

Possession vs. Direct Play: Evaluating Tactical Behavior in Elite Soccer

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Abstract Measuring and evaluating tactical behavior is one of the main goals in performance analysis in professional soccer. A specific tactical approach may present the difference between winning and losing, especially in the highest level of competition. So far tactical behavior is mostly determined by using one or two variables, like ball possession or number of passes. Within this study, we introduce a new index (Index of Offensive Behavior, IOB) that combines different variables of offensive actions to evaluate tactical behavior. To evaluate the indexes data of 676 official games (German Bundesliga 2009/10, & 2010/11, FIFA World Cup 2010) were analysed using the “MathBall”- notation software (Algorithmia Ltd., 2009). IOB was able to reliably distinguish the two common tactical approaches in soccer: possession and direct play. Furthermore, we could show that successful teams prefer possession play and that game control (measured via Index of Game Control, IOC) is the most important variable of success irrespective of the tactical approach.

Keywords Style of play, Performance indicators, Tactical behavior, Performance analysis, Index of Game Control, Index of Offensive Behavior

1. Introduction

2013 was one of the best years in German soccer, as two German teams faced each other in the Champions League final. But furthermore, it was the battle of two different tactical approaches to succeed: possession play vs. direct play. Bayer Munich is known for its dominant possession play which led them to recent success advancing to the Champions League Final three times in four years. Their counterpart, Borussia Dortmund, prefers the direct play approach by using an intensive pressing and looking to score immediately after capturing the ball from their opponent. Unfortunately, this close encounter did not provide clarification that one of the approaches is superior to the other as it was decided by a goal out of accident.

More precisely, if you take a closer look of the style of play of both teams it even made matters worse. Bayern Munich has implemented some aspects of the direct play approach into their game, as well as Borussia Dortmund likes to play ball dominant in phases of a game. Taking this into account, how do we differ between both approaches? Can we measure it just by using ball possession percentage? Even more important, how can we evaluate the tactical performance of a team and could this be an indicator for success? We will answer these questions within our

approach and give some practical suggestions based on our findings.

In soccer, teams aim to achieve two major aims: Scoring goals and prevent the opposing team from doing so. Comprehensive research was concentrating on those two aims [1–4] as scoring goals may be the only or at least the most valid performance indicator to determine team’s success. Yet researchers investigate certain performance indicators trying to elicit their influence on successful performances. The indicator receiving the most attention in performance analysis in soccer is ball possession. Literature often defines ball possession starting “when a player on the analysed team had sufficient control over the ball to enable a deliberate influence on its direction” [5] (p. 100) and registers its duration as comprehensive measure. Other researchers define ball possession “as the proportion of time each team held the ball” [6] (p. 1263) (for further definitions see also [7, 34]).

Several studies demonstrated that ball possession was influenced by variables like match status [5, 8–11] and the quality of the respective opposing team [7, 9, 11]. Researchers therefore mostly agree that teams being down on goals possess the ball longer [8, 10, 11] and that effectiveness of a possession is far more important than the mere time in possession [2, 7, 12, 13]. In terms of evaluating the effectiveness, passing accuracy and the conversion of ball possession into a high shot-on-goal to total shots ratio are critical indicators for effective ball possession and possession quality, respectively.

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Closely tied to the aforementioned is the determination of the two attacking strategies that are utilised by soccer teams: *possession play* and *direct play*. The former is defined as having more ball possession (= longer ball possession periods, more passes per possession) than the respective opponent, playing ball retentive with the aim to keep possession and playing risky passes preferably in the attacking third; hence possession play or elaborate attacks, respectively, “often progress relatively slowly” [14] (p. 247). In contrast, teams utilising direct play try “to move the ball into a shooting position as directly as possible with the least number of passes” [2] (p. 509) and is thus often equated with counter-attacking [3, 4, 14]. There has been a continuous debate which style of play may be advantageous over the other. This debate has its origin in the study of [15]. Within their study, they used a hand notation system to analyse more than 3000 games and found that about 80% of all goals were scored from a sequence of three or less passes and that teams had a shot-to-goal ratio of 10:1. Subsequently, some outcomes of the aforementioned study were misinterpreted [16] so that the opinion prevailed that ten shots are required to score a goal and that few passes per possession are advantageous over possessions with higher passing sequences. [17] supported the idea of the benefits of the direct play approach which coined soccer at that time, especially in Great Britain. [2] replicated the study of [15] but normalised the data and concluded that successful teams tend to play possession soccer with more touches of the ball per possession than unsuccessful teams. Subsequently, several studies supported these findings and identified longer ball possession durations to be linked to successful teams [5, 11, 18]. However, it remains questionable which style of play should be preferred over the other, not at least because of many teams adopting their style of play according to match status and the quality of the opposing team [18].

We think that complex tactical behavior, like style of play, should not be investigated by analysing just one or two ‘isolated’ performance indicator (like passes per possession, for an overview see Table 1). This point of view is supported by [19] in their review on performance indicators in sport. Recent studies in volleyball [20], ice-hockey [21], and basketball [22-24] revealed that to measure tactical performance and predicting success different performance indicators of offensive and defensive actions need to be taken into account. In soccer there is a lack of studies using an aggregated index to measure tactical behavior and performance.

To close this gap, we will introduce two indexes to determine game control and offensive behavior within this study. Game control is thereby seen as part of offensive behaviour and therefore is a component of the index of Offensive Behavior. We evaluate the reliability of both indexes to show consistency of our measurements. To show the ability of our indexes to predict success and to differentiate between possession play and direct play we analysed two consecutive seasons of the German Bundesliga and the FIFA World Cup 2010.

Table 1. Overview on Studies Investigating Possession and Direct Play

Year	Authors	Definition of possession play
1968	Reep & Benjamin	Number of passes
1988	Bate	Number of passes
1988	Hughes, Robertson & Nicholson	Number of ball contacts
1988	Pollard, Reep & Hartley	Number of passes
1997	Garganta, Maia & Basto	Number of passes; Time between gaining the ball till a shot on goal
1999	Grant, Williams & Reilly	Number of passes
2001	Stanhope	Time between gain and loss of possession
2001	Hook & Hughes	Number of passes
2004	Jones, James & Mellalieu	Time between gain and loss of possession
2005	Bloomfield, Polman, & O’Donoghue	Time between gain and loss of possession
2005	Hughes & Franks	Number of passes
2007	Lago & Martin	Time between gain and loss of possession
2009	Lago	Time between gain and loss of possession
2010	Tenga, Holme, Ronglan & Bahr	Number of passes; Time between gain and loss of possession
2011	Tenga & Sigmundstad	Number of passes; Time between gain and loss of possession

2. Method

2.1. Match Sample

A total amount of 676 official games over three competitions (Bundesliga 2009/10, n= 306; Bundesliga 2010/11, n=306; FIFA World Cup 2010, n= 64) were monitored and recorded via the official broadcasting signal. They were further analysed using the “MathBall”- notation software (Algorithmia Ltd., 2009, www.mathball.com). The software enables as to mark desired variables (Table 2) within the video footage per mouse click and in advance to automated type out offensive actions. With the help of this software tool different standard game-related statistics for passing, shooting, ball control and ball possession were recorded and advanced variables were calculated (see Table 2).

2.2. Reliability Testing

To prove reliability of the data used within the indexes, five different raters transcribed 120 randomly chosen game events. This procedure was repeated after twenty-one days to control for intra- and inter- reliability. Inter-rater reliability was calculated using Fleiss’ kappa to assess the agreement

between the five raters [25]. To ensure intra-rater reliability, correlations of kappa values between two time points of the same data set were calculated using a test-retest design with a delay of 3 weeks [30].

Table 2. Variables

Variable	Name	Description
PA	Passes per action	Number of passes of one offensive action
PD	Passing direction	Number of passes forward in relation to the overall number of passes subtracted from 1
TP	Target player passes	Number of passes to a target player in relation to number of overall and non-target player passes
PS	Passing success rate	Number of successful passes in relation to the overall number of passes
PSF	Passing success rate in forward direction	Number of successful passes forward in relation to the overall number of passes forward
MPA	Mean passes per attack	Relation of total number of passes to total number of attacks
GS	Game speed	Relation of the distance covered within one attack to the time with ball possession
TA	Mean time of attack	Relation of the total time of all attacks to the number of attacks
GP	Gain of possession	Mean time of the attack of the opponent subtracted by the own mean time of attack
DPA	Distance per attack	Distance covered during all attacks in relation to the total number of attacks
RP	Relative ball possession rate	Sum of all periods of possession of one team in relation to the sum of the periods of possession of both teams

2.3. Index of Game Control

To evaluate the performance of the offensive game of different teams, we calculated the Index of Game Control (IGC, see Equation 1). It includes several passing parameters (passes per action, passing direction, and target player passes) and parameters of passing success (passing success rate and passing success rate in direction forward). To aggregate the different parameters with different dimensions they were Z-transformed in advance of the calculation. This index gives an impression how accurate an attack was performed, regardless the preferred style of play of the team, but is nevertheless a component of the Index of Offensive Behavior.

$$IGC = zPA + zPD + zTP + zPS + zPSF \quad (1)$$

2.4. Index of Offensive Behavior

In order to assess the style of play of a team and to distinguish between direct and possession play we calculated the Index of Offensive Behavior (IOB, see Equation 2). The

index characterizes the offensive behavior of a team by using parameters of ball possession, gain of possession and quality of possession (IGC) as well as parameters of the duration and the covered distance of offensive actions and the overall game speed. All parameters with exception of IGC were Z-transformed to allow the combination of variables with different dimensions.

$$IOB = IGC + zRP + zDPA + zGP - zTA + zGS + zMPA \quad (2)$$

2.5. Data Analysis

For the purpose of showing validity of the IOB, we chose eight teams of the sample size that were characterized by four different coaches (UEFA A-level) as either using direct (Borussia Dortmund, Hannover 96, Honduras, Italy,) or possession play (Spain, Germany, Bayern Munich, Bayer Leverkusen). IOB should be in line with the characterizations, indication possession play with a positive and direct play with negative values.

To determine between successful and less successful teams, the teams with our sample size were categorized into four groups ranging from top four teams (Success Category 1, SC1, UEFA Champions-League Qualifiers) to the relegated teams (SC4). The entire classification by league position or performance in the FIFA World Cup 2010 is shown in Table 3.

In order to evaluate the two different indexes in relation to success we conducted a one-way analysis of variance (ANOVA) for IGC and IOB, respectively.

Table 3. Categorization of Success in the different competitions

Competition	League position/ Round	Number of teams	Success Category
German Bundesliga 2009/10 & 2010/11	1-4	4	SC1
	5-9	5	SC2
	10-14	5	SC3
	15-18	4	SC4
FIFA World Cup 2010	Quarterfinal	8	SC1
	Second round	8	SC2
	3 rd in Group stage	8	SC3
	4 th in Group stage	8	SC4

3. Results

3.1. Reliability

As shown in Table 4, data acquisition was conducted with high inter-rater and intra-rater reliability. Rater₁- Rater₄ (Ra) did reveal correlations above .75, which is seen as near total accordance [26, 30]. A lower level of accordance was performed by Ra₅, who has been the rater with the least experience in notation analysis. Furthermore, with the exception of Ra₅, the achieved intra-rater reliability of above .90 can be seen as excellent.

Table 4. Kappa-Values and correlations between the five raters (Ra)

T ₁ /T ₂	Ra ₁	Ra ₂	Ra ₃	Ra ₄	Ra ₅
Ra ₁	.90***	.79***	.82***	.82***	.66***
Ra ₂	.78***	.90***	.89***	.81***	.69***
Ra ₃	.87***	.90***	.95***	.86***	.71***
Ra ₄	.82***	.82***	.92***	.93***	.71***
Ra ₅	.73***	.64***	.69***	.67***	.75***

Note: n.s., *, ** and *** $p > 0.05$, $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. The correlations between the raters of the 1st measurement point (T₁) are above the diagonal, correlations of the 2nd measurement point (T₂) are beyond the diagonal and correlations between measurement points are in the diagonal.

3.2. Validity of the IOB

Table 5 shows the mean values of the teams picked to validate the IOB. As a high positive value describes possession play, it can be seen that Spain, the team mostly renowned for using possession play, scored highest. By contrast, Honduras a team characterized as play “kick and rush” scored a high negative value which describes direct play. Overall, with the exception of Italy, all teams characterized by the coaches for possession play achieved a positive and the ones characterized for direct play achieved negative IOB. Therefore, IOB seems to be able to clearly distinguish between both styles of play. Values also indicate that the IOB is able to differentiate how strict a team used one style of play or a mixed approach. Bayer Leverkusen and Borussia Dortmund could be seen as representatives for a mixed approach. Although both prefer either direct (Borussia Dortmund) or possession play (Bayer Leverkusen), they seem to partly use the other approach as well in stretches of a game (see [7] for statistical evidence of the categorization of the style of play of the different teams).

Table 5. Mean Values and Standard Deviation for Index of Game Control (IGC) and Index of Offensive Behavior (IOB) of Specific Teams

Team	IGC		IOB	
	M	SD	M	SD
Germany(P)	4.35	1.47	7.35	6.45
Spain(P)	7.15	1.36	16.13	3.55
Honduras(D)	-2.66	4.26	-8.45	6.69
Italy(D)	1.24	2.58	2.19	7.42
FCB(P)	4.34	3.88	12.36	8.31
BVB(D)	-0.69	3.86	-1.42	7.42
H96(D)	-2.1	3.65	-4.30	7.26
B04(P)	1.86	2.22	3.79	6.48

Note: Teams characterized of direct play (D) and possession play (P) from the FIFA World Cup 2010 and German Bundesliga where FCB (Bayern Munich), BVB (Borussia Dortmund), H96 (Hannover 96) and B04 (Bayer Leverkusen).

3.3. Impact of Playing Style on Success

To reveal the influence of the two different styles of play

on team success, we investigated the connection between the indexes and actual success. All of variables used to form the indexes (see Table 6) showed a significant main effect between the success categories (SC).

Table 6. Values of the Different Game-Related Variables of the Four Success Categories (SC)

Variable	SC1		SC2		SC3		SC4	
	M	SD	M	SD	M	SD	M	SD
PA	0.45	0.06	0.42	0.04	0.42	0.042	0.42	0.05
PS	0.85	0.08	0.84	0.05	0.84	0.05	0.83	0.05
PSF	0.70	0.10	0.68	0.08	0.68	0.08	0.68	0.08
PD	0.24	0.05	0.26	0.04	0.26	0.04	0.26	0.05
TP	0.91	0.05	0.90	0.05	0.90	0.06	0.89	0.06
RP	0.53	0.07	0.50	0.07	0.48	0.06	0.48	0.07
MPA	3.58	1.12	3.13	0.88	3.15	0.87	2.99	0.83
DPA	104.44	22.36	97.52	17.38	96.95	16.88	94.67	16.20
TA	14.88	3.46	13.84	2.61	13.61	2.36	13.15	2.47
GP	1.78	4.23	0.33	3.71	-0.78	3.62	-1.38	3.89
GS	8.25	0.84	8.39	0.71	8.49	0.71	8.61	0.77

Note: PA (Passes per action), PS (Passing success rate), PSF (Passing success rate in forward direction), PD (Passing direction), TP (Target player passes), RP (Relative ball possession rate), MPA (Mean passes per attack), DPA (Distance per attack in m), TA (Mean time of attack in s), GP (Gain of possession), GS (Game speed in m/s)

Using the developed indexes, a one-way ANOVA revealed significant main effect of Group ($F(3, 1349) = 20.39$, $p < .001$) for IGC (see Figure 1). Further, Tukey post-hoc comparisons showed a highly significant higher IGC for SC1 compared to the other groups, as well as SC4 as highly significantly lower IGC than the other groups but no difference between SC2 and SC3.

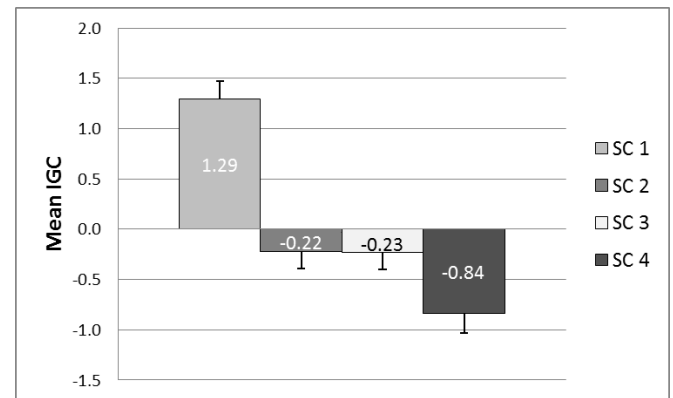


Figure 1. Mean values of the Index of Game Control (IGC) of the Four Different Success Categories (SC)

A similar pattern could be revealed for IOB (Figure 2) as a one-way ANOVA showed a significant main effect of Group ($F(3, 1349) = 30.16$, $p < .001$). Similar to IGC, SC1

and SC4 differed significant form the other success categories as shown by Turkey post-hoc analyses. However, IOB was significantly higher for SC2 than SC3. Additionally, it must be stated that only SC1 scored a positive value indicating possession play.

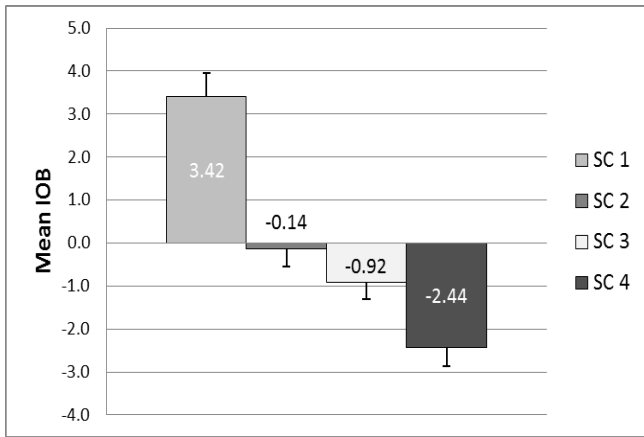


Figure 2. Mean values of the Index of Offensive Behavior (IOB) of the Four Different Success Categories (SC)

4. Discussion

In the present study we developed two indexes to better characterize the style of play in soccer and further investigate what style of play is used by successful teams.

In a first step we could show that the different variables we collected showed a high reliability between different raters and time points. Therefore, we showed that this data can be trusted and we created a reliable basis for our further calculations.

As we strove to create an index that is better suited to characterize tactical behavior in soccer, especially direct and possession play, we carefully reviewed the relevant literature. Based on this reviewed literature (see Table 1), we introduced a new index of offensive behavior that combines previous cited variables like ball possession [3], number of passes [2, 15, 27], the mean time of an attacking sequence [28], and the time between gain and loss of possession via our Index of Game Control [5, 10, 18, 29].

Table 7. Characteristics of the experts of the face validation

Coach	Licence	Years of experience	Highest Coaching level
1	Uefa A	11	Under 21 Bundesliga
2	Uefa Pro	20	German Bundesliga
3	Uefa A	13	Under 21 Bundesliga

Via face validation by UEFA A-licence soccer coaches (see Table 7), we showed that the IOB is able to distinguish between direct and possession play. Furthermore, the IOB gives deeper insights in the tactical approach of a team.

Spain, for instance, is known for its extensive possession play [36]. In the FIFA 2010 World Cup they achieved an IOB of 16.13, which was the highest number of all teams of our sample size. In contrast, Honduras scored an IOB of -8.45 indicating a strict use of direct play, which was in line with the appraisal of the coaches as a “kick and rush” team. Those observations are line with [7] and [37] who revealed the same teams as ball dominant or recessive by calculating and weighting ball possession times. Overall, by including the different variables that characterize different tactical approaches, the IOB is able to not just differentiate between direct and possession play but enables to make fine distinctions between the offensive approaches of different teams (see Table 5). Therefore, we achieved our main goal to calculate an index to describe and measure tactical behaviour like it is common in other sports [20-24]. However, the IOB focus more on team performance than of individual player performance like most indexes in basketball [22-24]. Further studies may yield the possibility to quantify individual performance with the IOB or IGC, as well.

The statistical analysis revealed that the most successful teams preferred possession play instead of direct play. These findings are in contrast with previous findings of [15] or [16]. However, they are in line with newer studies like [2], which concluded in their study that successful teams tend to play possession soccer, after normalizing their data. Further support for our findings is given by [5, 11, 18], which linked longer ball possession to successful teams. However, there is one exception that supports the idea of direct play to be more successful. Borussia Dortmund was the only team within success category 1 that preferred direct play. Yet there is a simple explanation for their success. Dortmund was the only team using the direct approach to have an IGC close to zero. That indicates that they had a good game control and were high efficient when attacking, what is seen as a main indicator for successful possession [2, 7, 12, 13]. Since a main variable within the IGC is the number of passes, Dortmund scored worse than most teams using possession play. However they can be seen as a team with high control over the game. These findings are in line with [37] and [38], who found that controlled passing was a main indicator for success in the World Cup 2010. As the different variables (see Table 6), which are included in the indexes, show SC1 and SC2 are more accurate in their passing and are playing a higher game speed, even though they have more possession. Despite preferring a strict direct play SC4 score at the same margin in most of the variables. However, teams in SC4 score worse on distance covered per attack and gain of possession, which seem to be very important for failure or success [6, 33].

As major weakness of performance indicators, as highlighted by [3] like the IOB and the IGC is the inclusion of the current opponent. The interaction process of both teams is well covered by [31] using game phase analysis or by [32] showing the interaction process via spatial parameters. Further studies might integrate those approaches when indentifying performance indicators in soccer.

5. Conclusions

In conclusion, we introduced two indexes that help to define and understand the tactical behavior of soccer teams. By using the indexes we could provide further evidence that possession play is linked with team success. However, we are in line with previous findings that the most important variables are control and effectiveness of attacking actions [2, 7, 12, 13]. In contrast, a low margin of distance covered per attack and the inability to regain possession seem the most important indicators for a bad tactical behavior. As the indexes are sensitive in differentiating tactical behavior, they might be a useful tool to evaluate differences in the course of a game. Therefore, further research could use them to investigate tactical pattern in relation to the match status, whether the team is playing at home or away, or the quality of the opposing team.

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