Beden Eğitimi ve Spor Araştırmaları Dergisi
Mart 2026, 18 (1) 15-27

BESAD
JPESS

Journal of Physical Education and Sports Studies
March 2026, 18 (1) 15-27

U17 Yaş Futbol Takımının Oyuncu Pozisyonlarına Göre Eğri ve Doğrusal Sprint Performans Puanlarının Analizi

An Analysis of Curved and Linear Sprint Performance Scores Based on Playing Positions in the U17 Football Team

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Makale Geçmişi
Geliş: 13 Ocak 2026
Kabul: 25 Şubat 2026
Çevrimiçi: 10 Ağustos 2026
DOI: 10.55929/besad.1852224

Makale Türü
Araştırma Makalesi

Öz: Bu çalışmanın amacı, U17 futbol takımının oyuncularının pozisyonlarına göre kavisli ve doğrusal sprint performans skorlarını incelemektir. Çalışmaya Göztepe Futbol Kulübü (GFK) U-17 takımında oynayan toplam 30 gönüllü futbolcu katılmıştır. GFK U-17 takımının ortalama sağ kavisli sprint performans süresi 2,65±0,10 s (zayıf taraf: WS), ortalama sol kavisli sprint performans süresi 2,61±0,10 s (güçlü taraf: GS) ve ortalama doğrusal sprint performans süresi 2,65±0,06 s olarak bulunmuştur. GFK U-17 futbol oyuncularının oyun pozisyonlarına göre, ortalama sağa doğru kavisli sprint performans süreleri şu şekilde bulunmuştur: forvetler 2,61±0,08 s (GS), defans oyuncuları (stoperler) 2,66±0,07 s (WS), orta saha oyuncuları 2,64±0,12 s (WS), bekler 2,59±0,10 s (WS), kanat oyuncuları 2,69±0,07 s (WS), kaleciler 2,74±0,13 s (WS). Ortalama sol kavisli sprint performans süreleri şu şekildeydi: forvetler 2,64±0,09 s (WS), stoperler 2,59±0,07 s (GS), orta saha oyuncuları 2,62±0,13 s (GS), bekler 2,55±0,06 s (GS), kanat oyuncuları 2,61±0,05 s (GS), kaleciler 2,67±0,11 s (GS). Ortalama doğrusal sprint performans süreleri ise şu şekildeydi: forvetler 2,64±0,06 s, stoperler 2,68±0,07 s, orta saha oyuncuları 2,64±0,06 s, bekler 2,64±0,05 s, kanat oyuncuları 2,63±0,05 s, kaleciler 2,68±0,08 s. Eğri ve doğrusal sprint performansları arasındaki ilişki incelendiğinde, eğri ZT ile eğri IT arasında yüksek bir korelasyon (r: 0,737, p<0,01) bulunmuştur. Eğri IT ile DS arasında orta düzeyde bir korelasyon (r: 0,383, p<0,05) bulunmuştur. Eğri ZT ile DS arasında ise korelasyon bulunmamıştır (r: 0,262, p>0,05). Katılımcılar oyun pozisyonlarına göre incelendiğinde, gruplar arasında istatistiksel olarak anlamlı bir fark bulunmamıştır.

Anahtar Kelimeler: *Futbol, U-17, Kavisli Sprint, Doğrusal Sprint, Performans*

Article History
Received: January 13, 2026
Accepted: February 25, 2026
Online: August 10, 2026
DOI: 10.55929/besad.1852224

Article Type
Research Article

Abstract: This study aimed to examine the curved and linear sprint performance scores of the U17 soccer team according to player positions. A total of 30 volunteer soccer players playing for Göztepe Football Club (GFK) U-17 team participated in the study. The average right side curved sprint weak side (RSCS-WS) performance time of the GFK U-17 team was found to be 2.65±0.10 s, the average left side curved sprint good side(LSCS-GS) performance time was 2.61±0.10 s and the average LS performance time was 2.65±0.06 s. The average performance times of GFK U-17 players according to their positions were as follows: RSCS-WS forwards 2.61±0.08 s, Stoppers 2.66±0.07 s, midfielders 2.64±0.12 s, fullbacks 2.59±0.10 s, wingers 2.69±0.07 s, and goalkeepers 2.74±0.13 s, and the total average value was determined to be 2.65±.10. The average sprint performance times measured by LSCS-GS for the curved were: forwards, 2.64±0.09 s; Stoppers, 2.59±0.07 s; midfielders, 2.62±0.13 s; fullbacks, 2.55±0.06 s; wingers, 2.61±0.05 s; goalkeepers, 2.67±0.11 s, and the total average value was determined to be 2.61±.09. LS performance times were determined as follows: forwards 2.64±0.06 s, stoppers 2.68±0.07 s, midfielders 2.64±0.06 s, fullbacks 2.64±0.05 s, wingers 2.63±0.05 s, goalkeepers 2.68±0.08 s, and the total average value was determined to be 2.65±.06. When examining the relationship between CS and LS performances, a high level of correlation was found between RSCS-WS and LSCS-GS (r: 0.737, p<0.01). A moderate correlation was found between LSCS-GS and LS (r = 0.383, p < 0.05). No correlation was found between RSCS-WS and LS (r: 0.262, p>0.05). When examined according to the positions played by the participants, no statistically significant difference was found between the groups (p>.05).

Keywords: *Soccer, U-17, Curved Sprint, Linear Sprint, Performance*

Bu makaleye atıf yapmak için | To cite this article
Berber, E., Özer, Ö., Gürses, V. V., Filter, A., Tatlıcı, A., & Uyhan, O. (2026). An analysis of curved and linear sprint performance scores based on playing positions in the U17 football team. *Journal of Physical Education and Sports Studies, 18*(1), 15–27.

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INTRODUCTION

Sprint is defined as the neuromuscular system's ability to achieve the maximum possible speed of response and movement under certain conditions, based on cognitive processes and the contribution of willpower (Gutknecht et al., 2025). It has been extensively addressed in the literature through kinetic and kinematic variables as well as muscle activity variables, and efforts have been made to research and develop it (Deng et al., 2025). Sprinting has been considered a key variable in most sports (Zabaloy et al., 2023; Bramah et al., 2024; Stanley et al., 2025). The demand for sprinting is greater in sports with wide, long fields, such as soccer. Football is a sport with physical and physiological demands that require the performance of a wide variety of high-intensity actions, such as sprinting, jumping, and changing direction (Pancar et al., 2025). In critical moments in soccer that affect the outcome of the game, such as goal-scoring opportunities, the elements that contribute most to performance are sudden, high-intensity activities, including sprinting, positive and negative acceleration, and direction changes (Haugen et al., 2014). Faude et al. (2012) emphasized that sprinting is the most common action preceding goal-scoring opportunities in the German Bundesliga and highlighted the importance of this movement (Faude et al., 2012). This clearly demonstrates that sprint-related physical capacity components play a decisive role in soccer. Sprints can be categorized as LS and CS. While LS have been extensively studied, researchers have recently focused more on CS due to their prevalence in real match situations (Özer et al., 2022; Filter-Ruger et al., 2022; Altmann et al., 2024). Movement analysis studies in soccer have shown that speed is rarely linear; 85% of sprints during a match are curved (Caldbeck, 2020; Fitzpatrick et al., 2019). This CS model requires specific biomechanical and neuromuscular adaptations, including asymmetric force production, dynamic balance, body control, and the ability to maintain speed during turns. These demands highlight the need to assess and train CS independently from LS to improve soccer-specific sprint performance (Pancar et al., 2025). Fílter et al. (2023) stated that although approximately 85% of actions performed at maximum speed in a professional soccer league are CS, there is no specific test to evaluate this ability. Accordingly, they developed a CS test performed on a 17-meter penalty arc (Fílter et al., 2023).

The purpose of this study is to examine the CS and LS performance scores of the U17 soccer team according to player positions.

METHOD

Participants

A total of 30 volunteer soccer players playing for Göztepe Football Club (GFK) U-17 team participated in the study. The average height of GFK U-17 players was 180.00 ± 4.64 cm, and their average body weight was 71.43 ± 5.37 kg. Individuals with acute or chronic orthopedic conditions that prevented high-intensity or prolonged exercise were excluded. Participants were instructed to avoid strenuous exercise for 24 hours before the test, maintain their regular sleep patterns, and refrain from using any medication that could enhance sprint performance. Participants were informed about the study, and written consent was obtained from their parents in accordance with the Helsinki Declaration. The study was approved by the Ethics Committee of the Institute of Health Sciences at Selçuk University (Protocol No. 2024-33).

Study Design

Considering the difficulties of conducting controlled studies during the official TFF league season, the need to prepare for ongoing competitions, and the impact of competitive matches and performance concerns, a cross-sectional descriptive research design was used for the evaluation. Anthropometric measurements, including height and body weight, were taken for the participants. Subsequently, information about the study was provided. A detailed explanation and demonstration of the CS and LS test protocol was provided. Following the explanation and demonstration, a standard football-specific warm-up protocol was implemented. After the warm-up protocol, participants performed two LS (17m) sprints. A whole rest period of 3-5 minutes was provided between sprints. The best value obtained was recorded in seconds. After the participants had fully rested, CS tests were performed on the penalty arc (17m). CS tests were performed twice from the right side of the penalty arc and twice from the left side of the penalty arc. A whole rest period of 3-5 minutes was given between sprints. Measurements were taken simultaneously on the participants' club turf fields. Measurements were taken while the players were playing during the season. The CS and LS measurements of the players participating in the study were taken 3 days after an official match during the season, following complete rest.

Data Collection Tools

Anthropometric Measurements

The participant's body weight and height were measured using a stadiometer (SECA-Mod. 220, Seca, Germany) (Soslu et al., 2022).

17 m Linear Sprint Test

For the assessment, photocells (Microgate, Witty, Italy) were placed on a flat surface on a soccer field with a distance of 17 meters between the start and finish lines. Participants were instructed to start from 1 meter behind the starting line, adopt a high-power stance when they felt ready, and complete the test at maximum speed. Two trials were performed with complete rest between them. The best result was recorded in seconds (Fílter et al., 2020).

Curved Sprint Test

The tests were conducted according to the previously reported protocol. The test involved placing photocells at the start and end of the penalty arc on an official soccer field. Participants began the test by sprinting from 1 meter behind the starting line, in an upright, ready position. Participants were instructed to complete the trial at their maximum speed. Each participant performed two trials, separated by adequate rest periods, two on the right and two on the left. The best time was recorded in seconds (Filter et al., 2020a).

Statistical Analysis

The statistical analysis of the obtained sprint performance data was performed using SPSS 27. Normality tests indicated that the data were normally distributed, and a One-Way ANOVA was used to assess differences between groups. A Pearson correlation test was applied to determine the relationship between CS and LS. Statistical significance was set at $p < 0.05$ for all analyses.

RESULTS

Table 1. U17 Players Age, Height, and Weight Averages Findings

	n	Avg.	Sd
Age		17	.00
Height	30	180.00	4.64
Body Weight		71.43	5.37

Table 1 shows that the mean age of the groups was 17.00±.00 years, the mean height was 180.47±4.64 cm, and the mean body weight was 71.43±5.37 kg.

Table 2. U17 Players Curve and Linear Sprint Average Findings

	n	Avg.	Sd
Right Side Curve Sprint- Weak Side(s)		2.65	0.10
Left Side Curve Sprint- Good Side(s)	30	2.61	0.10
Linear Sprint 17 m (s)		2.65	0.06

Table 2 shows that the average value of the RSCS-WS side parameter 2.65±0.10 s, LSCS-GS parameter 2.61±0.12 s and LS parameter 2.65±0.06 s.

Table 3. U17 Players Right Side Curve Sprint - Weak Side, Left Side Curve Sprint – Good Side and Linear Sprint Parameters Average by Positions

	Position	n	Avg.	Sd
Right Side Curve Sprint-Weak Side(s)	Forward	4	2.61	.08
	Stoppers	5	2.66	.07
	Midfielder	7	2.64	.12
	Fullbacks	5	2.59	.10
	Wingers	4	2.69	.07
	Goalkeeper	5	2.74	.13
	Total	30	2.65	.10
Left Side Curve Sprint- Good Side (s)	Forward	4	2.64	.09
	Stoppers	5	2.59	.07
	Midfielder	7	2.62	.13
	Fullbacks	5	2.55	.06
	Wingers	4	2.61	.05
	Goalkeeper	5	2.67	.11
	Total	30	2.61	.09
Linear Sprint 17 m (s)	Forward	4	2.64	.06
	Stoppers	5	2.68	.07
	Midfielder	7	2.64	.06
	Fullbacks	5	2.64	.05
	Wingers	4	2.63	.05
	Goalkeeper	5	2.68	.08
	Total	30	2.65	.06

Table 3 shows that the average value of the RSCS-WS parameter for the forward position is 2.61±.08, the average value for the stoppers position is 2.66±.07, the average value for the midfielder position is 2.64±.12, the average value for the fullbacks position is 2.59±.10, the average value for the wing position is 2.69±.07, the average value for the goalkeeper position is 2.74±.13, and the total average value was determined to be 2.65±.10. The LSCS-GS parameter average value for the forward position was

2.64±.09, the average value for the stoppers position was 2.59±.07, the average value for the midfielder position was 2.62±.13, the average value for the fullbacks position was 2.55±.06, the average value for the winger position was 2.61±.05, the average value for the goalkeeper position was 2.67±.11, and the total average value was determined to be 2.61±.09. The LS parameter average value for the forward position was 2.64±.06, the average value for the stoppers position was 2.68±.07, the average value for the midfielder position was 2.64±.06, the average value for the wide fullbacks position was 2.64±.05, the average value for the wingers position was 2.63±.05, the average value for the goalkeeper position was 2.68±.08, and the total average value was determined to be 2.65±.06.

Table 4. ANOVA Table for Groups

	Sd	Mean Square	F	p
Curve Sprint-Weak Side (s)	5	.01	1.31	.29
Curve Sprint-Good Side (s)	5	.01	.98	.45
Linear Sprint(s)	5	.00	.51	.76

Table 4 shows that no statistically significant difference was found in the RSCS-WS parameter between positions (p>.05). No statistically significant difference was found in the LSCS-GS parameter (p>.05). No statistically significant differences were detected in the LS parameter (p>.05).

Table 5. Right Side Curve Sprint – Weak Side, Left Side Curve Sprint – Good Side and Linear Sprint correlation table

Correlations				
		Right Side Curve Sprint- Weak Side (s)	**Left Side Curve Sprint Good Side(s)**	**Linear Sprint(s)**
Right Side Curve Sprint- Weak Side (s)	Pearson Correlation	1		
	Sig. (two-tailed)			
	N	30		
Left Side Curve Sprint- Good Side (s)	Pearson Correlation	,737**	1	
	Sig. (two-tailed)	0,000		
	N	30	30	
Linear Sprint(s)	Pearson Correlation	0,262	,383*	1
	Sig. (two-tailed)	0,163	0,037	
	N	30	30	30

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (two-tailed).

Table 5 shows that a high level of correlation ($r = 0.737$, $p<0.01$) was found between RSCS-WS and LSCS-GS. A moderate correlation was found between LSCS-GS and LS ($r = 0.383$, $p<0.05$). No correlation was found between RSCS-WS and LS ($r = 0.262$, $p>0.05$).

DISCUSSION AND CONCLUSION

The main objective of this study was to determine the average CS, RSCS-WS, LSCS-GS, and LS scores of GFK U-17 youth football players and to establish new reference values in the literature by assessing their sprint performance times, both linear and curved, according to the positions they played during the match. It was to determine whether curved sprint ability is position-specific in soccer, as is linear sprint capacity and change-of-direction performance. These findings support the literature on curved sprinting in competitive environments.

The running performance of the participants in our study differed depending on the direction of the curve. The average performance time of the curved sprint run performed by the GFK U-17 team's RSCS-WS was 2.65±0.10 seconds, average performance time for the sprint run on the curved performed by the

LSCS-GS was 2.61±0.10 s, and the average LS performance time was 2.65±0.06 s. In their research, Filter-Ruger et al. (2022) found that the curved speed performance of U17 footballers was 2.67±0.01 s for CSWS and 2.59±0.01 s for CSGS. Similarly, Baranovič and Zemkova (2021) did not find a statistically significant difference between the two parameters in their cross-sectional study focused on curved and linear sprint performance. Filter et al. (2020b), in their research on experienced 23-year-old soccer players, determined CSGS (2.45±0.11 s), CSWS (2.56±0.17 s), and LS (2.47±0.13 s). Alt et al. (2015) explained this situation by stating that CS requires the generation of centripetal force, involves the asymmetric functional roles of the inner and outer legs, stabilizes the inner leg primarily in the frontal plane, while the outer leg contributes more to the horizontal plane propulsive force, resulting in changes in joint angles, increased ground contact time, and changes in maximum speed compared to LS (Alt et al., 2015; Özer et al., 2022). Filter-Ruger et al. (2022) reported that performance improved with increasing age and experience. As shown, differences were observed between curved CSGS, CSWS, and LS across all studies. This is consistent with our research.

In our study, the average sprint performance times measured by RSCS-WS for GFK U-17 players according to their positions were as follows: forwards 2.61±0.08 s, stoppers 2.66±0.07 s, midfielders 2.64±0.12 s, fullbacks 2.59±0.10 s, wingers 2.69±0.07 s, and goalkeepers 2.74±0.13 s. The average sprint performance times measured by LSCS-GS for the curved were: forwards, 2.64±0.09 s; stoppers, 2.59±0.07 s; midfielders, 2.62±0.13 s; fullbacks, 2.55±0.06 s; wingers, 2.61±0.05 s; goalkeepers, 2.67±0.11 s. LS performance times were determined as follows: forwards 2.64±0.06 s, stoppers 2.68±0.07 s, midfielders 2.64±0.06 s, fullbacks 2.64±0.05 s, wingers 2.63±0.05 s, goalkeepers 2.68±0.08 s. Although previous studies in the literature included players at different positions, sprint performance (linear, curved, good, and weak sides) has not been analyzed by playing position. Filter-Ruger et al.

(2022) examined differences in age-related variables across playing positions in their study. Therefore, our study presents new evidence by comparing curved and linear sprint performance according to playing positions.

Another research topic of our study was the relationship levels between the curved and LS sprint performances of GFK U-17 football players. A high level of relationship ($r = 0.737$, $p<0.01$) was found between LSCS-GS and RSCS-WS. A moderate relationship ($r = 0.383$, $p < 0.05$) was found between LSCS-GS and LS. However, no correlation was found between LSCS-WS and LS ($r = 0.262$, $p>0.05$). The current results are also consistent with performance-based studies showing that inclined LS ability is partially independent of LS capacity. In their research, Loturco et al. (2020) found that players with superior LS may not always be able to translate this ability to curved trajectories efficiently. They emphasized that if certain playing positions show greater inconsistencies between CS and LS performances, this may reflect differences in technical capacity to maintain speed under curved constraints (Loturco et al., 2020). The results suggest that as young soccer players achieve physical, cognitive, and motor growth and maturation, as well as technical and motor skill proficiency, performance parameters that initially appear similar may develop independently. Future studies in young populations should examine the similarities and differences in the development of technical and motor proficiency in curved running across positions.

With these research results, it can be said that new reference values for curved and LS sprint performance specific to the positions played by GFK U-17 footballers have been added to the literature.

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