the tests compared to other research. Most studies, such as those by Cronin & Hansen (2005), dealt with the relationships between selected speed and power tests. In a sample of twenty-six males, they demonstrated statistically significant correlations between the achieved performance in countermovement jump height and sprinting at 5 meters (r = -0.6), 10 meters (r = -0.62), and 30 meters (r = -0.56). When comparing our results with other research, where tests in the presence of a soccer ball were also used, we encountered a slight difference. Sporiš et al. (2011) examined the relationships between tests of speed abilities, change of direction speed, and change of direction speed with the ball of elite young soccer players. The correlation between the zigzag and the zigzag test with the ball reached a value of r = 0.479. Makhlouf et al. (2022), in their study on young soccer players, showed a relationship between the Illinois test and the Illinois test with the ball r = 0.65. They also showed a relationship between the Illinois test with the ball and tests for assessing explosive power (CMJ r = -0.46 and triple-hop-test r = -0.49). Based on a 6-week intervention in thirty adolescent male soccer players, Sal-de-Rellán et al. (2024) found that the inclusion of running training with the ball together with resisted sprints training led to improved 5- and 10-meter sprints and improved performance in the zigzag test with the ball. Fiorilli et al. (2017) demonstrated a correlation between the Illinois and Illinois tests with the ball r = 0.917 in 92 young soccer players. Two hundred sixty-seven youth soccer players aged 12 to 19 years were tested in a study by Huijgen et al. (2010), where they demonstrated a correlation relationship r = 0.542 between performance in the shuttle sprint and shuttle dribble tests.

In our case, we did not achieve a positive result of the correlation coefficient between our chosen independent variables and tests on a 10 m sprint with the ball and the change of direction test with the ball. Our sample's technical skill level could cause a negative result in the change of direction test with the ball. Performance in running with changes of direction in the presence of the ball can be considered multifactorial and depends on a combination of physical abilities, such as strength, speed, and the level of technical skills. Optimization of all these components through specific training methods can lead to a significant improvement in performance in changes of direction, which is crucial for success in sports with high demands on agility and speed, such as soccer. The 10 m sprint test with the ball did not show statistically significant correlations. The given results could be because the 10-meter sprint with the ball requires the player not only to accelerate and maintain the achieved speed but also to control the ball precisely during speed. The given possible inhibitory effect causes the physical parameters of our abilities, such as speed and strength, not fully manifest in conditions where movement is controlled and limited by the technique of working with the ball (Simonet et al., 2023). Therefore, although negative, our results support including specific soccer training to improve the technique of running with the ball in training processes. By doing so, we can better prepare players for conditions typical for match situations. It is accurate that linear speed has long been recognized as a fundamental aspect of soccer training. However, our study offers nuanced insights by quantifying how linear sprinting influences soccer-specific ball control task performance. Although these findings may appear confirmatory, they underscore the foundational importance of integrating linear sprint training with technical elements in soccer-specific drills. This perspective aligns with Fiorilli et al. (2017), who emphasized the predictive role of linear speed in soccer-specific sprints. By reiterating this relationship in semi-professional athletes, we aim to validate its relevance across competitive levels.

Running with the ball is essential in a soccer match. This activity is used to solve some situations in the match and can potentially help the player create free space and opportunities to score a goal (Barbon Junior et al., 2022). Since the model leaves a significant part of the variability unaccounted for, including more specific soccer exercises that combine sprinting with ball control may increase player performance, which can later be implemented in conditions very similar to a soccer match. The suggestion to incorporate sprint exercises with the ball reflects their importance in soccer-specific contexts, particularly for semi-professional players. While such exercises are standard at youth levels, they are often underutilized in older age groups due to a greater emphasis on tactical and positional training. Our results advocate for maintaining a balance between technical and physical training, especially for players transitioning to higher levels of competition. Furthermore, Sal-de-Rellán et al. (2024) demonstrated that resisted sprint drills combined with ball training significantly improve sprint performance in match-like conditions, reinforcing the value of such practices. Either strength or speed abilities did not considerably predict shorter sprints and sprints with changes of direction. Both of these indicators are very important for soccer performance. Therefore, it would be appropriate to develop the technical component of the player in these types of sprints and sprints with changes of direction. The technical component when working with the ball can play a crucial role. The training process should include short sprints and sprints with changes of direction, where the emphasis would be on acceleration, ball control, and quick change of direction. The combination of speed and technical training could better support performance in short sprints and sprints with changes of direction, and thus, with proper implementation in a soccer match, achieve better results.

One of the limitations of our study could be the number of participants. Although our model reached statistical significance in one of the parameters, the limited number of participants may reduce the statistical power of the analysis. Focus on semi-professional players admittedly limits the generalizability of our findings. The term "*semi-professional*" encompasses a broad range of skill levels, potentially leading to variability in results. Future studies should aim to define this population more precisely and include larger, more diverse samples spanning various competitive levels. Expanding the research scope to younger and elite players would provide a comprehensive understanding of how these relationships evolve across developmental stages. Another possible limiting factor may be that semi-professional players may not demonstrate the same technical and physical skills as professionally trained individuals. These differences are most likely due to the difference in the volume of training units. The study used a cross-sectional design, which limits the possibility of inferring causal relationships between sprint performance without the ball and sprint performance with the ball. Although the model suggests a significant predictive relationship, it is unclear whether improving one necessarily leads to improving the other. A longitudinal study would be more appropriate to determine whether targeted 30 m sprint training without the ball can causally improve sprint performance with the ball.

While isometric strength tests may not directly apply in day-to-day coaching, they offer precise insights into neuromuscular capabilities and can inform individualized training interventions. For example, Spiteri et al. (2013) highlighted the role of isometric strength in change-of-direction performance. Coaches can adapt these findings by incorporating practical strength measures such as single-leg squats or Nordic curls to target muscle groups relevant to soccer performance. Although our study did not directly address this transition, it lays the groundwork for future research linking lab-based assessments with field-relevant training applications. Future research should examine additional variables, reactive agility or sprint biomechanics, to better understand the predictors of sprint performance with the ball. In conclusion, the study confirms the relationship between general sprinting abilities and soccer-specific sprinting tasks, with the 30 m sprint without the ball being a significant predictor of ball performance. However, a multidimensional approach to training and further investigation of other influencing factors, such as cognitive and technical abilities, are needed to comprehensively understand sprint performance in soccer. To draw generally valid conclusions, we should focus on a larger sample of tested players in the future. In addition, testing different age categories at various performance levels would be optimal to achieve more valid results. We acknowledge that our study did not incorporate variables such as decision-making or situational awareness, which are critical in soccer performance. Agility and speed during match play often involve cognitive demands, such as reacting to opponents and anticipating play dynamics. Incorporating tools like reactive agility tests or video-based decision-making assessments in future research would enrich the understanding of sprint performance in realistic game scenarios. Moreover, position-specific analyses would provide insights into how linear and directional sprints vary by tactical roles, as suggested by recent studies on positional demands in soccer (Ade et al., 2016).

CONCLUSIONS

Our study ascertains a moderate to strong correlation ($r = 0.59$) between performance in the 30 m sprint without the ball and performance in the 30 m sprint with the ball. This finding suggests that players who exhibit high linear sprint performance without the ball tend to maintain that speed when sprinting with the ball, assuming proficient ball control. Therefore, this statement emphasizes the importance of linear speed as a fundamental factor in soccer performance, even after introducing technical elements such as ball control. Including sprint exercises with ball-specific training in the training process is very beneficial for soccer performance. Since sprinting with the ball is a crucial aspect of soccer, players should regularly train sprinting with the ball in conditions as close to a soccer match. This practice will help to improve the transfer of linear speed to soccer-specific tasks, ensuring that technical skill with the ball is not a limiting factor for sprint speed. It would also be appropriate to include monitoring of strength and speed abilities in training processes, not only from the perspective of developing these abilities but also as a possible prevention of injuries.

Future studies should include larger groups of athletes with different performance levels (e.g., elite, amateur) to determine whether the correlation between sprinting with and without the ball applies to all performance levels. Other predictors, such as cognitive and technical abilities, should also be included. In conclusion, testing strength and speed abilities (with or without the ball) are crucial for more comprehensive soccer performance and potential progression. If we continue to address these areas, future studies may provide deeper insight into how speed and technical abilities influence overall soccer performance, leading to better training approaches and athletic development.

AUTHOR CONTRIBUTIONS

IS – study design, data curation, writing – original draft; TV – study design, data analysis, writing – original draft; JP – conceptualization of the study, writing – review and editing; DB – study design, data curation, writing – review and editing.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

ETHICS APPROVAL

The study was approved by the Research Ethics Committee of Masaryk University (EKV-2016-096).

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