



TECHNICAL STUDY 3

Technical Study 3

A comparative performance analysis of games played on Football Turf and natural grass surfaces, from the evaluation of games played in the Dutch Eredivisie.

Introduction

Recent findings from two previous ProZone technical studies on European Football, have shown that playing patterns do not significantly change when teams compete on FIFA RECOMMENDED 2 STAR Football Turf as opposed to natural grass surfaces.

Some small differences were observed in certain facets of play, including attacking play, possession transitions, interceptions, and crossing patterns. Further objective analysis was therefore deemed necessary to quantify and compare playing patterns on Football Turf and natural grass surfaces.

The following study includes ProZone technical analysis from 34 football matches played in the Dutch Eredivisie (Dutch domestic Premier League) during the 2006–07 season. Analysis of this kind, from games played on both FIFA RECOMMENDED 2 STAR Football Turf and top quality natural grass surfaces, will enable us to further explore the fundamental question: Does the game change on Football Turf?

Aim

The aim of this third study, is to further analyse the potential impact that Football Turf may have on the pattern of the game and performance, and hence provide an objective feedback about the use of Football Turf playing surfaces in football.

Method

Data was collated from 34 Dutch Eredivisie matches during the 2006–07 season.

Of these 34 games, 17 involved games played at SC Heracles Almelo's Polman Stadium that has a FIFA RECOMMENDED 2 STAR Football Turf surface, while the other 17 involved games played at FC Utrecht's Galgenwaard Stadium, which has a natural grass surface. From these 34 matches, only the away team's data from the games played at SC Heracles Almelo and FC Utrecht were considered in the analysis. Eliminating the home team's data removed any perceived bias or learned effect resulting from habitual play on Football Turf or natural grass, which may have distorted the result.

An equal number of games on Football Turf and natural grass (involving the same 17 away opponents) were therefore analysed in a fair and direct comparison. From the 34 away team performances, there were 464 players used in the study (234 players on grass and 230 players on Football Turf). Only players who play 90 minutes were included for the individual and positional average data.

Matches were analysed using the computerised ProZone MatchViewer system. The system enables a range of tactical and technical information to be extracted from a single camera source, through plotting every on-the-ball action that occurs in a game (event, player, and pitch position). Around 2000–2500 ProZone 'events' were analysed per game using the ProZone MatchViewer system, providing a comprehensive range of technical match data for comparison.

Match information was then exported to ProZone's Trend Database application, which allowed the comparative multi-game

analysis of the 34-game dataset. Additional technical data was exported from ProZone's centralised Trend Database, and the following benchmarking comparisons concluded:

1. 17 Dutch games played on natural grass turf Vs 17 Dutch games played on Football Turf: Team and individual averages.
2. 17 Dutch games played on natural grass turf Vs 17 Dutch games played on Football Turf: Positional comparison.
3. League and competition benchmarking: Dutch Eredivisie, Champions League (combined with UEFA Cup data – as per the previous Study 2), UEFA Cup and FA Premier League.

Results/Discussion

Effective playing time

Overall analysis of the data shows that effective playing time (ball in-play duration) was not affected by the playing surface (51 minutes 02 seconds – 55 % – on Football Turf Vs 51 minutes 37 seconds – 55 % – on natural grass). Although the effective playing time in the Dutch Eredivisie is slightly lower than previously reported in the Champions League and UEFA Cup games (59 %), no significant differences were found between the ball in play duration in games played on grass turf and Football Turf in the present study.

Tactical analysis

Only very minor variations were reported for the frequency of player and team events from games played on natural grass and Football Turf within the tactical analysis.

The average number of tackles made in Dutch football was slightly higher than reported in the previous study involving Champions League and UEFA cup matches





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(approximately 33 per team per match Vs 28 per team per match), although the playing surface did not seem to affect the frequency of tackles per match in this study. On Football Turf the team match total was 30.29 equating to a player average of 3.11 per match, while the figures on grass turf were 33.88 and 3.40, respectively. Although slightly more tackles were reported per match on grass, the findings compliment the previous two ProZone studies, which also reported similar numbers of tackles performed on both Football Turf and natural grass surfaces (study 1; 22 Vs 22 and study 2; 28 Vs 28 per team per match).

In the present study, tackles were further analysed by categorising into 'ground' and 'standing' tackles in an attempt to determine whether the type of surface affected whether players were more inclined to stay on their feet or slide into tackles when challenging for the ball. From the 30 team tackles reported on average per match on Football Turf, 87 % (26 in total) were standing while 13 % (4) were ground tackles. On grass, the number of ground tackles is slightly higher (22 % of the total tackles made).

Despite reporting more ground tackles on grass, the average number of fouls awarded to teams on Football Turf (17.65) and grass (17.94) were almost identical. In keeping with the findings from the earlier two studies, however, there were more yellow cards reported per match on grass (2.06 Vs 1.59 per team). This would suggest that officials are likely to award a similar number of free kicks to teams for standing and ground tackles, although more likely to punish ground

tackles with bookings. The fewer ground tackles reported on Football Turf could be of interest when looking at the relationship between playing surface and the incidence, nature, and causes of injuries. More research is required.

Similar numbers of blocks were reported on Football Turf and natural grass (1.42 Vs 1.34 on average per player per game). Unlike the previous study (which found that teams performed 20 more interceptions on average per game on Football Turf) the frequency of interceptions reported on football and grass surfaces in this study were very similar (141 Vs 138 respectively). It was suggested in the last study, that Football Turf might lead to more transitions of possession due to the higher number of interceptions and possession losses reported. Having analysed a larger number of games, we can however see that this does not appear to be the case, with 244 Vs 243 occasions where teams regained possession of the ball on grass and Football Turf respectively. These figures therefore suggest that the playing surface does not affect the number of possession transitions in a game, and the differences found previously are likely to be the result of the specific games analysed and the smaller sample size.

The average number of headers per team per match was almost identical for Football Turf (75.59) and grass (76.18). The data reported in the previous Champions League and UEFA Cup study (Study 2) had suggested that Football Turf may produce more headers per match than grass surfaces (68 Vs 56 per team per match respectively), although the findings of the present study demonstrate that the pitch surface does not

affect the frequency of headers that players need to perform during matches.

The average number of dribbles performed per team, coupled with average touches per possession, will provide key objective information for ball-player interaction and therefore comparisons of Football Turf and natural grass playing surfaces. We can see from the data, that on average slightly more dribbles were performed by teams on grass than on Football Turf (6.76 Vs 5.82 respectively), whereas the average number of touches per possession per player were almost identical on grass and Football Turf (2.59 Vs 2.60). It therefore appears that players are equally as comfortable on either playing surface in terms of controlling and releasing the ball. The slightly higher inclination of players to dribble on natural grass, may be linked to the higher frequency of passes reported on Football Turf and discussed in more detail below.

Passing analysis

The most significant finding in the present study, was the higher incidence of passes attempted on Football Turf compared to natural grass, and the benchmark for the Dutch Eredivisie (an average of 308 Vs 270 Vs 274 passes per team per game respectively). Therefore, it could be contended that Football Turf encourages a greater passing style of play (the fewer dribbles and clearances reported on Football Turf compared with grass in this study would suggest that passing is the preferred player action on Football Turf). This could indeed be the case, although caution must be exercised when analysing this data, as the findings may also correlate to the standard and playing styles of the respective home teams (FC Utrecht and





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SC Heracles Almelo) in this study. This possibility (that the standard of the home teams will directly affect the data reported by the away teams) is a potential limitation in this study, and discussed in greater detail later. To reduce the chances of this limitation, this paper will analyse passing patterns in more detail as percentages of the total passing frequency.

The playing surface did not affect passing success rates, with 76 % success report by teams who played on Football Turf and 75 % by teams on grass. These findings for Dutch football are slightly lower than the benchmarks from the UEFA Cup (79 %), Champions League & UEFA Cup combined (82 %) and FA Premier League (78 %), but suggest that the type of playing surface does not affect player's ability to successfully find a team-mate.

There were more forwards (147 Vs 135), backwards (72 Vs 62) and sideways (89 Vs 74) passing on Football Turf. As a percentage of the total passing on Football Turf and natural grass, this represented 48 % Vs 50 % forwards, 23 % Vs 23 % backwards, 29 % Vs 27 % sideways respectively. Therefore, we can see the teams in this study were either slightly more direct or positive in their passing on grass, whereas teams on Football Turf demonstrated a slightly higher tendency to play sideways and switch play, or perhaps even be more patient in their attacking approach. Interestingly, when teams did pass forwards on Football Turf higher success rates were reported (65 % Vs 60 %), demonstrating the effectiveness of this playing approach and perhaps how Football Turf facilitates more successful forward passing.

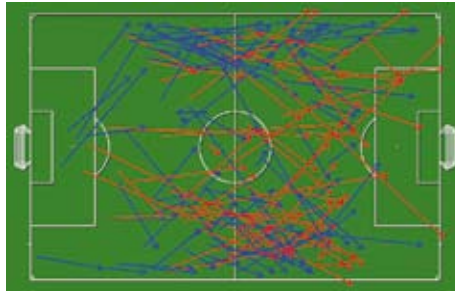


Diagram 1: Example of successful forward (blue) and unsuccessful (red) passing by an away team on natural grass in a match

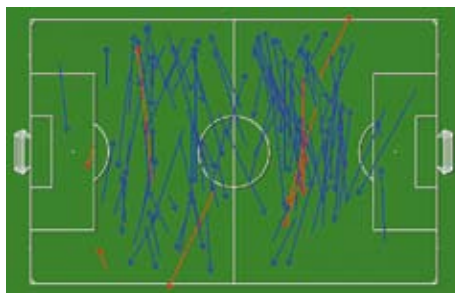


Diagram 2: Example of successful sideways (blue) and unsuccessful (red) passing by an away team on Football Turf in a match

As with the previous Champions League and UEFA Cup studies, players on Football Turf attempted more passes in their own half than players who played on a grass surface (an average of 16.35 Vs 13.65 per player per match, which equates to 56 % Vs 54 % of their total respective passes). This underscores the fact that fewer forward passes were recorded on Football Turf, and also infers that teams who play on this surface may defend deeper and enjoy possession for longer periods (hence greater passing frequency). In terms of a passing distance, there were slightly more long balls (>25m) played on

Football Turf than on natural grass (on average 85 Vs 70 per team per match, 28 % Vs 26 % of total passing) and also more medium (10–25 m) passes (158 Vs 135 or 51 % Vs 50 %). Interestingly, and in contrast to the previous study, the teams showed a greater tendency to play more short passes (<10m) on grass (66 Vs 65 respectively, which constitutes 24 % Vs 21 % of the total passing frequency reported). There are varying ways of interpreting this data, including a more intricate and compact playing style on grass, or a more expansive style of play on Football Turf (we saw that there were more sideways passes, which would underscore this hypothesis). It could also suggest that players are more confident about playing medium and long passes on Football Turf, while players who perform on grass perceive the short pass to be a safer option in terms of finding a team mate.

Attacking play

As reported in the previous study, more goals were scored by teams playing on Football Turf as opposed to grass (on average, 1.12 Vs 0.59 per match respectively). This seems to be the result of increased attacking play on Football Turf, including more shots (13 Vs 12 on average per team per match), penalty area entries (39 Vs 35) and final third entries (67 Vs 65). Once again, caution should be exercised when evaluating this data, given that the standard the home team's defensive play is not considered in this study. For example, FC Utrecht only lost 2 home games (conceding 11 goals) during the 2006–07 season, while SC Heracles lost 4 games at home, conceding 19 goals in the process. This is discussed further in 'Possible limitations'.



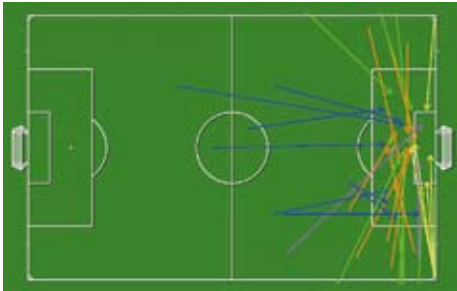


Diagram 3: Example of penalty area entries attempted in a match by an away team on natural grass in a match

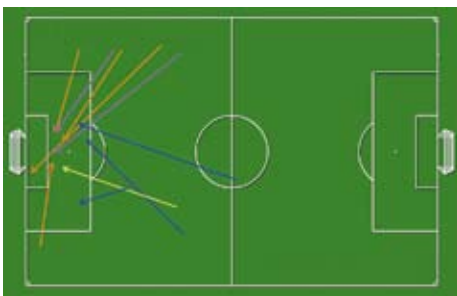


Diagram 4: Example of penalty area entries attempted in a match by an away team on Football Turf

The goal versus shot ratio from the present study, shows that on Football Turf, teams are likely to score a goal every 12 shots, whereas on grass a team would need to attempt over 20 shots per game. The reasoning behind this large difference could be the varying standard of the home team's goalkeeper and defenders (a contention further supported by the fact that there were actually more efforts on target on grass, 52 % Vs 41 %). However, it could also imply a unique and unexpected ball-ground interaction on Football Turf for shots that bounce before the goalkeeper attempts a save. In addition, it may also allude to the

possibility that players are able to make a cleaner contact with the ball when playing on Football Turf and hence ensure a more penetrative shot.

Upon further analysis it can be seen that, of the shots attempted on Football Turf, a slightly larger amount were taken from outside the box as opposed to inside (on average, 6.71 Vs 6.41 respectively). Conversely, shots attempted on a grass surface were mainly attempted inside the box (on average, 6.47 Vs 5.53 respectively). The findings suggest that players may feel more confident in taking more long-range shots on Football Turf, although it could be due to how high up the pitch FC Utrecht and SC Heracles Almelo defended on grass and natural turf respectively. For example the higher incidence of offside decisions reported on grass (3.12 Vs 2.94 per team per match) would suggest that FC Utrecht were defending higher up the pitch and attempting to catch the opposition off-side. Similarly, if SC Heracles Almelo were defending deep, this would explain the fewer offside decisions in the Football Turf matches, and more shots from outside the penalty area.

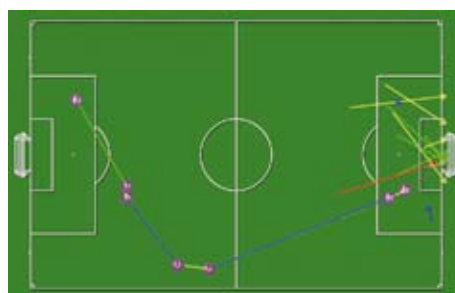


Diagram 5: Example of shots attempted in a match by an away team on Football Turf

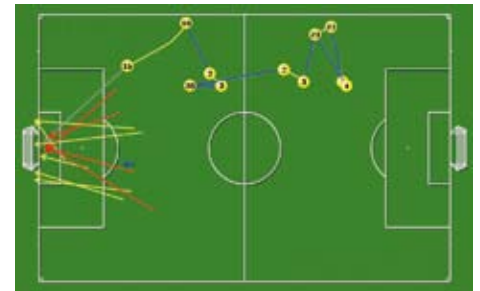


Diagram 6: Example of shots attempted in a match by an away team on Football Turf

The number of shots per team and game in Dutch football (13 on average) were identical to the number reported in other leagues and competitions (13 UEFA Cup Vs 13 in Champions League and UEFA Cup combined Vs 13 in the FA Premier League).

More crosses were delivered on Football Turf than on grass (on average, 12 Vs 11 per team per match). This finding is in contrast to the crossing analysis in the previous two studies where more crosses were performed on grass (13 Vs 12). Given that the difference is minimal, and having analysed a greater number of matches, we can conclude that the type of playing surface will not affect the frequency of crosses in matches. When all three studies to date are collectively considered, it seems that the playing surface has little impact on the team's wide attacking play.

Positional comparisons reveal that players of varying positions exhibit similar performance characteristics on Football Turf and natural grass surfaces. Whereas in the previous study, we saw that the wide players were generally more involved in games played on grass – leading to the contention that games on grass turf may





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promote more wing play and a higher frequency of crosses. No clear positional differences were reported in the current study. The wide players (left and right midfield) who performed on grass turf actually had slightly higher pass frequencies than players on Football Turf (left midfield 25 Vs 23 and right midfield 29 Vs 26), although more crosses were reported by these players on Football Turf (left midfield 2.3 Vs 1.3 and right midfield 1.9 Vs 1.7). In all other positions, players performing on Football Turf reported higher frequencies of passing (than in the same position on a grass surface) in line with the higher total team average passing seen on Football Turf in this study (308 Vs 270).

Possible limitations

During this study, all 34 sets of home team performances (17 FC Utrecht and 17 SC Heracles Almelo) were removed from the dataset to eliminate any perceived familiarity with the playing surface. Only using the away team's data led to a fair and direct comparison, given that the same 17 away teams played both at FC Utrecht and SC Heracles Almelo during the season. Of the 90 minutes players used for the individual and positional average data, 73% of the players who played away at SC Heracles Almelo also played away at FC Utrecht.

However, despite providing a strong tit-for-tat away dataset for comparative analysis, it could be argued that the standard and playing style (including formation) of the respective home teams could have directly affected the away team's performances and therefore the overall results. A look at the final league ratings in the Dutch Eredivisie in the 2006–07 season, reveals

that FC Utrecht finished 9th while SC Heracles Almelo finished 14th, winning 11 and 7 of their home games respectively. This demonstrates that the varying standard of the home teams used in the study, is likely to have affected the away team's data (this could explain for example, the higher frequency of passes, shots and goals by the away teams playing at SC Heracles Almelo).

Other possible limitations include the different officials used in the games and the timing of the fixtures during the season (weather conditions, morale of the teams and potential for fatigue during the season).

Conclusion

In the third objective study involving ProZone technical data, the impact of Football Turf and a natural grass surface on the pattern of football matches was considered. 34 games from the Dutch Eredivisie were analysed using the ProZone MatchViewer system (17 on Football Turf and 17 on natural grass) to ascertain whether the game changes on Football Turf. Various league and competition benchmarks were used as performance norms for comparative purposes, and results were also related to the two previous ProZone studies undertaken in this area.

In conclusion, this study reveals that:

- Football Turf does not dramatically effect the pattern of a football match, with clear similarities to data collated from games played on natural grass.
- No significant differences were reported in the "tactical analysis", including the frequency of dribbles, tackles, clearances, blocks and average touches per possession.

- There were more ground tackles than standing tackles reported on natural grass, suggesting that players are more inclined to stay on their feet on Football Turf. This may also explain the higher number of fouls, yellow cards and red cards reported on grass.
- Contrary to previous study (Champions League and UEFA Cup football), there was also no notable difference in the number of possession transitions and interceptions reported in games.
- There was a higher frequency of passes attempted and received on Football Turf, although it is suggested that this may also have been linked to the standard of the respective home team opponents.
- No notable differences were observed in terms of the passing success rates; and forward, backwards and sideways passing or short, medium and long passes (as a percentage of the total team pass frequency).
- Football Turf surfaces seemed to encourage a higher incidence of attacking play (including more final third entries, penalty area entries, shots and goals), although this could also be associated with the respective standard of the home teams, who experienced varying success during the season.
- In-depth positional analysis revealed no differences in playing characteristics for defenders, midfielders or attacking players.





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The third investigation involving objective ProZone analysis, provides further independent technical and tactical information on playing patterns exhibited by teams on Football Turf and natural grass, which will influence future implementation of FIFA RECOMMENDED 2 STAR Football Turf surfaces. Additional factors such as the standard of the home teams; the strategy of the away teams (e.g. formations utilised) and approach of the officials may also have affected the data. Therefore it is recommended that additional quantitative research – incorporating additional comparative data from games on Football Turf and natural grass – should be undertaken.

For full results tables and definitions please visit www.FIFA.com or contact football.turf@fifa.org

| Main Events Table comparing the per match individual and total team average for games played on natural grass turf and football turf | | | | |
|---|-------------------|---------------|----------------------|-------------------|
| Tactical Overview | Grass | | Football Turf | |
| | Individual | Team | Team | Individual |
| Total Headers | 7.61 | 76.18 | 75.59 | 8.04 |
| Tackles | 3.40 | 33.88 | 30.29 | 3.11 |
| Fouls | 1.60 | 17.94 | 17.65 | 1.68 |
| Blocks | 1.42 | 15.00 | 13.29 | 1.34 |
| Interceptions | 13.90 | 137.76 | 141.12 | 14.37 |
| Clearances | 2.87 | 31.12 | 27.47 | 2.55 |
| Possession Won | 22.53 | 244.18 | 243.00 | 22.92 |
| Possession Lost | 23.46 | 257.59 | 260.12 | 24.66 |
| Average Number Touches | 2.59 | NA | NA | 2.60 |
| Dribbles | 0.70 | 6.76 | 5.82 | 0.49 |
| Passing Overview | | | | |
| Total Passes | 26.20 | 270 | 308 | 29.97 |
| Successful Passes | 19.77 | 204 | 237 | 23.04 |
| Unsuccessful Passes | 6.43 | 66 | 71 | 6.93 |
| Total Pass Completion % | 75% | 75% | 76% | 77% |
| Balls Received | 29.30 | 310 | 349 | 33.03 |
| Passes Forwards | 12.78 | 135 | 147 | 14.13 |
| Passes Backwards | 6.18 | 62 | 72 | 6.86 |
| Passes Sideways | 7.25 | 74 | 89 | 8.98 |
| Pass Attempted Own Half | 13.65 | 145 | 171 | 16.35 |
| Passes Attempted in Opposition Half | 12.55 | 126 | 137 | 12.88 |
| Total No Short Passes | 4.85 | 66 | 65 | 6.14 |
| Total No Medium Passes | 13.30 | 135 | 158 | 14.90 |
| Total No Long Passes | 6.53 | 70 | 85 | 8.19 |
| Attacking Overview | | | | |
| Goals | 0.04 | 0.59 | 1.12 | 0.07 |
| Total Number of Shots | 1.18 | 12.00 | 13.12 | 1.28 |
| Shooting Accuracy | 50.34% | 50.52% | 47.09% | 37.50% |
| Final Third Entries | 6.23 | 65.12 | 67.18 | 6.47 |
| Penalty Area Entries | 3.15 | 35.12 | 38.65 | 3.35 |
| Total Corners | 0.39 | 4.29 | 5.00 | 0.47 |
| Crosses | 1.03 | 11.41 | 12.12 | 0.98 |
| Offsides | 0.26 | 3.12 | 2.94 | 0.22 |

