

Ball possession and passes as key performance indicators in the Algerian league of soccer (LFP1).

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ARTICLE INFORMATION	ABSTRACT
ORIGINAL RESEARCH PAPER RECEIVED: 09/01/2022 ACCEPTED: 18/04/2022 PUBLISHED: 01/06/2022	THE AIM OF THE PRESENT STUDY IS TO IDENTIFY IF BALL POSSESSION AND PASS ARE KEY PERFORMANCE INDICATORS IN THE ALGERIAN LEAGUE OF SOCCER. 64 GAMES PLAYED IN THE ALGERIAN "LIGUE DE FOOTBALL PROFESSIONNEL 1 (LFP1) "FROM THE 2015/16 SEASON WERE ANALYZED. ATTRIBUTE OF BALL POSSESSION AND PASS ANALYZED ARE: BALL POSSESSION: SEQUENCE BY BALL TOUCH, SEQUENCE BY TIME, OVERALL TIME AND POSSESSION PERCENTAGE; PASS: OVERALL NUMBER AND SUCCESSFUL (%), BY PITCH AREA, BY PLAYING POSITION. GAMES WERE ANALYZED BY THE DARTFISH SOFTWARE. RESULTS SHOWED THAT NEITHER OVERALL PASS AND POSSESSION (ABSOLUTE AND RELATIVE) ARE RELATED TO SUCCESS. HOWEVER, WE FOUND THAT DEFEATED TEAMS TEND TO RECORD MORE SEQUENCE WITH «7-10" TOUCHES (8.5±5.12 VS 7.09 ± 4.23 AND 5.1 ± 3.21 FOR WON AND DRAW GAMES ; P<0.05) AND MORE SUCCESSFUL PASSES (%) (P<0.05).FORWARDS TEND TO ACHIEVE MORE PASSES IN WON GAMES COMPARE TO DRAW AND LOST ONES (P=0.59; 0.06 RESPECTIVELY). DISTRIBUTION OF PASS ON THE FIELD WAS DIFFERENT IN DRAW GAMES PITCH AREA
KEYWORDS: PERFORMANCE INDICATORS, POSSESSION, PASS, DARTFISH, SOCCER, ALGERIA	
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1. Introduction

Over the past 50 years, passes and especially short passes (i.e., less than 20 meters) have received more attention than any other technique in training practices. It is considered to be the basic technique in soccer (especially young players) for building a collective game (Franks & Hughes, 2016, p. 19).

In scientific literature, added to the exclusive studies of the pass and its association with performance, the majority of research that has analyzed the technical-tactical activity has integrated the pass as one of the main variables.

A lot of key performance indicators have been identified in different international and domestic competitions. The most recurrent are: Shots in the 2018 FIFA world cup (Hadji, 2021) and in the 2002-2010 FIFA world cup (Castellano et al., 2012); Cross in the five major European competitions (Sarkar, 2018; Vecer, 2014); Foul committed in the Algerian LFP1 (Hadji, 2018); Possession for the national Algerian team (Hadji et al., 2019) and domestic European competitions (Jones et al., 2004).

In the 1990 and 1994 World Cups, for the top teams (semi-finalists), longer passing sequences produced more goals per possession than shorter passing sequences. For the other teams, no tactic had a clear advantage (Hughes & Franks, 2005). In the French professional league (2008/09), midfielders make the highest percentage of successful passes ranging from 75% to 78%, while the lowest values are recorded among strikers (71%) and central defenders (63%) (Dellal et al., 2010). In the Italian "Serie A", Rampinini et al. (2009) top five teams make more short passes (27) and successful short passes (25) than the weakest teams 19 and 17 respectively. Comparing the top three levels in English football, Bradley et al. (2013) report that "Premier League" players make greater number ($P < 0.01$) of total passes, successful passes, forward passes, balls received and touches per possession compared to their peers in the Championship and League.

A longitudinal study on the evolution of technical-tactical activity in the "Premier League" over seven (7) seasons (from 2006/07 to 2012/13), reveals a 40% increase in the total number of passes per game. The central players (central defenders and midfielders) showed the most pronounced increases in the total number as well as the percentage of successes, while the winger players (full-backs and wing midfielders) recorded only small to medium increases in the total number of passes and percentages of successes. (Bush et al., 2015) (Wallace & Norton, 2014) report the same evolution (40%) in World Cup final games from 1966 to 2010.

In the "Ligua", Lago-Peñas and Lago-Ballesteros (2011) reveal that teams playing at home, make more passes (422 against 396) and successful passes compared to the visitors (309; 286 respectively).

Comparing football activity between the "Liga" (Spanish) and the "Premier League" (English PL), Dellal et al. (2011) found similar characteristics in the passing performances between players playing in the «Liga" and the "PL". Players in these two leagues achieved a success rate of between 70% and 81%. However, the strikers in La Liga had better success rates than those in the PL, who also had the least success compared to other positions.

The pass is a performance indicator related to where competition take place (home or away, tournament), the result (won, draw or lost) and the level of the team (according to the final ranking). Researchers agree that the percentage of successful passes is more important than the total number of passes. The two parameters of the pass (number and percentage of successes) are higher in teams playing at home and the highest ranked. For domiciliation, it is possible that the conditions of conduct are favourable to the team that receives, this advantage is directly observed on the number of passes and its quality. For the teams ranked at the top of the table, it is obvious that the quality of their players allows a better technical mastery. On the other hand, the results are sometimes contradictory when the comparison of the pass, including the total number, is made in relation to the result of the match. It seems that, in a situation of loss, the team is able to make more passes. This may be due to the strategic choices of the teams, when one team leads the score, it often tends to fall behind and leave the possession of the ball to the other team.

2. Method and Materials

2.1. Participants

The study was carried out on 64 matches of the Algerian Professional Football League 1 (LFP1) of the 2015/2016 season, including 22 won, 22 lost and 20 draws

2.2. Materials

The observation was carried out with the Dartfish software (Dartfish pro v 5.5). A specific tagging panel was developed to match the aim of the study.

2.3. Design and Procedure

The elements observed are: (1) ball possession: time (min), percentage, number of ball touches and average time per possession sequence; (2) Pass:

Total and successful by playing position, distribution on the field (lines, third and half field).

It is important to specify that “Playing position” mean all the players who belong to that position. For example, if we record 20 passes for the midfielder, it means that all midfielder players have made 20 passes together, not just one. By “playing position” variable, the contribution of each section (position category) in the offensive activity is determined

2.4. Statistical Analysis

We used the Shapiro-Wilk Test to check normality assumption. For the comparison between groups: Fisher's ANOVA with Tukey in Post hoc when the normality condition is met, Kruskal-Wallis with Dunn in Post hoc otherwise, the Student Test to compare two groups. The homogeneity of variances was checked with the Levene test. Data are expressed as average and standard deviation. The significance level was set at 0.05

3. Results

a) Ball possession

The study of the ball possession variable is studied according to the number, the average time per sequence, the total time and the percentage of possession.

Table 1. Ball possession sequences between won, draw and lost games

	Win	Draw	Loss	Test	P-value	Sign.
Possessions (n)						
Between 1-3	105,36 ± 19,15	116,35 ± 13,7	105,45 ± 22,55	2,28 (F)	0,11	NS
Between 4-6	19,55 ± 6,49	22,8 ± 8,62	22,73 ± 8,48	1,19 (F)	0,31	NS
Between 7-10	7,09 ± 4,23	5,1 ± 3,21*	8,5 ± 5,12*	3,31 (F)	0,04	*
More than 10	3,27 ± 2,73	1,65 ± 2,01	2,73 ± 2,9	2,11 (F)	0,13	NS
Total	135,27 ± 18,28	145,8 ± 13,47	139,41 ± 14,47	2,40 (F)	0,09	NS
Average Time per possession	9,1 ± 7,66	10,25 ± 8,89	9,98 ± 9,38	20,08 (K)	< 0.0001	**
Total time (Min)	22,5 ± 3,65	22,12 ± 4,13	23,82 ± 3,61	1,18 (K)	0,313	NS
Percentage (%)	48,57 % ± 6.96 %	--	51,43 % ± 7,2 %	1,35 (T)	0,181	NS

F: Fisher; K: Kruskal-Wallis; T: Student

*: significant at 0.05;*** : 0,001; NS: non-significant

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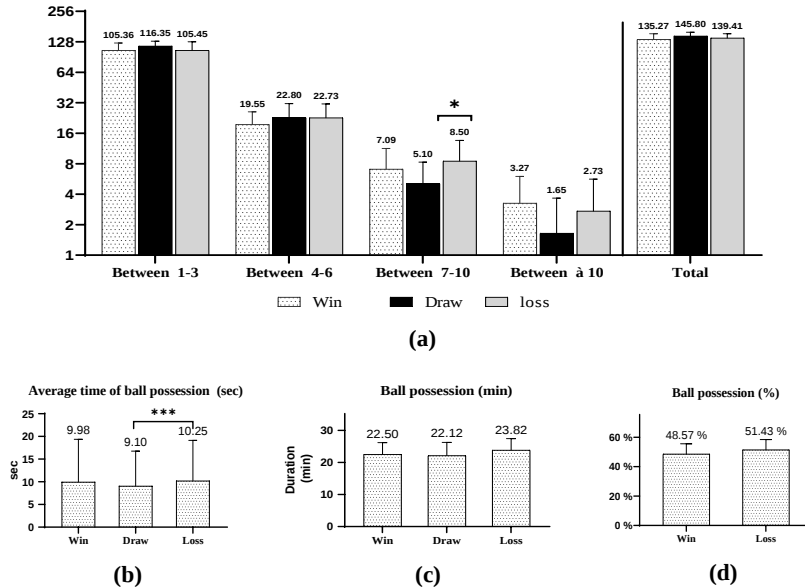


Figure 1. Ball possession sequences between won, draw and lost games

Ball possession vs result (won, drawn and lost)

Each possession is the result of a collective exchange of the ball. Possession can be characterized by the number of touches of the ball.

The number of possessions in the Algerian league (LFP1) varies between 135 and 146 per game. the results of the comparison of the total number do not show a significant difference between won, drawn and lost games. Similarly, there is no difference in the number of passes per possession, with the exception of the "Between 7-10" category. As demonstrated in, it turns out that this type of sequence is less present in draw games (5.1 ± 3.21) than in lost ones (8.5 ± 5.12), ($P < 0.05$) and no difference was recorded for the matches won.

Average time per sequence of possession

The average time of possession is calculated from the sum of all possessions (seconds) divided on the number of possessions for each game.

The results of the analysis show that the average time in possession of the ball varies between 1.52 and 1.71 seconds. Possession sequences in defeated teams are longer ($p < 0.001$) than in tied teams (draw) (1.71 ± 1.48 ; 1.51 ± 1.28 respectively). In the games won, the teams achieve average time possession.

Total time of ball possession (min)

In the lost matches, the teams seem to have the greatest time in possession (23.82 min). However, the results of the comparison do not show a significant difference ($P>0.05$).

Percentage of possession

In this part, we treat ball possession in terms of percentage. It represents the time the team had possession of the ball compared to the actual time of the game. Regardless of the actual time (in min), the percentage refers to a notion of the balance of power between the two teams.

Possession expressed as a percentage does not allow to calculate the average during draws because it always comes back to 50% (if one teams achieve 40%, logically the other team will achieve 60% and it will bring us back to an average of 50% for this group). For these reasons, we excluded the "Draw" group from this comparison.

The percentage of ball possession did not show any difference between won games and lost ones ($P=0.181$). On the other hand, the trend of superiority in lost matches partially explains the trend observed among teams playing away. Of the 32 matches observed, 15 are of this nature (won at home and lost away).

b) Passes

In this part we deal with the variable "pass" with its different modalities, namely the total number, the number and percentage of successful passes as well as the number by zone and by game post.

In LFP1, the pass in terms of total number does not show a difference from the match result ($P = 0.282$). All the same, it seems that the defeated team achieves the highest number (336.05 ± 92.09), followed by won matches and draws (323.45 ± 72.36 and 297.15 ± 71.67 respectively). These findings are consistent with those of ball possession. In contrast to the EN, both (pass and possession) record a tendency - without statistical significance - of superiority in lost matches.

The number of successful passes in absolute terms reflects the technical mastery and organization in the field that makes it possible to find the safest solutions. Analysis of variance (ANOVA) revealed no significant difference between groups (won, zero and lost) ($P = 0.13 > 0.05$). In the absence of a difference, a peer comparison does not have to take place. still shows that the highest value is recorded during lost matches (254.36 ± 88.66), while the smallest value is recorded during draws (208.4 ± 61.25).

The percentage of successful passes represents the number of successful passes divided by the total number multiplied by a hundred, and is

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expressed as a percentage. It reflects the degree of success of the transmission of the ball between teammates. This transmission is often the result of good technique as well as good organization in the field.

Table 2. Comparing total passes and successful passes (N & %) between win, draw and lost games.

	Win	Draw	Loss	F	P-value	Sig.
Total passes	323,45 ± 72,36	297,15 ± 71,67	336,05 ± 92,09	1,294	0,282	NS
Successful Passes (N)	240,59 ± 67,61	208,4 ± 61,25	254,36 ± 88,66	2,120	0,130	NS
Successful Passes (%)	73,59% ± 7,09%	69,33% ± 5,02%	74,68% ± 6,45%*	4,181	0,020	*

*: Significant at $P < 0.05$ (Tukey test)

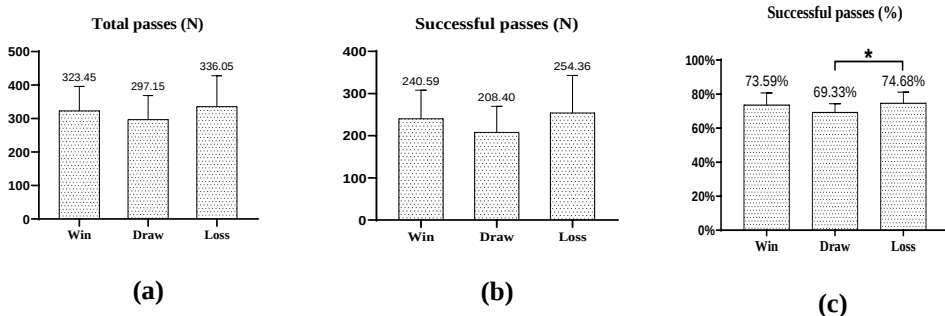


Figure 2. Percentage of passes completed in matches won, drawn and lost

Analysis of variance (ANOVA) reveals differences between outcome groups (in LFP1) in terms of percentage of successful passes ($P = 0.02 < 0.05$). The pairwise comparison (Tukey test) shows that the success of passes is higher in lost matches than in draws ($P = 0.021$). We cannot ignore the trend observed by comparing draw and won games, which is moving towards superiority in won matches, knowing that the $P = 0.08$ which is very close to the limit of significance (0.05).

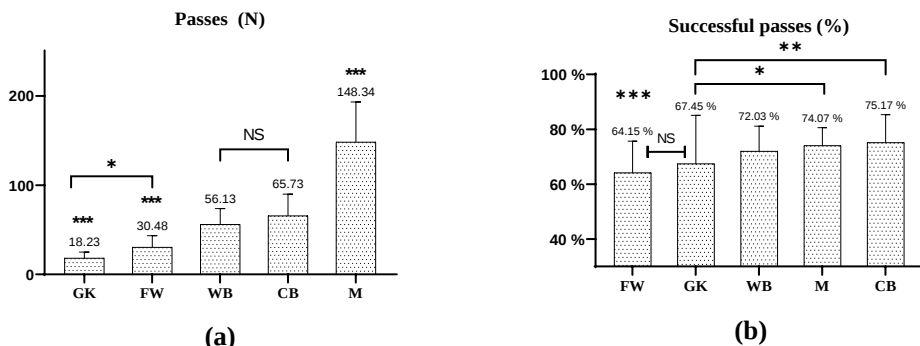
Passes per playing position

It is important to remember that we mean by “playing position” the set of players affiliated to that class. For example, in a 4-5-1 system, the midfield

position consists of five players. Thus, a value of 100 passes refers to the number made by the five of the players and not by a single one.

In a LFP 1 game, midfielders make the most passes (148.34 ± 45.06 ; 46.5% of total passes) ($p < 0.001$) compared to other positions. The second place is shared between axial and lateral defenders (56.13 ± 17.56 ; 17.6% and 65.73 ± 24.25 ; 20.6% respectively) ($P = 0.198$ between the two). Goalkeepers and forwards (18.23 ± 6.81 ; 5.7% and 30.48 ± 12.93 ; 9.6% respectively) achieve a lower average than all positions at $P < 0.001$. Between the latter two, a difference at $P < 0.05$ is observed in favor of the attackers.

By reporting successful passes to total passes, we notice that attackers are the least accurate ($64.15 \pm 11.54\%$) in the execution of passes compared to all positions ($P < 0.001$) with the exception of goalkeepers where there is no significant difference. The latter (GB) achieve a success rate ($67.45 \pm 17.61\%$) lower than midfielders ($74.07 \pm 6.5\%$; $P < 0.05$) and axials ($75.17 \pm 10.16\%$; $P < 0.01$). On the other hand, axials, midfielders and full-backs record percentages of successes very close to one another.



* ; ** ; : Significant difference at 0.05; 0,01 ; 0.001 respectively (Tukey test)

Figure 3. pass and successful pass cross playing position

Table 3. Analysis of variance (ANOVA) of the Total passes and successful passes in regard to playing position

Post	Total passes	Successful passes (%)
Goalkeeper (GB)	18,23 $\pm$ 6,81	67,45 $\pm$ 17,61
Forward (FW)	30,48 $\pm$ 12,93	64,15 $\pm$ 11,54
Wingback (WB)	56,13 $\pm$ 17,56	72,03 $\pm$ 9,12
Center back (CB)	65,73 $\pm$ 24,25	75,17 $\pm$ 10,16
Midfielder (M)	148,34 $\pm$ 45,06	74,07 $\pm$ 6,5
F fisher	264,417	10,286
P-value	0,000	0,000
Meaning	***	***

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Table 4. Analysis of variance (ANOVA) of the number of passes for each position of play between games won, drawn and lost (LFP1)

	Win	Draw	Loss	F	P-value	Sig
Total passes						
Forward (FW)	34,91 ± 11,63	25,55 ± 10,48	30,55 ± 14,94	2,911	0,063	
Center back (CB)	65,91 ± 28,79	59,65 ± 24,22	71,09 ± 18,41	1,173	0,316	
Goalkeeper (GK)	19,23 ± 8,21	17,3 ± 6,13	18,09 ± 5,98	0,420	0,659	NS
Wingback (WB)	60,62 ± 15,58	49,25 ± 16,27	58,09 ± 19,25	2,470	0,093	
Midfielder (M)	142,68 ± 33,13	144,3 ± 41,96	157,68 ± 57,09	0,720	0,491	
Successful passes (%)						
Forward (FW)	67,1% ± 9,89%	61,45% ± 13,24%	63,64% ± 11,26%	1,300	0,28	NS
Center back (CB)	76,32% ± 11,67%	71,63% ± 8,41%	77,24% ± 9,56%	1,859	0,165	NS
Goalkeeper (GK)	67,67% ± 17,7%	61,78% ± 21,01%	72,38% ± 12,71%	1,959	0,15	NS
Wingback (WB)	72,99% ± 9,83%	67,46% ± 8,12%	75,26% ± 7,89%	4,448	0,016	*
Midfielder (M)	74,69% ± 6,33%	71,56% ± 4,92%	75,74% ± 7,45%	2,420	0,097	NS

Bold values: close to significance limit 0.05

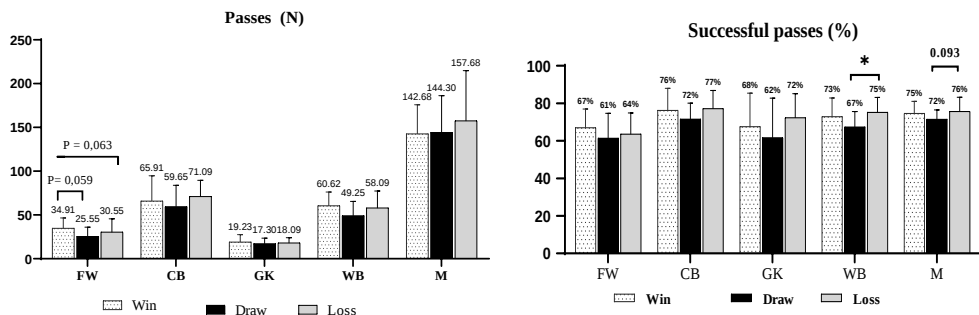


Figure 4. Passes per playing position in won draws and lost games

In general, the TT activity according to playing positions in terms of passing does not differ between won, draws and lost games ($P>0.05$). However, we

find that attackers tend to make more passes in won matches compared to draws ($P=0.059$).

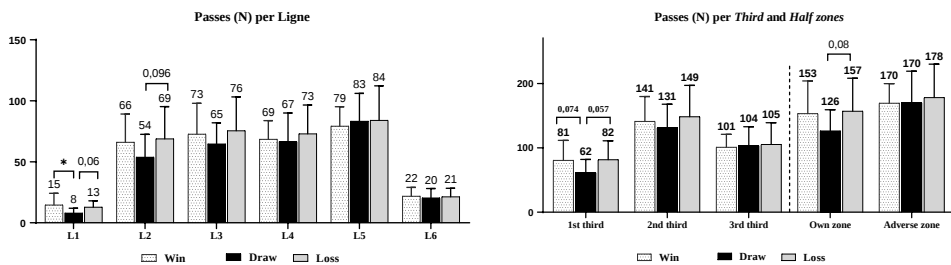
Distribution of passes on the field

Table 5. Analysis of variance (ANOVA) of the number of passes according to different terrain breakdown (depth, width, third and half of field) (LFP1)

Zone Name	Win	Draw	Loss	Fisher's F	P-value	Sig.
Lines						
L1	14,64 $\pm$ 9,52	8 $\pm$ 3,91	12,82 $\pm$ 5,16	5,397	0,007	**
L2	66,05 $\pm$ 23,15	53,8 $\pm$ 18,7	68,86 $\pm$ 26,4	2,485	0,092	NS
L3	72,73 $\pm$ 25,23	64,65 $\pm$ 17,34	75,5 $\pm$ 27,69	1,141	0,326	NS
L4	68,5 $\pm$ 15,29	66,75 $\pm$ 23,29	73 $\pm$ 23,53	0,503	0,607	NS
L5	79,23 $\pm$ 15,9	83,25 $\pm$ 22,88	84,05 $\pm$ 28,2	0,278	0,758	NS
L6	21,82 $\pm$ 7,24	20,45 $\pm$ 7,66	21,36 $\pm$ 6,94	0,191	0,827	NS
Third-zone						
1st third party	80,68 $\pm$ 30,93	61,8 $\pm$ 20,24	81,68 $\pm$ 29,26	3,443	0,038	*
2nd third	141,23 $\pm$ 38,66	131,4 $\pm$ 36,55	148,5 $\pm$ 48,67	0,880	0,420	NS
3rd third	101,05 $\pm$ 20,05	103,7 $\pm$ 29,16	105,41 $\pm$ 33,65	0,134	0,875	NS
Half-zone						
Own area	153,41 $\pm$ 50,7	126,45 $\pm$ 32,91	157,18 $\pm$ 51,19	2,729	0,073	NS
Zone adverse	169,55 $\pm$ 30,32	170,45 $\pm$ 48,86	178,41 $\pm$ 51,75	0,261	0,771	NS

* ; **: Significant difference at 0.05; 0.01 respectively

Values with significant differences are presented below.



*: Significant difference at $P<0.05$

Figure 5. Number of passes in the first third in matches won and lost (LFP1)

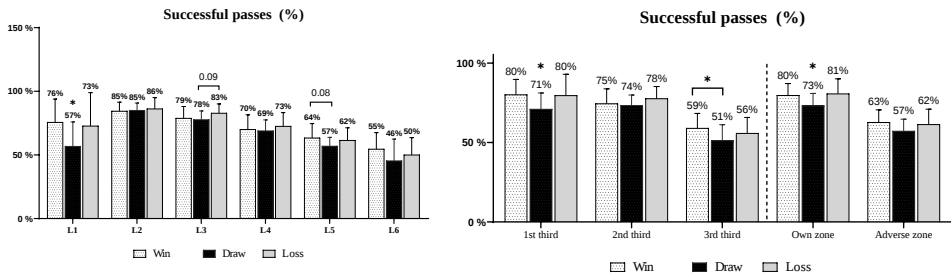
In LFP1 and in won matches, teams record more passes in the first third, especially line 1, than in draws. But the comparison between won and lost matches reveals no significant difference.

Table 6. Analysis of variance (ANOVA) of the percentage of successful passes between won, draw and lost matches according to different field divisions (LFP1)

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Pitch area	Win	Draw	Loss	F	P-value	Sig.
Lines						
L1	75,8% ± 18,08%	56,9% ± 19,03%	72,9% ± 26,08%	4,646	0,013	*
L2	84,6% ± 6,9%	85,2% ± 5,57%	86,4% ± 8,67%	0,382	0,684	NS
L3	79% ± 9,09%	77,9% ± 6,67%	83% ± 7,09%	2,584	0,084	NS
L4	70,2% ± 11,33%	69,1% ± 8,44%	72,7% ± 10,59%	0,689	0,506	NS
L5	63,5% ± 11,13%	57,1% ± 6,72%	61,6% ± 9,7%	2,512	0,089	NS
L6	54,7% ± 12,83%	45,6% ± 16,88%	50,2% ± 13,4%	2,082	0,133	NS
Thirds						
1st third	80,2% ± 9,47%	71,1% ± 10,04%	79,7% ± 13,25%	4,399	0,016	*
2nd third	74,6% ± 9,17%	73,5% ± 6,34%	77,8% ± 7,43%	1,807	0,173	NS
3rd third	59,1% ± 9,22%	51,4% ± 9,84%	55,9% ± 9,88%	3,384	0,040	**
Halves						
Own area	79,8% ± 7,29%	73,3% ± 7,57%	80,8% ± 9,24%	5,140	0,009	*
Adverse zone	62,8% ± 7,76%	57,3% ± 7,38%	61,5% ± 9,47%	2,497	0,091	NS

* ; **: Significant difference at <0.05; 0.01 respectively



* ; **: Significant difference at $\alpha < 0.05; 0.01$ respectively

Figure 6. Distribution of the percentages of successful passes according to different division between won, draw and lost (LFP1) (only those with significant differences)

In LFP1, the percentage of successful passes only differs from draws. It shows that all significant differences indicate that the accuracy of the pass decreases during draws compared to the match won and lost. While similar averages are recorded among the winners and the losers.

4. Discussion

The pass is the fundamental element of offensive activity in football, it is evaluated in quantity and quality. the quantity achieved in a match provides information on the fluidity of the circulation of the ball and on the collective control. This mastery is largely based on rational disposition as well as high physical activity (Bradley et al., 2011; Tenga et al., 2010). While the quality, in terms of percentage of successful passes, informs about

individual technical mastery and defining the profile of the players composing that team.

In the LFP1, the pass with its different modalities (success, zone and position) does not differ either by domiciliation or by result ($P > 0.05$).

For the domiciliation of the match, the results are in contradiction with those found in the Spanish "Liga" (Lago-Peñas & Lago-Ballesteros, 2011), English "Premier League" (Carmichael & Thomas, 2005).

For the result of the match, despite the absence of a significant difference ($P = 0.282$), we still observe that the defeated teams make a little more pass than the victorious ones (336 against 323). This is in line with the results of Harrop and Nevill (2014) that have noticed that in the English "League One", the number of passes is highest when the team has lost the game. as with possession of the ball, the pass seems related to failure. the two parameters depending on each other, are the result of an adaptation (adaptive strategy) to a situation of delay in the score.

The distribution of successful passes and passes on the pitch shows differences in some areas compared to the outcome of the match. the zones are: its own half for the number and percentage and the zones L5 and L6 on the right side for the percentage. All the differences are against the draw, whether compared to the match won or lost. This observation states that during draws, teams tend to minimize the circulation of the ball in its own half which is justified by the reduced number of passes in this area, and minimize the availability of players in the opposing zone, which is justified by a very low percentage of successful passes in the advanced areas of the field.

Comparing the results of this study with high-level teams (Dellal et al., 2011) reveals that the percentage of successful passes in LFP1 (72%) is on the lower limit of the standards (70% to 80%). By position, only axials have percentages similar to the standards (75%), attackers have the lowest value (LFP1 = 64%, standards = 76%), while midfielders as well as full-backs are below the standards (LFP1 = 74%; 72% respectively, against the standard = 77% to 80% for both positions).

5. Conclusion

In this study, we have presented some descriptive statistics related to the offensive phase (Ball possession and passes) of the Algerian LFP1. as summary of key finding, we listed the following:

The number of possession *sequences* is around 140 per game. The *total* number of sequences and according to the number of ball *touches* is not linked, neither to the domiciliation of the match, nor to the result. The actual playing time does not exceed 45 minutes (22 minutes per team). The *average time* per sequence of possession is around 2 sec. It is not related to the game location or the result of the match. The total number of passes is around 320 per game. The total number, the number of passes passed and the percentage of successes do not differ significantly from the domiciliation or the final result of the match. Midfielders followed by full-backs perform the highest number of passes. The participation of the playing positions in the total number of passes does not affect the final result. The distribution of passes on the pitch during won games is different from draws ones. Neither possession or passes are identified as key performance indicator in Algerian LFP1.

In specific scientific literature, these two variables were found very important to success in some studies and non-significant in others. The origin of this contradictory conclusions may have two explanations; the first one is related to “operational definition” of the variables. What is consider as successful pass for one researcher, may not be for the other. For that, researcher must find way for unifying definitions that everyone agrees; The second one is related to game philosophy and country style. Studies have shown several times that domestic leagues have their own performance indicators. In Algeria ‘soccer, it seems that success is related to other variables than ball possession and passes.

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