CIES Football Observatory Monthly Report
n°68 - October 2021

Analysis of the distances covered in professional football competitions

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1. Introduction

Since last summer, the CIES Football Observatory has had the pleasure of working with match data produced exclusively by SkillCorner. The French company has developed an innovative approach to track players from any football broadcast, whilst generating physical data and continuous XY tracking via specialised algorithms.

This Monthly Report focuses on the distance covered by players during matches. For this, we use the data from 7,855 matches played during the 2020 or 2020/21 seasons in 31 leagues from both Europe and America. The study analyses the distances covered according to speed and present comparisons with regard to leagues, team results and player position.

Figure 1: study sample

Domestic leagues	Season	Matches
Liga Profesional Argentina (ARG)	2020/21	103
Pro League (BEL)	2020/21	308
Série A (BRA)	2020	344
1. HNL (CRO)	2020/21	163
First League (CZE)	2020/21	197
Superliga (DEN)	2020/21	165
Premier League (ENG)	2020/21	365
Championship (ENG/2)	2020/21	421
Liga (ESP)	2020/21	365
Segunda División (ESP/2)	2020/21	396
Ligue 1 (FRA)	2020/21	338
Ligue 2 (FRA/2)	2020/21	345
Bundesliga (GER)	2020/21	302
2. Bundesliga (GER/2)	2020/21	258
Super League (GRE)	2020/21	221
Serie A (ITA)	2020/21	372
Serie B (ITA/2)	2020/21	340
Major League Soccer (MLS)	2020	240
Eredivisie (NED)	2020/21	286
Ekstraklasa (POL)	2020/21	210
Primeira Liga (POR)	2020/21	249
Premier League (RUS)	2020/21	219
Premiership (SCO)	2020/21	143
Super League (SUI)	2020/21	162
Allsvenskan (SWE)	2020	213
Süper Lig (TUR)	2020/21	387
Premier League (UKR)	2020/21	141
Continental cups	**Season**	**Matches**
Copa Libertadores (CCL)	2020	128
Copa Sudamericana (CCS)	2020	90
Champions League (UCL)	2020/21	163
Europa League (UEL)	2020/21	221

2. Distance and results

During the seasons analysed, outfield players from a team of the 31 leagues studied covered an average of 99.9 km per match. This figure does not vary much according to competition. The value for the championship where the players ran the most, the Spanish Liga (103.7 km), was indeed only 3.7% above the general average. The Brazilian Serie A (95.8 km) is the competition in which players covered the least distance on average.

This analysis shows the absence of a clear connection between leagues' level and distance covered. The average for the five major European championships, the Champions League and the Europa League is above the general one, but the gap is minimal (+1.3%). At most, we can remark the presence at the bottom of the rankings of South American competitions, both domestic (Brazilian Serie A, Argentinean Superliga) and international (Copa Libertadores, Copa Sudamerica). This points towards a slower playing style than that found in Europe.

Figure 2: average distance for outfield players, per team and match (2020 or 2020/21 seasons)

Liga (ESP)	103.7 km
Allsvenskan (SWE)	103.6 km
Eredivisie (NED)	103.6 km
Serie A (ITA)	102.9 km
Ekstraklasa (POL)	102.8 km
Pro League (BEL)	102.0 km
Champions League (UCL)	101.9 km
Europa League (UEL)	101.1 km
Major League Soccer (MLS)	101.1 km
Super League (SUI)	101.0 km
Premier League (ENG)	100.9 km
1. HNL (CRO)	100.8 km
Segunda División (ESP/2)	100.7 km
Primeira Liga (POR)	100.6 km
Premier League (RUS)	100.3 km
First League (CZE)	100.2 km
Bundesliga (GER)	100.0 km
Serie B (ITA/2)	99.5 km
Premier League (UKR)	99.2 km
Superliga (DEN)	99.0 km
Premiership (SCO)	98.9 km
Ligue 1 (FRA)	98.6 km
Ligue 2 (FRA/2)	98.6 km
2. Bundesliga (GER/2)	98.6 km
Super League (GRE)	98.4 km
Liga Profesional Argentina (ARG)	97.7 km
Süper Lig (TUR)	97.1 km
Championship (ENG/2)	96.8 km
Copa Libertadores (CCL)	96.1 km
Série A (BRA)	95.8 km
Copa Sudamericana (CCS)	95.8 km

The differences between competitions in the average distance covered in high intensity (> 5.5 m/s or 19.8 km/h) are not very clear either. On average, during the seasons studied, an outfield player ran 734 metres in high intensity per match. In this case also, the value recorded in the big-5 leagues and European international competitions is above the general average, but the gap (+3.2%) does not allow us to establish a link between the competition's level and aggregated distances covered by players.

At team level, we examined the correlation between the average number of points obtained per match over the season and the average values for distances covered, both in total and in high intensity, with the hypothesis that teams running more have a greater chance of winning. Here too, no significant link was uncovered.

Figure 3: average distance in high intensity, per outfield player and match

Liga (ESP)	804 m
Ekstraklasa (POL)	802 m
Premier League (ENG)	790 m
Serie A (ITA)	773 m
Super League (SUI)	769 m
Pro League (BEL)	765 m
First League (CZE)	764 m
Eredivisie (NED)	761 m
Segunda División (ESP/2)	754 m
Europa League (UEL)	751 m
Champions League (UCL)	750 m
Primeira Liga (POR)	748 m
1. HNL (CRO)	741 m
Superliga (DEN)	741 m
Allsvenskan (SWE)	733 m
Bundesliga (GER)	732 m
Championship (ENG/2)	728 m
Liga Profesional Argentina (ARG)	717 m
Premier League (UKR)	717 m
2. Bundesliga (GER/2)	717 m
Premier League (RUS)	715 m
Serie B (ITA/2)	713 m
Major League Soccer (MLS)	701 m
Ligue 1 (FRA)	699 m
Süper Lig (TUR)	697 m
Ligue 2 (FRA/2)	697 m
Super League (GRE)	696 m
Premiership (SCO)	689 m
Série A (BRA)	674 m
Copa Libertadores (CCL)	671 m
Copa Sudamericana (CCS)	647 m

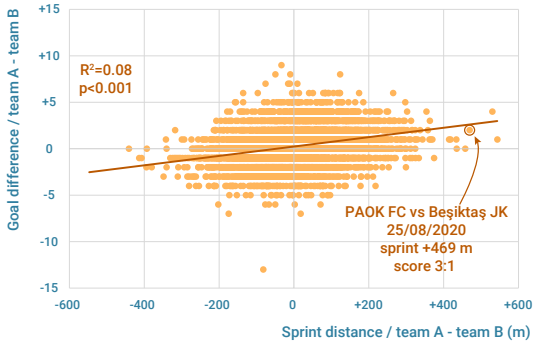
We have also tested the correlation between the gap in distances ran by each team and the goal difference for each of the 7,855 matches of the sample. Although weak, a statistically significant link (r2=0.08) exists between the results and distance covered sprinting (>25.2 km/h). Nevertheless, insofar as the sprints are usually by forwards, this result probably points towards the tendency of teams who take the advantage to counterattacking.

Moreover, in winning matches, when in possession, attacking players tend to run in high intensity relatively more than for draws or losses, which also shows a greater tendency to counterattack when a team has the advantage. On the other hand, during winning matches, when the adversaries have possession, defenders run in high intensity relatively less than during draws or losses, which in turn demonstrates a greater tendency in defending deep when leading.

Our study confirms what already underlined by many researchers who also analysed aggregated physical data without finding any significant relationships with game outcome. However, other studies (notably Faude, Koch and Meyer) found that the vast majority of goals are preceded by at least one powerful action of the scoring or the assisting player (straight sprints, jumps, rotations and change-in-direction sprints).

While player physicality is certainly of great importance to succeed in football, the aggregated data investigated in this report are not the best suited to reflect its importance during key moments in games. Further research is thus required to analyse the unique SkillCorner physical data in a more detailed way.

Figure 4: gap in sprint distance between teams and goal difference during a match



3. Players' age as an explanatory element

The players' age is an important factor in physical performance. With the passage of time, this diminishes for well-known physiological reasons. What about the situation at the level of leagues and teams? Are the distances covered related to the line-ups fielded from an age perspective?

In the first instance, we crossed the average age of players on the pitch and the total distance covered per team at league level. The existence of a negative link, weak but statistically significant (r2 = 0.08), confirms this hypothesis. The players from older leagues such as Turkey run, on average, less distance than those from younger competitions, such as the Dutch Eredivisie. A statistically significant correlation also exists at the level of teams.

The strength of the relation increases when we take into account the distance covered in high intensity. This is even more reinforced when applied to forwards only (r2 = 0.14). The link between age and distance covered therefore mainly concerns attacking positions, where players are required to run fast more often. Youth in this case is an advantage in both the tendency and ability to furnish such efforts.

Figure 5: average distance per team and age of players on the pitch, per league

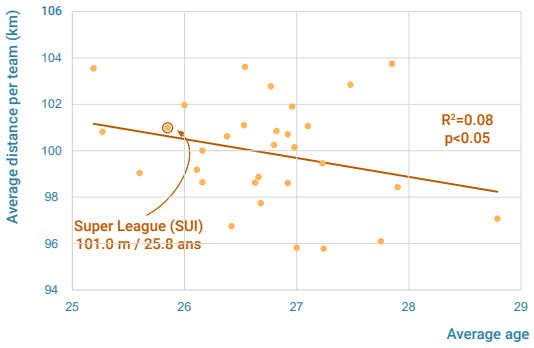
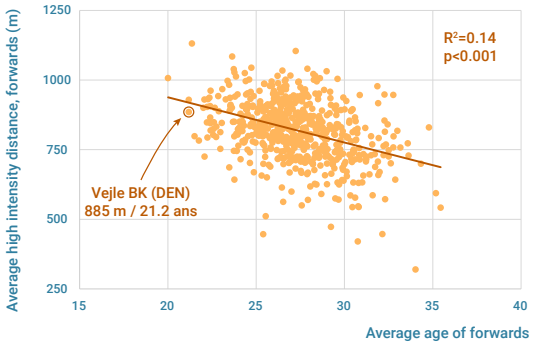


Figure 6: average distance in high intensity and forwards' average age on the pitch, per team



4. The key importance of position played

Thanks to the SkillCorner data, we also have access to the position played by footballers for each match. The position is notably defined in five modalities: centre backs, full backs, midfielders, wingers and centre forwards.

Centre backs are, on average, the players who cover the least distance on the pitch (9.2 km per match), while midfielders are those who cover the most (10.6 km). The average distance during sprints or in high intensity changes this hierarchy in favour of footballers playing in wide positions (both defensively and offensively) and forwards. Whether for total distance or that covered at higher speed, the same hierarchies between positions exist in all of the leagues studied.

Apart from this distribution by position, the SkillCorner data also allows us to analyse the values according to having possession, or not, of the ball (without taking into account distances ran during transition phases and stoppage time). A first finding is that players run more when their team does not have the ball: 3,911 metres per outfield player and match compared to 3,594. This observation applies to all competitions analysed.

The gap between the distance with the ball and without varies strongly according to the position played on the pitch. With a difference of about 550 metres per match, centre backs run logically more when the opposing team is in possession. Although the difference is reduced, midfielders (376 m) and full backs (341 m) follow the same logic. For wingers, this gap is much less, while it is actually slightly positive for centre forwards.

In taking into account the distances covered in high intensity, the difference between having or not having possession becomes slight (76 m), but the variations between positions increase. With possession, wingers cover four times more distance in high intensity than centre backs and 1.7 times more than midfielders. Conversely, in phases of the game where the team does not have the ball, these efforts are much more evenly distributed, with a maximum distance for full backs.

Figure 7: average distances of players per match, by position and speed (metres)

	Total distance	High intensity	Sprint
Centre back	9,222	485	96
Full back	9,888	814	191
Midfielder	10,611	719	114
Winger	10,253	932	211
Forward	9,945	847	191
Total	10,000	734	151

Figure 8: distance per match with or without possession, by position (metres)

Total distance	With possession	Without possession	Gap
Centre back	3,161	3,714	-553
Full back	3,525	3,866	-341
Midfielder	3,867	4,243	-376
Winger	3,730	3,886	-154
Forward	3,691	3,684	+7
Total général	3,594	3,911	-317

Figure 9: distances in high intensity per match with or without possession, by position (metres)

High intensity distance	With possession	Without possession	Gap
Centre back	111	318	-207
Full back	335	423	-88
Midfielder	272	399	-128
Winger	461	401	+60
Forward	433	338	+95
Total	299	376	-76

5. Conclusion

The distance covered by players is not an indicator reflecting the level of a team or a league. The differences between the 31 competitions analysed are relatively slight, whether for total distance or for high intensity one (>19.8 km/h). The players from European teams tend nevertheless to cover more ground than those from South American clubs, which reflects a more rapid playing style.

At the level of match results, players from winning teams tend to cover more distance sprinting (>25.2 km/h) than their opponents. However, this primarily reflects the greater tendency for teams taking the lead to counterattacking and not a significant gap between players of the competitions analysed from a running abilities' perspective.

However, other research showed that the vast majority of goals are preceded by at least one powerful action of the scoring or the assisting player. The aggregated data investigated in this report are thus probably not the best suited to reflect the importance of players' physicality during key moments in games. Further research is thus required to analyse SkillCorner's physical data in more detail.

A statistically significant link was observed between the players' age and distances covered, whether for total distance or that ran in high intensity. The strongest relation was recorded between the forwards' age and high-speed runs. The younger forwards in a team (or league), the greater the distance ran in high intensity.

Important differences at the level of total distances covered and the speed of runs also exist between positions. Midfielders run the most (10.6 km per match on average), while centre backs the least (9.2 km). Wingers cover the greatest distance both in high intensity (932 m) and when sprinting (211 m). In these cases too, the lowest figures were measured for centre backs.

With the exception of centre forwards, all the other outfield players run more without possession than during phases with the ball. However, this ratio greatly varies according to teams' ability to master the ball. From a physical perspective, players in teams holding possession are thus clearly at an advantage as they can focus their efforts in the attacking phase. This is particularly valid for wingers and centre forwards.