



## TECHNICAL STUDY 4

### Technical Study 4



A comparative performance analysis of games played on Football Turf and natural grass surfaces from the evaluation of games played during the FIFA U-20

World Cup Canada 2007.

#### Introduction

The FIFA U-20 World Cup Canada provided an ideal opportunity to further the technical analysis research into whether the game changes on Football Turf. Three previous studies involving ProZone analysis, found that playing patterns do not significantly change when teams compete on FIFA RECOMMENDED 2 STAR Football Turf as opposed to natural grass surfaces.

Research to date has focused on elite men's club football, with a total of 48 games analysed from the UEFA Cup, Champions League and Dutch Eredivisie. Few differences have been observed in terms of player, team and positional variations, although it was concluded during the previous study, that greater critical mass would enable us to achieve more confidence in the data.

The FIFA U-20 World Cup provided us with a unique opportunity to analyse an additional 52 international football matches and further explore the fundamental question: Does the game change on Football Turf?

#### Aim

The aim of this fourth study, is to further analyse the potential impact that Football Turf may have on the pattern of the game and performance. Furthermore, it should

provide an objective feedback concerning the use of Football Turf playing surfaces in football.

#### Methods

Data was collated from the FIFA U-20 World Cup matches played in Canada in 2007. During the tournament, games were played at six different locations; Toronto, Montreal, Ottawa, Burnaby, Victoria and Edmonton. Toronto's National Soccer Stadium, Montreal's Olympic Stadium and Ottawa's Frank Clair Stadium all housed FIFA RECOMMENDED 2 STAR Football Turf, while the Swangard Stadium (Burnaby), the Commonwealth Stadium (Edmonton) and Royal Athletic Park (Victoria) all had natural grass playing surfaces.

Of the 52 games, 29 were played on Football Turf and 23 were played on natural grass. In total, 104 teams and 1433 players were analysed in the study (796 players on Football Turf and 637 players on natural grass). Only data gathered in normal playing time (no extra time or penalties) was used in the study and the team, individual and playing position results were averaged for a direct and fair comparison between performances on Football Turf and natural grass playing surfaces. Only players who competed for 90 minutes were included in the individual and positional average data.

Match information was then exported to ProZone's Trend Database application, which allowed the multi-game comparative analysis of the 52-game dataset. Additional technical data was also exported from ProZone's centralised Trend Database, permitting the following benchmark conclusions:

1. 23 FIFA U-20 World Cup games played on natural grass turf Vs 29 FIFA U-20 games played on Football Turf: Team and individual averages.
2. 23 FIFA U-20 World Cup games played on natural grass turf Vs 29 FIFA U-20 games played on Football Turf: Positional comparison.
3. Previous study benchmarking: Dutch Eredivisie, Champions League (combined with UEFA Cup data – as per the previous Study 2) and UEFA Cup.
4. Additional benchmarking: FA Premier League Academy averages.

#### Discussion

##### Effective playing time

The average effective playing time (ball in-play duration) during tournament matches was 56 %, which is similar to the figure reported in previous studies. Overall analysis of the data shows that effective playing time was not affected by the playing surface (52 minutes 0 seconds – 55 % – on Football Turf Vs 52 minutes 29 seconds – 56 % – on natural grass). This data, coupled with the findings from the previous studies, demonstrates that the effective playing time is not affected by the playing surface and that, on average, the ball is in play for the same duration on either Football Turf and natural grass.

##### Tactical analysis

As with the previous study (Dutch football), only few differences were reported concerning the frequency of player and team events from tournament games played on natural grass and Football Turf. The average number of tackles made during the tournament (30 per team per match) was in line with the benchmarks previously reported. Objective match data regarding





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the relative frequency of tackles in games played on Football Turf and natural grass surfaces is vital, given the perceived relationship concerning incidences of injury in games. However, uniquely in this report there were more tackles reported by players on Football Turf than on grass (32 Vs 27 on average). During the previous Dutch study, we saw that games played on natural grass produced a higher incidence of tackles during games, hence leading to the assumption that players may be more likely to stay on their feet on Football Turf but commit to more challenges on grass. However, the findings from the present study, do not appear to support this theory, and the younger players who competed during the FIFA U-20 World Cup appeared equally – if not more – prepared to challenge for the ball on Football Turf. The findings could of course also be attributed to the tactics and playing patterns of the respective teams who played on Football Turf and natural grass, as well as incidences of other player's associated actions during games.

Tackles were again analysed in more depth – by categorising into “ground” and “standing” tackles – in an effort to determine whether the playing surface affected the type of challenge players attempted in games. In accordance with the findings from Study 3, we saw that teams playing on both grass and Football Turf reported a greater inclination towards standing tackles rather than ground tackles (80% Vs 20% of the total number of team tackles on Football Turf and 75% Vs 25% on grass respectively). The data suggests, that although players are more likely to perform ground tackles (for example sliding challenges) on natural grass, Football Turf

does not seem to discourage players from challenging for the ball on the ground.

Interestingly, despite the higher incidence of ground tackles reported on grass, the number of fouls committed by teams was higher on Football Turf (17.09 on average per team per match Vs 14.91 on natural grass pitches) – and we can therefore conclude that there were also more fouls committed in the defending third (4.47 Vs 3.87) and subsequently more yellow cards awarded (2.57 Vs 1.96) on Football Turf. These findings contradict the previous technical studies that all reported a higher incidence of fouls and yellow cards on grass, leading to the contention that this may have been related to the incidence of ground tackles on grass (22% of total tackles Vs 13% on Football Turf) and perceivably the official's inclination to punish such challenges. This however, does not appear to be the case during the present study and therefore we can conclude, that although the type of playing surface may affect the type of challenge attempted by players, the number of fouls committed remains similar.

Once again, the frequency of interceptions (131 Vs 128 per team per match) and incidence of blocks (1.13 Vs 1.17 on average per player per game) reported on Football Turf and natural grass were very similar. The number of possession transitions (won and lost possession of the ball) was almost identical (an average of 238.37 Vs 238.41 occasions where possession was regained by teams playing on natural grass and Football Turf respectively). Following the analysis of Champions League Football (Study 2) it had been contended that Football Turf might lead to more transitions of possession through a greater incidence of

interceptions and possession losses. This could be critical to the future implementation of Football Turf surfaces, given that many top coaches believe that games are won or lost on the basis of a team's ability to retain or regain possession of the ball. The current findings – combined with the data reported from the previous study – suggest that the type of playing surface does not affect this facet of the game.



Diagram 1: Example of possession regains by a team playing on Football Turf



Diagram 2: Example of possession regains by a team playing on natural grass





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The frequency of headers (on average 62 per team per game) was generally lower than we saw in the previous study (Dutch football reported an average of 76 on both natural grass and Football Turf), suggesting that these younger players kept the ball on the ground for longer periods during games. In terms of the playing surface comparison, slightly higher numbers of headers were witnessed in games played on natural grass (64 per team per game Vs 60). Although not a significant finding, this data is nevertheless interesting, given that one of the previous studies suggested that teams were required to head the ball more on Football Turf (68 Vs 56 header per team per match in Study 2; Champions League football). The data reported in the previous and current report, would suggest that the playing surface does not affect the requirement on players to perform headers during matches.

One of the key performance indicators analysed throughout all previous technical research studies, has been a player's average number of touches per possession per game. It is maintained that this data will provide crucial information on player-ball interaction (for example, a player's ability to control the ball) on natural grass and Football Turf playing surfaces. The average number of touches per possession per player was almost identical on grass and Football Turf (2.71 Vs 2.70). Coupled with the findings from the previous study (2.59 Vs 2.60), we can conclude that players are equally comfortable with the ball at their feet on either playing surface.

### Passing analysis

As with the previous study, the frequency of passes attempted on Football Turf was higher than on natural grass (296 Vs 282

on average per team per match). It was contended during the previous report, that the higher rate of passing frequency from the away teams analysed on Football Turf (308 Vs 270) may have been directly linked to the standard of the home team. It appears however, that although the difference was not as profound as reported in the Dutch football analysis, there seems to be a continuity throughout the various studies, suggesting that Football Turf encourages teams to attempt more passes.

Once again, the playing surface did not affect passing success rates, with 78 % success reported by teams in the tournament, regardless of the playing surface. This finding tells us that, firstly, the standard of passing in the tournament was comparable to the performance benchmarks already reported in previous studies (Dutch Football: 76 %, UEFA Cup: 79 %, Champions League & UEFA Cup combined: 82 % and FA Premier League: 78 %). Secondly, and more significant for the purpose of this study, the findings also tell us that the type of playing surface does not affect player's ability to successfully pass to a team-mate.

There were more forwards (140 Vs 130), backwards (58 Vs 57) and sideways (98 Vs 91) passing on Football Turf, which is a reflection of the greater frequency of passes reported generally. As a percentage of the total passing on Football Turf and natural grass, this represented 47.2 % Vs 46.1 % passes forwards, 19.6 % Vs 20.3 % backwards and 33.2 % Vs 32.4 % sideways respectively. These tendencies are similar to the findings reported in Dutch football (Study 3) and suggest that players who play on Football Turf are more likely

to employ a positive or direct style of play (the relative success rates of forward passing – 67 % on grass and 66 % on Football Turf – suggest it could be the latter, although the difference is not significant). The greater inclination of players to pass sideways on Football Turf demonstrates continuity between the previous studies, which also suggest that teams may seek to switch play as part of their attacking build up more so than teams who play on natural grass. Once again the differences reported in the direction of passing during the tournament were minimal and suggests that the game does not change dramatically when teams play on Football Turf surfaces. For the fourth successive study, more passes were attempted by teams in their own half on Football Turf (an average of 161 Vs 154 per team per match). Upon initial inspection this data would suggest that teams who play on Football Turf may defend deeper and enjoy possession for longer periods during games (hence the greater pass frequency reported on Football Turf). As a percentage of the total passes attempted, however, those attempted in a team's own half represents 54 % of the total for both playing surfaces, therefore demonstrating that – although we can expect to see a higher frequency of passes generally on Football Turf – this does not affect the game in terms of where passes emanate from (46 % percent of passes on both playing surfaces were attempted in the opponent's half of the field).

In terms of a passing distance, there were slightly more long balls (>25m) played on natural grass (an average of 70 Vs 65 per team per match, 24.6 % Vs 21.9 % of total passing), which contradicts the findings of the previous two studies that both reported





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a greater number of long passes from teams on Football Turf. A similar variation was seen with short passes (<10m), although on this occasion there was a higher percentage reported Football Turf (28.1 % Vs 25.9 % of total team passes). Medium passes accounted for the remaining 50 % on natural grass and 49.5 % on Football Turf. However, in view of findings from previous studies, where an inverse pattern was reported, it is likely that these minimal differences relate to the standard and playing styles of the respective teams rather than the playing surface.

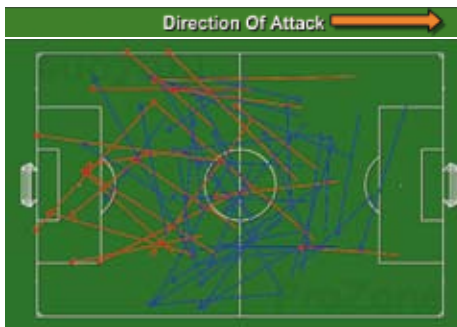


Diagram 3: Example of successful long (blue) and unsuccessful (red) passes by an away team in a match played on Football Turf (direction of attack right-to-left)



Diagram 4: Example of successful short (blue) and unsuccessful (red) passes in a match by a team playing on grass

### Attacking play

Almost an identical number of goals were scored on average per team and match (1.20 on natural grass Vs 1.19 on Football Turf). Furthermore, the number of shots attempted was very similar (14.48 Vs 14.79 respectively), and higher than normally witnessed in football (average of 13 shots per team and game recorded in all previous studies). However, despite these comparable findings, more final third entries (68 Vs 64) and penalty area entries (32 Vs 29) were reported on natural grass. Looking back over all four studies, this is the first time greater numbers of attacking entries were reported on grass, although ultimately this did not seem to have any influence on the frequency of shots and goals per game (there were actually slightly more shots per team on Football Turf, despite the fewer attacking entries).

Higher shooting accuracy was seen on Football Turf than on natural grass (45 % Vs 41 %). The average number of on-target shots on Football Turf was 6.71 per team and match, compared to 5.91 on natural grass. These findings contradict the previous study looking at Dutch football, where slightly lower on-target efforts were recorded on Football Turf (5.41 Vs 6.24, representing 41 % Vs 52 % shooting accuracy). Closer analysis of the relative shooting patterns on both playing surfaces, reveals that this pattern was also true for shots attempted both inside and outside of the box (53 % Vs 46 % on target for shots within the box and 39 % Vs 37 % for shots from outside the box). This would suggest that Football Turf surfaces generally allow players to make more accurate attempts at the opponent's goal. However, in view of previous studies where the reverse was

found to be true, this finding might reflect more powerful attacking players having played on the Football Turf, or perhaps even a chance result.

More offside decisions were reported on natural grass (2.26 Vs 1.81 per team and match), which probably accounts for the higher number of attacking entries reported on Football Turf. However, the fact that there was also a higher number of offsides on grass in the previous Dutch study (3.12 Vs 2.94 per team and match), and a greater number of attacking entries on Football Turf, suggests that other factors may have also influenced this result. For example, it could be that Football Turf encourages teams to play shorter passes into the feet of attacking players, whereas on grass, teams attempt longer passes behind defensive players for the attackers to catch up with it. The higher incidence of long passes on grass and short passes on Football Turf would compliment this premise, although, given the low number of offside decisions generally awarded in games, further research would be required to verify this theory.

One of the most interesting findings, was the greater number of crosses recorded on natural grass compared to Football Turf (13.09 Vs 10.31), which was also reported in Studies 1 and 2 (UEFA Cup and Champions League) and led to the contention that Football Turf may lead to a more narrow style of play. However, the recent Dutch research (Study 3) found the inverse to be true with slightly more crosses delivered on Football Turf (12 Vs 11). Given that no continuity seems to have emerged throughout the research, we can therefore assume that the type of playing surface does not affect the number of crosses we are likely to witness in games. In this specific study,





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a closer look at the positional variations, shows that players who played on natural grass may have chosen to cross the ball rather than pass or dribble; left midfielders, for example, on average crossed the ball on 2.14 occasions on Football Turf compared to 3.18 on natural grass. However, more passes and dribbles were reported by left midfielders on Football Turf (27.27 Vs 25.12 passes and 1.38 Vs 0.97 dribbles on average respectively).

Centre midfielders generally had higher pass frequencies on Football Turf (42 Vs 35 on average per game), as a direct consequence of receiving more balls in matches (40 Vs 35 on average per game). The passing success rates were slightly higher on Football Turf (81% Vs 80%) and generally higher than seen in FA Premier League academy football. Appendix 3 summarises the positional comparison undertaken, and reveals very similar findings for all playing positions. We can therefore conclude that the type of playing surface does not affect positional playing characteristics exhibited in games.

### Possible limitations

The FIFA U-20 World Cup gave us the perfect opportunity to further analyse whether the game changes on Football Turf. 29 games played in three Football Turf stadiums were compared with 23 games played on natural grass in three other stadiums. This not only provided us the largest single dataset to date (52 matches), but also eliminated any perceived home bias (a potential risk in the previous study) as the games were international tournament matches played at neutral stadiums. However, due to tournament logistics and the luck of the draw, certain teams of varying standard would have played more

games on Football Turf than on natural grass (and vice versa), which arguably limits the effectiveness of the study. It is nevertheless expected, that given the large number of games, any potential anomalies would even out over the total dataset.

Other possible limitations include the different officials used in the games, the standard of the opposition (including formation utilised) and the timing of the matches (kick-off time and rest period between games).

### Conclusion

In the fourth objective study involving ProZone technical data, the impact of Football Turf and natural grass surfaces on the pattern of football matches was considered. 52 games from the FIFA U-20 World Cup were analysed using the ProZone MatchViewer system (29 on Football Turf and 23 on natural grass) to ascertain whether the game changes on Football Turf. The findings from the current tournament dataset were also compared to those of the set of the three previous studies.

### In conclusion, the current findings reveal that

- Football Turf does not dramatically effect the pattern of a football match, and the collective data reveals clear similarities to that of tournament games played on natural grass.
- The effective (ball in play) playing time for tournament matches was very similar on Football Turf and grass (55–56% of the game on average).
- Although subtle differences were observed with certain variations in the “tactical

analysis”, the majority of variations (including a player’s average number of touches per possession) reported similar findings.

- As with the previous (Dutch football) study, in which tackles were analysed in more depth, players were more inclined to perform ground tackles on grass surfaces (1 in 4 challenges Vs 1 in 5 on Football Turf), although this did not correlate to the number of fouls and yellow cards awarded (which were greater on Football Turf).
- Contrary to the initial studies (UEFA Champions League and UEFA Cup), yet in accordance with the previous study, there were also no notable differences in the number of possession transitions and interceptions reported in tournament games.
- There was a higher frequency of attempted passes and balls received on Football Turf, so we can conclude that this may be a feature of matches played on Football Turf surfaces (having reported similar findings previously).
- No notable differences were observed in terms of the passing success rates; and only minor differences were reported in the analysis of passing direction and passing distance. So, although pass frequencies on Football Turf are slightly higher, it seems that the type of passes executed by players does not change.
- Contrary to the previous research, in this specific study, natural grass surfaces seemed to encourage a higher incidence of attacking play (including more final





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third entries, penalty area entries and crosses), although this did not affect the number of shots and goals reported on each playing surface.

- Despite centre midfielders enjoying more possession of the ball on Football Turf in this tournament, an in-depth positional analysis reveals no significant differences in the playing characteristics of defenders, midfielders or attacking players.
- The fourth 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 influence of the officials, the strategy and formation of the individual teams and the timing of the matches (kick-off time and rest periods between tournament matches) may also have affected the results. However, having comprehensively analysed 100 matches from a technical perspective, we can assume that the effect of such external influences would have been diminished.

For full results tables and definitions please visit [www.FIFA.com](http://www.FIFA.com) or contact [football.turf@fifa.org](mailto:football.turf@fifa.org)

<b>Main Events Table comparing the per match individual and total team average for games played on natural grass turf and football turf</b>				
<b>Tactical Overview</b>	<b>Grass</b>		<b>Football Turf</b>	
	<b>Individual</b>	<b>Team</b>	<b>Team</b>	<b>Individual</b>
Total Headers	4.64	<b>63.98</b>	<b>60.00</b>	4.37
Tackles	2.64	<b>26.57</b>	<b>32.36</b>	3.39
Fouls	1.08	<b>14.91</b>	<b>17.09</b>	1.24
Blocks	1.17	<b>16.20</b>	<b>15.45</b>	1.13
Interceptions	9.26	<b>128.04</b>	<b>131.12</b>	9.55
Clearances	1.80	<b>24.91</b>	<b>24.09</b>	1.76
Possession Won	17.21	<b>238.37</b>	<b>238.41</b>	17.37
Possession Lost	18.18	<b>251.02</b>	<b>253.38</b>	18.46
Average Number Touches	2.71	<b>NA</b>	<b>NA</b>	2.70
Dribbles	0.33	<b>4.61</b>	<b>5.67</b>	0.41
<b>Passing Overview</b>				
Total Passes	20.43	<b>282</b>	<b>296</b>	21.53
Successful Passes	15.90	<b>220</b>	<b>231</b>	16.80
Unsuccessful Passes	4.53	<b>63</b>	<b>65</b>	4.73
Total Pass Completion %	78 %	<b>78 %</b>	<b>78 %</b>	78 %
Balls Received	23.14	<b>319</b>	<b>330</b>	24.04
Passes Forwards	9.65	<b>134</b>	<b>140</b>	10.17
Passes Backwards	4.17	<b>57</b>	<b>58</b>	4.21
Passes Sideways	6.61	<b>91</b>	<b>98</b>	7.15
Pass Attempted Own Half	11.11	<b>154</b>	<b>161</b>	11.73
Passes Attempted in Opposition Half	9.32	<b>129</b>	<b>135</b>	9.81
Total No Short Passes	4.12	<b>73</b>	<b>83</b>	6.05
Total No Medium Passes	10.12	<b>140</b>	<b>148</b>	10.76
Total No Long Passes	5.02	<b>70</b>	<b>65</b>	4.73
<b>Attacking Overview</b>				
Goals	0.08	<b>1.20</b>	<b>1.19</b>	0.09
Total Number of Shots	1.05	<b>14.48</b>	<b>14.79</b>	1.08
Shooting Accuracy	41 %	<b>41 %</b>	<b>45 %</b>	45 %
Final Third Entries	4.89	<b>67.91</b>	<b>64.02</b>	4.66
Penalty Area Entries	2.88	<b>31.74</b>	<b>29.40</b>	2.65
Total Corners	0.40	<b>5.39</b>	<b>5.48</b>	0.40
Crosses	0.96	<b>13.09</b>	<b>10.31</b>	0.75
Offsides	0.16	<b>2.26</b>	<b>1.81</b>	0.13

