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Performance and tactical behavior of youth soccer players

Desempenho e comportamento tático de jogadores de futebol das categorias de base

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Abstract – The aim of this research was to evaluate the performance and tactical behavior of youth soccer players of teams from base categories. The sample consisted of 152 male soccer players aged 11-17 years who participated in the in the U-13 (n = 50), U-15 (n = 62) and U-17 (n = 40) Sergipe State Championship in the year 2015. The System of Tactical Assessment in Soccer (FUT-SAT) was used to identify the players' tactical behavior based on the fundamental tactical principles. The main results of the study show that players presented higher tactical offensive performance (50.8 ± 9.8 points) compared to defensive performance (34.3 ± 5.7 points) ($p < 0.001$; $d = 2,1$), and the *Depth Mobility* principle presented the highest performance indices in the offensive phase (64.1 ± 8.7; $F = 54.4$; $p < 0.001$; partial $\eta^2 = 0.26$). *Defensive Coverage* showed the highest performance indexes in the defensive phase (46.1 ± 24.3; $F = 54.4$; $p < 0.001$; partial $\eta^2 = 0.26$).

Key words: Athletes; Soccer; Sports performance; Adolescents.

Resumo – *O objetivo da pesquisa foi avaliar o desempenho e o comportamento tático de jovens jogadores de futebol de equipes das categorias de base. A amostra foi composta por 152 jogadores de futebol, do sexo masculino, entre 11 e 17 anos de idade, que participaram do Campeonato Sergipano nas categorias sub-13 (n = 50), sub-15 (n = 62) e sub-17 (n = 40) no ano de 2015. Foi utilizado o Sistema de Avaliação Tática no Futebol (FUT-SAT) para identificar o comportamento tático dos jogadores a partir dos princípios táticos fundamentais do futebol. Os principais resultados do estudo mostraram que os jogadores apresentaram maior performance tática ofensiva (50,8 ± 9,8 pontos) do que a defensiva (34,3 ± 5,7 pontos) ($p < 0,001$; $d = 2,1$), sendo que o princípio da Mobilidade foi o que apresentou os maiores índices de performance na fase ofensiva (64,1 ± 8,7; $F = 54,4$; $p < 0,001$; η^2 parcial = 0,26). A Cobertura Defensiva foi o princípio que apresentou os maiores índices de performance na fase defensiva (46,1 ± 24,3; $F = 54,4$; $p < 0,001$; η^2 parcial = 0,26).*

Palavras-chave: *Adolescentes; Atletas; Futebol; Performance esportiva.*

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INTRODUCTION

Soccer is a collective sport characterized by being predominantly tactical[1]. Tactics consists of game space management actions in order to solve problems to determine the winner of the game[2-5.] In this way, the resolution of problems must occur according to the logic of the game and respecting the tactical principles of soccer[5].

Tactical principles can be divided in relation to the tactical organization of players in the field, starting from a generalist idea for the specific actions of the game[5-7], which are identified in the following perspective: general, operational, fundamental and specific tactical principles[5,8,9].

From the analysis of tactical principles, two essential concepts to understand tactics in soccer arise: performance and tactical behavior[10-11]. Tactical behavior is related to the efficiency of players' actions[11]. Tactical performance consists of the player's tactical effectiveness and is related to problem-solving ability[10,12,13].

Américo et al.[14] analyzed the tactical efficiency of youth soccer players aged 11-17 years and showed that U-15 players had more tactical errors than athletes of other categories. Giacomini and Greco [2] showed that players in the U-17 category had better tactical performance than their peers of younger categories. Costa et al.[3] conducted a comparative study between categories corroborating with the results of Giacomini and Greco[2]; however, the researches used different methods of tactical analysis.

However, despite the interesting proposal of tactically comparing different age groups, there is no consistency in scientific literature regarding which category presents more developed tactical aspects. In addition, it is important to understand that tactical analysis of soccer is more comprehensive and complex. Therefore, exclusive evaluation of tactical efficiency or tactical performance, comparing only players of different age groups, and not providing information on the tactical profile of athletes being formed may present only a partial view of tactics in basic soccer categories.

Thus, in spite of the importance of tactical aspects in the formation of soccer players[15-18], to our best knowledge, there are no studies in scientific literature seeking to tactically evaluate basic category athletes from a holistic perspective. In this way, the aim of the research was to evaluate the performance and tactical behavior of youth soccer players of teams of basic categories.

METHODOLOGICAL PROCEDURES

Sample

A total of 9,617 tactical actions were evaluated through fundamental tactical principles. Tactical actions were carried out by 152 young soccer players, all male, aged 11-17 years (14.3 ± 1.6 years), who played the Sergipe Soccer Championship in the U-13 (n = 50), U-15 (n = 62) and U-17 categories (n = 40), competitions organized by the Sergipe Soccer Federation, assuming a sports training character.

Study design

The research project was approved by the Human Research Ethics Committee of the Federal University of Sergipe (protocol No. 1,595,119), and all procedures followed the determinations of resolution CNS 466/2012.

Players were evaluated in their training environments. For tactical evaluation of players, the Soccer Tactical Assessment System (FUT-SAT)[11] was used. The FUT-SAT consists of a reduced game (two teams with goalkeeper + three soccer players) in a field of 36 m x 27 m, during 4 minutes, with the rules of the formal game, except for the offside rule (figure 1).

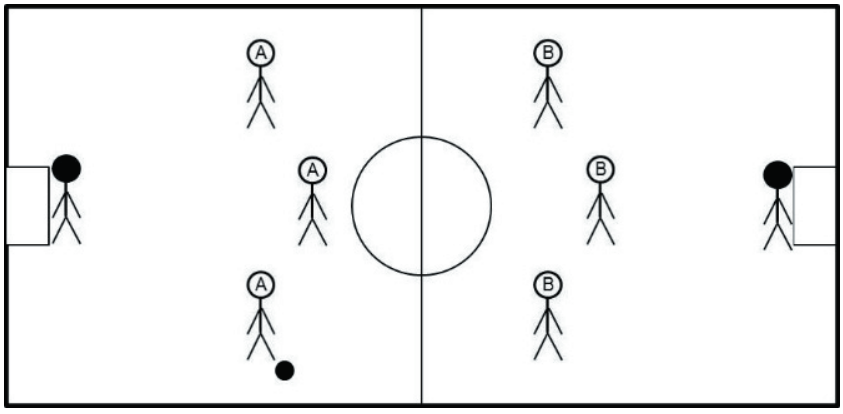

Figure 1. Illustrative image with the structural organization of the FUT-SAT 11.

The evaluation was based on the basic tactical principles of soccer[5,8] (Box 1), which results in the identification of tactics based on tactical performance indexes (TPI), amount of tactical actions performed by principle and success percentage in the implementation of principles. TPI vary from 0 to 100 and are calculated using the following equation[11]: TPI = Σ tactical actions (performance of principle × quality of principle performance × place of action in the game field × action outcome) / number of tactical actions

The analysis of the games was performed using the Soccer Analyzer® software, and data were recorded in an ad hoc Excel for Windows® worksheet[11].

Data analysis

Analyses were made based on the offensive tactical performance index (OTPI), defensive tactical performance index (DTPI) and tactical principle. The amount of accomplishment per tactical principle was also verified, in addition to the success percentage in the execution of fundamental tactical principles.

In order to verify the reliability of records, an intra-rater concordance analysis was performed by means of a duplicate analysis of ~ 10% of the total tactical actions performed by players, and the reanalyzed tactical actions were defined by lot. The concordance analysis was performed using the Kappa index. The intra-rater analysis showed a high degree of concordance between the two observations previously selected by lot (K index = 0.876, $p < 0.001$).

Data were then checked for distribution normality using the Kolmogorov-Smirnov test ($p < 0.05$), followed by non-parametric Mann-Whitney

Box 1.. Description of the fundamental tactical principles of soccer in the offensive and defensive phases of the game, based on the ideas of Costa et al.[5] and Teoldo, Guilherme and Garganta[8].

Offensive Phase (team with ball possession)	
Penetration	Tactical action performed with ball possession. The player seeks to break through the cross lines of the opposing team and consequently advance on the opponent's playing field towards the goal.
Offensive Coverage	Offer of support to the player with the ball within or near the game center in search of numerical superiority in ball possession by reducing opponents' defensive pressure.
Depth Mobility	Tactical action that allows the team to play in depth through increasing effective game space.
Width and Length	Tactical action that can be performed with and without ball possession. Without ball possession, the player offers pass lines to the player with the ball in breadth and depth. With ball possession, it consists of actions taken towards the goal itself or on the side of the field in order to gain time in decision making.
Offensive Unity	Tactical action that allows the team to play in cohesion by performing compact attacks from reduced distances between the team's cross lines.
Defensive Phase (team without ball possession)	
Delay	Primary opposition to the player with the ball within the game center, avoiding their advancement on the game field in addition to blocking pass lines.
Defensive Coverage	Secondary opposition to the player with the ball within the game center, in order to provide balance in the actions of the player who carries out the tactical contention principle.
Concentration	A tactical action aimed at maximum protection of the goal itself by conditioning the opponent to areas of the game field that offer less risk to the team.
Balance	Tactical action to maintain defense security by covering pass lines offering guarantee to players who perform contention and defensive coverage.
Defensive Unity	Tactical action that allows the team to defend itself as a whole, keeping defensive compression through the distance between the team's own cross lines.

(relative to the comparison between two variables) and Kruskal- Wallis tests (relative to the comparison between three or more variables), also using the Dunnett C test as post hoc when $p < 0.05$. The analysis also determined the effect size according to Cohen[19] and partial η^2[20]. Cohen classifies the effect size as small (d = 0.2) medium (d = 0.5) and large (d = 0.8), while partial η^2 varies from 0 to 1.0, with the largest partial η^2 value, the largest effect size[20]. All calculations were performed using the SPSS 20.0 statistical software (IBM, USA), adopting 5% significance level.

RESULTS

When comparing the offensive tactical performance with defensive tactical performance, it was verified that OTPI is higher than DTPI (50.8 ± 9.8 and 34.3 ± 5.7, respectively, $p < 0.001$, d = 2, 1). When comparing the tactical performance of players by principle, it was observed that *Depth Mobility* is the tactical principle with the highest index in the offensive phase of the game ($F(9, 1344) = 54.4$, $p < 0.001$, partial $\eta^2 = 0.26$). Among defensive principles, it was observed that the *Defensive coverage* is the principle with the highest values, and the *Defensive Unity* has higher performance index compared to C*oncentration* principle ($F(9, 1344) = 54.4$, $p < 0.001$; Partial $\eta^2 = 0.26$) (Table 1).

Regarding the number of tactical actions carried out per principle, it was observed that *Offensive Coverage* and *Width and Length* offensive tactical principles are the most accomplished by players, with *Penetration* showing the lowest number of actions performed ($F(9, 1510) = 166.1$, $p < 0.001$, partial $\eta^2 = 0.50$). In the defensive phase of the game, *Balance* and *Defensive Unity* tactical principles are the most accomplished by players,

with *Defensive Coverage* showing the lowest number of actions performed (F (9, 1510) = 166.1; p < 0.001; partial η^2 = 0.50) (Table 2).

When offensive and defensive tactical efficiency of players was compared, it was found that players had 91.9% ± 7.8 correct basic offensive tactics and only 84.3% ± 10.7 (p <0.001, d = 0.8). In relation to the success percentage per tactical principle, *Offensive Coverage, Depth Mobility* and *Width and Length* obtained the highest success percentage, *Penetration* being the principle with the least number of correct executions in the offensive phase of the game (F (9 , 1344) = 49.9, p <0.001, partial η^2 = 0.25). In the defensive phase, *Delay* was the one that obtained the least number of hits, *Concentration* being the principle with the least number of correct executions (F (9, 1344) = 49.9, p <0.001, partial η^2 = 0.25) (Table 3).

Table 1. Mean and standard deviation of the Tactical Performance Indexes by tactical principles of the offensive and defensive phases of soccer

Offensive phase	Penetration	Offensive coverage	Depth Mobility	Width and Length	Offensive Unity	partial η^2	p
	48.8 ± 12.3	50.5 ± 24.3	64.1 ± 8.7*	49.2 ± 11.2	48.1 ± 10.3	0.26	<0.001
Defensive phase	Delay	Defensive Coverage	Balance	Concentration	Defensive Unity	partial η^2	p
	32.6 ± 12.3	46.1 ± 24.3#	34.3 ± 8.7	30.8 ± 11.2†	35.2 ± 10.3	0.26	<0.001

* 95%CI = 4.3 to 26.4 in relation to *Penetration*; 6.6 to 20.6 in relation to *Offensive Coverage*; 8.0 to 21.8 in relation to *Width and Length*; 8.1 to 24.0 in relation to *Offensive Unity*. # 95%CI = 4.8 to 22.3 in relation to *Delay*; 3.3 to 20.3 in relation to *Balance*; 6.6 to 24.0 in relation to *Concentration*; 2.3 to 19.5 in relation to *Defensive Unity*. † 95%CI = -8.4 to -0.4 in relation to *Defensive Unity*.

Table 2. Mean and standard deviation of the total tactical actions performed by players per tactical principle of offensive and defensive phases of soccer

Offensive phase	Penetration	Offensive Coverage	Depth Mobility	Width and Length	Offensive Unity	partial η^2	p
	1.6 ± 1.5	10.2 ± 5.1*	2.5 ± 2.6	9.7 ± 4.6#	4.2 ± 2.6	0.50	<0.001
Defensive phase	Delay	Defensive Coverage	Balance	Concentration	Defensive Unity	partial η^2	p
	6.1 ± 3.3	1.2 ± 1.3#	9.7 ± 4.0†	3.9 ± 2.5	8.4 ± 3.9**	0.50	<0.001

* 95%CI = 7.2 to 10.0 in relation to *Penetration*; 6.2 to 9.2 in relation to *Depth Mobility*; 4.5 to 7.5 in relation to *Offensive Unity*. # IC95% = 6.8 to 9.3 in relation to *Penetration*; 5.8 to 8.6 in relation to *Depth Mobility*; 4.1 to 6.8 in relation to *Offensive Unity*. † 95%CI = 2.3 to 5.0 in relation to *Delay*; 7.4 to 9.6 in relation to *Defensive Coverage*; 4.6 to 7.0 in relation to *Concentration*. ** 95%CI = 1.0 to 3.7 in relation to *Delay*; 6.2 to 8.3 in relation to *Defensive Coverage*; 4.6 to 7.0 in relation to *Concentration*.

Table 3. Mean and standard deviation of the success percentage obtained in the execution of tactical principles of the offensive and defensive phases of soccer

Offensive Phase	Penetration	Offensive Coverage	Depth Mobility	Width and Length	Offensive Unity	partial η^2	p
	60.8 ± 40.2*	97.3 ± 7.6	97.5 ± 9.1	95.5 ± 11.4	80.3 ± 28.5#	0.25	<0.001
Defensive phase	Delay	Defensive coverage	Balance	Concentration	Defensive Unity	partial η^2	p
	68.7 ± 24.6**	91.3 ± 24.3	85.0 ± 16.3	98.0 ± 7.2†	87.3 ± 18.3	0.25	<0.001

* 95%CI = -49.1 to -23.7 in relation to *Offensive Coverage*; -49.5 to -23.8 in relation to *Depth Mobility*; -47.6 to -21.8 in relation to *Width and Length*; -34.2 to -4.7 in relation to *Offensive Unity*. # 95%CI = -25.0 to -9.0 in relation to *Offensive Coverage*; -25.4 to -9.0 in relation to *Depth Mobility*; -23.6 to -7.0 in relation to *Width and Length*. ** IC95% = -33.0 to -12.2 in relation to *Defensive Coverage*; -24.0 to -8.6 in relation to *Balance*; -36.0 to -22.6 in relation to *Concentration*; -26.5 to -10.5 in relation to *Defensive Unity*. † 95%CI = 8.3 to 17.7 in relation to *Balance*; 5.6 to 15.9 in relation to *Defensive Unity*.

DISCUSSION

The aim of this research was to evaluate the performance and tactical behavior of youth soccer players of teams from base categories. By identifying that players have greater offensive tactical effectiveness than defensive, the present study corroborates results obtained by Santos et al.[12]. Américo et al.[14] also verified that the tactical offensive efficiency was greater than defensive in a study carried out with soccer players aged 11-17 years.

These findings can be explained by several factors, among them a national game culture focused on the offensive phase, because the samples used in the studies of Santos et al.[12] and Américo et al.[14] were composed of players from the southeastern region of Brazil, being complemented by the present study with players from the northeastern region of the country.

In contemporary soccer, ball possession stands out in the performance of a team and, consequently, in the success rate[20-23]. By verifying that tactical offensive actions are more correctly executed, the culture of ball possession valorization can be an influential factor in the process of formation of soccer players with offensive characteristics more efficient than defensive ones.

In addition, the longer the ball possession, the less errors of defensive tactical actions are performed, and the ball possession will have to be controlled for longer periods of time in order to make fewer defensive tactical errors. It is important to emphasize that this is only a strategy, and it is important to stimulate holistic teaching and the plurality of players in tactical actions with the objective of forming complete players both in the offensive phase and in the defensive phase of the game[7,24,25].

In relation to the tactical performance per principle, it was verified that *Depth Mobility* is the one that presents the greatest index in the offensive phase of the game and *Defensive Coverage* in the defensive phase. The *Depth Mobility* principle allows the increase of effective playing space playing in depth, which is an important specific principle of offensive play in contemporary soccer[26]. *Depth Mobility* was also one of the offensive tactical principles with a high percentage of correct execution by players. However, such a finding may have been favored by the method used in which the offside rule was not applied.

The *Defensive Coverage*, tactical action of support to the player that performs the *Delay* principle, can enable the team to play with numerical superiority in the place of ball possession, which can generate greater technical actions of ball interception, consequently, increasing the possibilities of recovering ball possession[5]. It was also verified that the *Concentration* tactical defensive principle was the one that obtained the highest percentage of correct performances, which is a tactical action that aims at maximum protection of the goal and could be a "cover" of *Defensive Coverage*.

It is noteworthy that the scientific literature shows positive associations of ball possession recovery followed by a goal kick, which has offensive efficacy related to the defense-attack transition[27]. In this way, this tactical profile presented by players from Aracaju can favor the development of a

game model that stimulates the specific tactical principle of removing the ball from the pressure zone in the defense-attack transition[8].

Regarding the correct performance of tactical offensive principles, *Offensive Coverage,* and *Width and Length* also presented the current percentage, which shows the concern of players to offer pass lines to the player with the ball, either near or distant to him. For being players with good understanding of the *Width and Length* principle, the coach can use the specific principle of offensive play of amplitude, important in opening spaces in the opponent's defensive organization[28]. Both principles require well-developed perceptual and cognitive abilities, peculiar abilities of expert players[29-30], in view of the complexity and the high level of abstraction that such principles require from players[5,14].

Some limitations were present in this investigation. It was not possible to identify whether these responses (tactical performance) of players are reproducible, since each athlete was evaluated only once. However, the process of analyzing the individual performance in the FUT-SAT demands prolonged time as a result of the many variables observed, which would make it unfeasible to re-evaluate the entire sample of athletes. Another possible intervening variable was the number of players per game. The GK + 3 vs. 3 + GK game is the minimum structure suggested by the FUT-SAT. It is possible that with more players on each team, the amount of interactions and tactical actions would be expanded, thus obtaining a more comprehensive and accurate perspective. It should be noted; however, that the structure adopted in the present study is in line with the original FUT-SAT protocol, and that it has been used in previous studies[10-12,14].

CONCLUSIONS

It was concluded that players have a higher tactical offensive performance than the defensive performance, and they are more likely to correctly perform tactical offensive principles than defensive ones. It was verified that *Depth Mobility* and *Defensive Coverage* principles were those that presented the highest tactical performance in the offensive and defensive phases, respectively. Players perform more *Offensive Coverage* and, *Width and Length* tactical actions in the offensive phase of the game and *Balance* and *Defensive Unity* in the defensive phase of the game. In relation to the success percentage in the implementation of principles, *Offensive Coverage*, *Depth Mobility* and, *Width and Length* are those with the highest success rate in the offensive phase of the game and *Concentration* in the defensive phase.

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