

## HIGH INTENSITY PARAMETERS IN 2018 SOCCER WORLD CUP

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### ABSTRACT

The purpose of this study was to analyze the differences in the high intensity physical performance parameters, between the best and the worst teams of the 2018 Soccer World Cup. The distance covered at 20- 25 km/h, the distance covered at > 25 km/h, the top speed, and the total number of sprints were analyzed. No significant differences between groups were found, except for the top speed in the quarter-final round, which indicates that, regarding elite soccer teams, the success of a soccer match relies mainly in technical and tactical strategies. However, most high intensity performance parameters were higher in the best group, especially in the quarter-final and semi-final rounds, suggesting that the top speed achieved by the players during the match and the distance covered at speeds > 25km/h may also play an important role, particularly when the level of fatigue is not very high.



### KEY WORDS

soccer, physical demands, high intensity parameters, sprint distance.



### INTRODUCTION

Football is an intermittent sport that includes activities at different levels of intensity, abundant changes of direction and a high number of accelerations, decelerations and

other explosive activities<sup>1-3</sup>. In addition to the technical demands, the physical requirements of elite football players have been extensively studied over the last decades<sup>4-6</sup>.

Nowadays, monitoring players' running performance is considered essential to help coaches design appropriate training sessions<sup>7-9</sup>. According to Saward et al.<sup>10</sup>, knowledge of the workload during matches is necessary to optimise specific training sessions during the season, depending on the demands of the matches and the different playing positions. A professional football player runs on average between 9 and 12 km during a match<sup>5,11</sup>, but this amount varies depending on running speed and playing position<sup>5,12-14</sup>.

Due to the high number of intermittent activities during a football match, the total distance travelled is an insufficient parameter to understand the physical requirements of the players, and the distance travelled at high speeds seems to be a better indicator of success in the match, especially in some playing positions<sup>7,15-17</sup>. For example, distance travelled at high for example, the distance travelled at high speed by players in lateral positions can determine team success<sup>14</sup>. In addition, sprinting ability is a desirable attribute to contribute to success in a match<sup>18-20</sup>. Excluding goalkeepers, professional football players perform, on average, more than 20 sprints per match<sup>13,14</sup>, cover more than 200 m at sprint speeds<sup>21</sup> and reach top speeds of around 30 km/h<sup>11,14</sup>. However, different tactics in a match can modulate the physical demands of the players<sup>22</sup>.

Many studies have looked at total distance covered during a match and at distances covered at high or very high intensity<sup>5,6,11,13,14</sup>. These studies analysed data from several or all teams participating in the Spanish Premier League or English Premier League<sup>5,11,13</sup>, data from 58 teams playing in the European Champions League and UEFA Cup<sup>6</sup> or data from all matches of the 2018 World Cup<sup>14</sup>. However, although they studied the differences between different playing positions, none of them analysed the differences between the best and worst teams in those leagues and competitions. Therefore, the purpose of the present study was to analyse the differences in high-intensity activities between the best and worst teams in the quarter-finals, semi-finals and final of the 2018 Football World Cup.



## MATERIALS Y METHODS

### Design and participants

This study used data provided by FIFA for the matches of the 2018 Football World Cup<sup>23</sup>. At the beginning of the competition there are usually large differences in the level of play of the best and worst teams, which can result in the best teams not playing to their full potential. Because of this, only data from the quarter-finals, semi-finals and final were analysed.

The teams were divided in each round into two different groups: the group of the best and the group of the worst ranked teams. In the quarter-finals and semi-finals, the best group consisted of the teams that qualified for the next round and the worst group consisted of the teams that did not. In the final, the best group consisted only of the winning team and the worst group consisted of the losing team. Only players who played at least 90 minutes of each match, excluding goalkeepers, were selected. The players were classified into 5 different playing positions: central defenders, wing backs, midfielders, wingers and forwards.

However, due to the low number of players in each position, all positions were grouped together for further analysis. The study followed the ethical guidelines of the Declaration of Helsinki.

### **Measures**

FIFA<sup>23</sup> provided 14 different physical activity parameters for each player during each match, in the first half, in the second half and in the full match. Only four of them during the full match were used in this study: the distance travelled at speeds between 20 and 25 km/h, the distance travelled at speeds above 25 km/h, the maximum speed reached and the number of sprints performed. The data were obtained with a reliable optical real-time tracking system at 25 frames per second<sup>14,24</sup>.

### **Statistical analysis**

Statistical analysis was carried out with SPSS for Windows, v. 22.0 (SPSS Inc., USA). We pooled the data from all the different positions of the best and worst teams and calculated the mean and standard deviation of all variables. Shapiro-Wilk tests were performed to check the normality condition of the variables and, as this condition was always met, Student's t-tests were performed to determine the significant differences between the best and worst teams in each round. In addition, effect sizes were calculated with Hedges' g and the correction for small samples and interpreted according to the following criteria: minimal effect (< 0.20), small effect (0.20 - 0.50),

moderate effect (0.50 - 0.80) or large effect (> 0.80)<sup>25</sup>. Results were considered significant when the degree of significance was less than 0.05 ( $p < 0.05$ ).

## RESULTS

The means and standard deviations of all variables, calculated from the pooled data of the best and worst teams in each round, are given in Table 1. Significant differences and effect sizes can also be found in Table 1.

and effect sizes can also be found in Table 1. No significant differences were found between the groups, except for top speed in the quarter-finals. However, most of the high-intensity physical activity parameters were higher in the top group, especially in the quarter-finals and semi-finals.

Table 1. Descriptive statistics, significant differences and effect sizes

Variables	Phase	All Mean $\pm$ SD	Worst group Mean $\pm$ SD	Best group Mean $\pm$ SD	p-value	Hedges' g (effect size)
Distance travelled at 20-25 km/h (m)	Quarter-final	503,13 $\pm$ 166,36	507,86 $\pm$ 165,79	499,12 $\pm$ 169,31	0,840	-0,05
	Semi-final	514,86 $\pm$ 181,26	499,76 $\pm$ 160,13	529,11 $\pm$ 202,82	0,639	0,16
	Final	509,20 $\pm$ 155,20	552,00 $\pm$ 167,24	460,29 $\pm$ 135,41	0,269	-0,57
Distance travelled at > 25 km/h (m)	Quarter-final	171,59 $\pm$ 99,10	148,07 $\pm$ 85,63	191,55 $\pm$ 106,46	0,088	0,44
	Semi-final	197,09 $\pm$ 109,22	172,76 $\pm$ 89,31	220,06 $\pm$ 123,29	0,205	0,43
	Final	224,73 $\pm$ 122,56	236,75 $\pm$ 133,63	211,00 $\pm$ 117,47	0,700	-0,19
Maximum speed (km/h)	Quarter-final	28,60 $\pm$ 2,11	27,88 $\pm$ 2,18	29,21 $\pm$ 1,86	0,013	0,64
	Semi-final	28,34 $\pm$ 2,15	28,02 $\pm$ 1,89	28,64 $\pm$ 2,39	0,402	0,28
	Final	28,84 $\pm$ 2,26	28,78 $\pm$ 2,60	28,91 $\pm$ 2,01	0,920	0,05
Number of sprints	Quarter-final	30,31 $\pm$ 11,06	29,96 $\pm$ 10,96	30,61 $\pm$ 11,30	0,823	0,06
	Semi-final	31,31 $\pm$ 11,41	30,18 $\pm$ 10,02	32,39 $\pm$ 12,79	0,574	0,19
	Final	31,13 $\pm$ 9,92	33,38 $\pm$ 11,12	28,57 $\pm$ 8,42	0,369	-0,46

SD: standard deviation; \*: significant differences between groups ( $p < 0.05$ ).

Table 2 shows the means and standard deviations of all variables with the pooled data for both the best and worst teams, as well as for the three phases. Significant differences between groups and effect sizes are also shown in Table 2.

2. Significant between-group differences were only found in maximum speed. However, the effect sizes also showed small differences in the distance travelled at speeds above 25 km/h. Between-group differences in the number of sprints and distance travelled at speeds between 20 and 25 km/h were minimal.

Variables	All Mean ± SD	Worst group Mean ± SD	Best group Mean ± SD	p-value	Hedges' g (effect size)
Distance travelled at 20-25 km/h (m)	5507,65 168,36	± 511,92 161,96	± 503,74 ± 175,33	0,352	-0,05
> 25 km/h distance covered (m)	186,81 106,37	± 169,38 ± 98,04	202,74 ± 111,91	0,799	0,31
Top speed (km/h)	28,55 ± 2,13	28,06 ± 2,14	29,00 ± 2,03	0,020	0,45
Distance travelled at > 25 km/h (m)	30,74 ± 10,94	30,55 ± 10,55	30,91 ± 11,37	0,861	0,03

SD: standard deviation; \*: significant differences between groups ( $p < 0.05$ ).

## DISCUSSION

The purpose of the present study was to analyse the differences in high-intensity activities between the best and the worst teams of the 2018 Football World Cup. Our main finding is that, although the differences were not significant, the effect sizes showed that most of the high-intensity parameters analysed were higher in the best group in the quarter-finals and semi-finals, but not in the final.

Regarding the values obtained for the measured variables, our results are not in agreement with those obtained by Bradley et al.<sup>5</sup> and Mallo et al.<sup>11</sup> Bradley et al.<sup>5</sup> analysed data from English Premier League players. They did not calculate the total number of sprints per match or the maximum speed, but the distances covered at speeds between 20 and 25 km/h or higher were greater than in our study. Mallo et al.<sup>11</sup> analysed 111 Spanish Primera División League matches and the distance covered between 20 and 25 km/h was less than in our study and the distance covered at speeds between 20 and 25 km/h was less than in our study. over 25 km/h was, however, greater. These differences with respect to our study could be due to the different level of the teams analysed, but probably the main reason is the different physical requirements per match in a league such as the Spanish Primera División or the English Premier League, whose duration is approximately 9 months, and in the Football World Cup, which is played in just over a month.

In this sense, Di Salvo et al.<sup>6</sup>, who measured the total number of sprints per match and the distance covered at more than 25 km/h, in 67 European Champions League or UEFA Cup matches, between 2002 and 2006, obtained values that were quite high. 2002 and 2006, obtained values much closer to ours. It is true that these competitions do not take place in a single month, but their structure is quite similar to that of the World Cup.

We are not aware of any studies comparing the differences in high-intensity match activities between the best and the worst teams in leagues or competitions. However, due to the lack of significant differences found in our research, it seems obvious that, in the case of elite teams, technical and tactical strategies are better indicators of success than physical parameters, as has been suggested by several studies<sup>26-29</sup>. Only top speed seems clearly higher in the best teams, and significant differences are even found when analysing the three phases together. In fact, Ugalde-Ramirez<sup>14</sup> analysed the same parameters in the same competition, but including all teams and all matches, and obtained mean values of maximum speed intermediate between those found in our study for the best and worst teams.

Our results also suggest that the best teams travelled distances at speeds greater than 25 km/h slightly faster than the worst teams, especially in the quarter-finals and semi-finals. The fact that these differences were not found in the final may be due to fatigue accumulated in the previous rounds, as has been claimed by Palucci et al.<sup>30</sup> in their study of Brazilian professional football players, who presented lower values of high-intensity physical activities in periods of many matches.



## CONCLUSIONS

The fact that we found almost no significant difference in high-intensity activities between the best and the worst World Cup teams indicates that, for elite teams, the success of a match lies mainly in technical and tactical strategies. However, the maximum speed reached by the players and the distance covered at speeds above 25 km/h could also play an important role, especially when the fatigue level is not yet very high. Therefore, coaches should design specific training sessions dedicated to increasing players' top speed and their ability to cover longer distances at higher speeds. It would also be advisable to improve strategies to accelerate recovery between games that are not sufficiently far apart, in order to avoid a decrease in high-intensity activities during matches.



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