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Tactical behavior of U-15 soccer players: assessment of changes over a season

Comportamento tático de atletas sub-15 no futebol: avaliação das alterações ao longo de uma temporada esportiva

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Abstract – This study aimed to compare the tactical behavior of U-15 soccer players over a season. Sixteen high-level athletes (mean age 14.5 years) from the city of Belo Horizonte participated in the study. Athletes were monthly evaluated by means of the field test using the System of Tactical Assessment in Soccer – FUTSAT, which allowed the characterization of the incidence of tactical principles and place of action in the game field, as well as the percentage of positive offensive and defensive tactical principles. Data were analyzed by Friedman's test (incidence of tactical principles and place of the action) and one-way ANOVA for repeated measures (percentage of positive tactical principles), adopting significance level of $p<0.05$. Results showed differences in the incidence of offensive and defensive units tactical principle, as well as the place of actions in the game field. An improvement in offensive and defensive tactical behavior was also observed throughout the season.

Key words: Physical education and training; Soccer; Task performance and analysis.

Resumo – *Este estudo objetivou comparar o comportamento tático de jogadores de futebol sub-15 ao longo de uma temporada esportiva. Participaram do estudo 16 atletas (idade média 14,5 anos) de uma equipe de alto nível da cidade de Belo Horizonte. Atletas foram avaliados mensalmente por meio do teste de campo do Sistema de Avaliação Tática no Futebol – FUTSAT –, o qual permitiu a caracterização da incidência dos princípios táticos e do local da ação tática do campo de jogo, além do percentual de acerto dos princípios táticos ofensivos e defensivos. Dados foram analisados por meio do teste de Friedman (incidência de princípios táticos e local da ação) e ANOVA One-Way de medidas repetidas (percentual de acerto dos princípios táticos), adotando-se nível de significância de p<0,05. Resultados apontaram diferenças na incidência de ações de unidade ofensiva e defensiva, além da localização das ações táticas no campo de jogo. Observou-se ainda melhoria no comportamento tático ofensivo e defensivo ao longo da temporada esportiva.*

Palavras-chave: *Análise e desempenho de tarefas; Educação física e treinamento; Futebol.*

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INTRODUCTION

The context of action in Team Sports, including soccer, is characterized by a high unpredictability, randomness and variability[1], which demands from athletes a constant ability to read the game for correct decision-making for the solution of emerging problems in the context of action[2]. Decision making, in turn, is based on the eminently tactical knowledge that the athlete has about the game[3], which is the basis for the development of the tactical skills of soccer players.

Given the nuclear aspect of tactics in the soccer training process[4], there is a clear need for the development of systems that allow the evaluation of this ability - and the consequent possibility of adjustments in the contents and in the training process. The System of Tactical Assessment in Soccer - FUT-SAT-[5] assesses tactical skills based on fundamental tactical principles, which represent a set of guidelines for the players' action during the game, providing a rapid reach of tactical solutions for emerging problems[6, 7]. Recently, different studies have used FUT-SAT to compare the tactical behavior of athletes from different age groups[8-10] and positions[11], reinforcing the importance of tactical evaluation for the qualitative evolution in the soccer training process.

Previous studies have pointed to changes in the incidence of tactical principles after 20[12] and 37[13] soccer training sessions, indicating potential use of FUT-SAT to assess longitudinal changes in the tactical skills of soccer players. Moreover, literature suggests that the motor skills of soccer athletes change during a sports season[14]. At this point, as tactical ability is based on knowledge structures[2], which are potentially developed through teaching-learning-training processes[15], it is hypothesized that tactical skills and therefore tactical behavior changes during a sports season in soccer players. To date; however, studies have characterized the tactical behavior of U-15 athletes only at a particular point in the sport season[8], which does not fill this gap.

Given the growing interest in assessing tactical ability in soccer, as well as the proposal of new methodological approaches for the teaching-learning-training process, studies on possible variations in tactical skills over the season will allow teachers and coaches to better adjust contents in the soccer training process. In this sense, this study aimed to analyze the tactical behavior in relation to the incidence of tactical principles and tactical performance in relation to the percentage of positive tactical actions of U-15 soccer players during a sports season. It is hypothesized that both behavior and tactical performance will change throughout the season.

METHODOLOGICAL PROCEDURES

Participants and ethical aspects

Initially, 30 soccer players of the U-15 category (born in 2001, mean age of 14.5 years at the beginning of collection) from an elite club of the city

of Belo Horizonte participated in this study. Throughout the year, changes in the team composition occurred due to dropouts and injuries, which prevented the participation of 30 athletes in all collections. At the end, data from athletes who participated in at least 75% of collections were considered, with 16 participants remaining. All athletes, as well as their legal representatives, gave written consent for participation in the study. This study received a favorable opinion from the Research Ethics Committee of the Federal University of Minas Gerais, which was registered under CAE number 51011915.9.0000.5149.

The athletes' sports season comprised 48 games and 236 training sessions, totaling 20511 minutes of practice. During the season, 65% of the training time was devoted to technical-tactical activities (with ball), 18% to specific strength and speed training, and 17% to preparatory and regenerative activities. Athletes participated in 5 competitions, 3 international and 2 regional.

Procedures

Data collection comprised a period of 10 months between March and December 2016. During this period, 9 collections were carried out, one per month (collection 1: March, collection 2: April, collection 3: May, collection 4: June, collection 5: August, collection 6: September, collection 7: October, collection 8: November, collection 10: December), excluding the month of July due to the holidays of athletes. Collections were separated by 25-35-day intervals, with dates set accordingly to the club's competitive schedule. All collections occurred in the afternoon prior to the day's training session in order to reduce the influence of fatigue on observed behavior.

Duly trained researchers conducted all data collection sessions, which took place at the club's training center, in the same place where athletes traditionally perform training sessions. Each collection session started with a preparatory activity - according to a routine standardized by the club - lasting 10 minutes. In the sequence, athletes performed the field test of the System of Tactical Assessment in Soccer - FUT-SAT -[5]. The test included a game in the GR3-3GR structure (goalkeeper plus three line players per team) in a 36 m x 27 m soccer field with all the rules inherent to the formal game and duration of 4 minutes. Each collection lasted approximately 30 minutes, including the preparatory activities and the field test. In all collections, teams were composed of a defender, a midfielder and a forward, as previously performed[16] in order to reduce the influence of positional status on observed behaviors[11,17]. All tests were recorded using a JVC HD Everio GZ-HD520 digital camcorder for further analysis.

Tactical Behavior Analysis

In this protocol, the athletes' tactical behavior was evaluated within Observation Macro-Category based on ten tactical principles, five related to the offensive phase - penetration, offensive coverage, space (with and without ball), depth mobility and offensive unit - and five defensive – delay, defen-

sive coverage, balance (defensive and recovery), concentration and defensive unit, previously stated in literature[5]. Also within this Macro-Category, place of action in the game field was evaluated, which includes actions of attack carried out in the offensive and defensive midfield, in addition to defensive actions, also carried out in the offensive and defensive midfield. From the observation protocol, the percentage of positive offensive and defensive tactical principles was also established, adopted as the measure of tactical performance in the present study.

The evaluation of the items that make up the Observation Macro-Category of FUT-SAT emerges from the analysis of recordings, using the Soccer Analyzer ® software, which allows the insertion of the field diagram on the video of the game and the establishment of the game field and ball line, references adopted for the definition of tactical principles. All analyses were conducted by experts trained in the use of the observation system.

Data analysis

Data regarding the incidence of tactical principles and place of action on the playing field were analyzed using the Friedman test, using Dunn post hoc in cases where significant values were reported. This analysis was conducted in the Prism 7 for Windows software (GraphPad Prism, Version 7.03, GraphPad Software, Inc.). For these variables, the median incidence of tactical principles was reported and the interquartile range (25% -75%) was adopted as a measure of dispersion.

In order to compare the percentage of positive tactical principles, data were initially checked for distribution normality (Shapiro-wilk test), homoscedasticity of variances (Levene test) and sphericity (Mauchly test). Based on assumptions, one-way ANOVA of repeated measures was used to compare values in the nine collection sessions, followed by Tukey post hoc when significant p values were reported. The effect size (partial h^2) was also calculated according to literature recommendations and classified as "no effect" (h^2_p < <0.04), minimal effect (0.04 <h^2_p< <0.25), moderate effect (0.25 <h^2_p< <0.64) and strong effect (h^2_p< > 0.64) [18]. The analysis procedures were conducted in the statistical package SPSS (SPSS Version 20.0 for Windows, SPSS Inc., Chicago, IL, USA), adopting 5% significance level. In these cases, data were reported on average, adopting the standard deviation as a measure of dispersion.

Data Quality

Procedures for verifying the inter- and intra-rater reliability were also conducted in order to verify agreement in the expert's observations. In this sense, 4 of the 32 games performed during the season were re-evaluated (12.5%), as recommended in literature[19]. Re-analyses occurred after 21 days, minimizing the familiarity of evaluators with the evaluated scenes[20]. Cohen's Kappa coefficient and the standard error for variables Tactical Principles and Place of Action in the Game Field were calculated. Concordance above 0.8 for all variables was observed, with standard error not exceeding 0.017. Thus, intra- and inter-rater agreement is classified as "perfect"[21].

RESULTS

Table 1 below presents the median (interquartile range) of incidence of offensive tactical principles throughout the season. As observed, differences were reported only in the incidence of offensive unit actions (F = 40.39, p = 0.001). Data point to the reduction in offensive unit actions throughout the season.

Table 1: Comparison of the incidence of fundamental attack tactical principles throughout the season.

	Penetration	Offensive coverage	Space without ball	Space with ball	Depth Mobility	Offensive unit
March[1]	4 (2-5.75)	9(7-11)	9(7.25-10)	1(0.25-2)	3(2-3.75)	14.5(12.5-16.75)
April[2]	3(2-4)	9.75(8.25-11.75)	11.5(6.25-14.75)	1.5(1-2.75)	1(0.125-2.75)	10.5(8.625-12)
May[3]	3.5(2-4)	9(8-10.75)	9(5.5-13)	1(1-2.75)	1(0.25-3)	8(3-10)
June[4]	3(1.25-4.75)	10(7.25-13.5)	12(8-14.75)	2(1-2.75)	1.25(0.25-3)	8.5(5-11)
August[5]	4(2.25-5)	9.5(9-12.25)	12.5(8-14)	2(1-3)	0.5(0-3)	7.5(5.125-12.5)
September[6]	4(2.25-4.75)	9(8-14)	10(6.25-14.75)	1(1-2)	1(0.25-2.75)	6.5(5.125-9.75)
October[7]	3(2-4)	8.5(7-10.75)	12.5(8.25-14.75)	2(1-3)	2(0.25-2.75)	6(4.25-8)
November[8]	3.75(3-4)	9(6.5-11)	10.5(8-12.75)	1.25(0.25-2.75)	2(1-2.375)	5.25(3.25-7.5)
December[9]	2.5(2-4)	9(8-10)	9.5(6.5-11.75)	1.5(1-2)	1(0.25-4)	6(2.5-8)
F	8.131	4.668	8.854	6.548	12.38	40.39
p-value	0.42	0.792	0.354	0.586	0.135	0.001*
Post Hoc						1<3,4,6,7,8,9

* Significant differences

Table 2 below presents the median (interquartile range) of the fundamental tactical defense principles throughout the season. Results show significant differences only in the incidence of defensive unit actions (F = 20.21, p = 0.009), with higher incidence in April than in May. However, consistent differences throughout the season were not reported in any defensive tactical principles.

Table 2: Comparison of the incidence of fundamental tactical defense principles throughout the season.

	Delay	Defensive coverage	Defensive Balance	Recovery Balance	Concentration	Defensive Unit
March[1]	5.5(3.25-0.875)	3(2-5)	5(2.25-6)	2(1-3.75)	4(3-4)	14(13-17.75)
April[2]	6(4.25-7)	2(1-3.75)	5(3-6)	2(1.25-3)	4.5(3-5)	14.25(12.63-16.75)
May[3]	5(3.25-7)	2(1-3)	4(3-5)	2(2-3.75)	4.5(2.25-7)	11(9-13)
June[4]	5(3.25-7.5)	2(1-3)	4.5(2.25-6)	2(1.125-3.75)	3(2-6.75)	13(12.25-16.5)
August[5]	5(3.5-6)	2(1-3)	3.5(2.25-5.75)	3(2-3.75)	3.5(3-6)	13.5(12.25-17.75)
September[6]	5.5(4-7.75)	2.75(1-4)	4(2.25-5)	3(1.25-4.75)	4(3-6)	13(12-14.75)
October[7]	5(3-6.75)	3(2-5.5)	4.5(3-7.75)	2(1.25-3.75)	4(3-5)	11(9.25-13.75)
November[8]	5.5(4-6.75)	3(2.25-4.75)	4(3-6)	2.75(1-5)	3(2-5.5)	12.75(11-14)
December[9]	6(5-9)	3.5(2-5)	6.5(4-8)	2(2-3.75)	3(2-5)	12(9.25-13.75)
F	1.714	15.28	11.58	6.491	2.12	20.21
p-value	0.988	0.053	0.17	0.592	0.977	0.009*
Post Hoc						2>3

* Significant differences

Table 3 presents the medians (interquartile range) of the incidence of tactical actions on the playing field throughout the sports season. Higher

incidence of defensive actions in the defensive midfield was reported in April compared to December (F = 18.51, p = 0.017), with no differences in the other variables investigated.

Table 3: Comparison of the incidence of tactical actions on the playing field during the season.

	Defensive actions in the offensive midfield	Defensive actions in the defensive midfield	Offensive actions in the offensive midfield	Offensive actions in the defensive midfield
March[1]	20(16.5-21)	15.5(12.5-25.25)	22(19-25.25)	17(13-19.75)
April[2]	17(14.25-23-25)	17.25(14-21.5)	23.5(21.25-25.5)	17.5(11.25-23)
May[3]	16.5(12-20.25)	14.5(11-18.5)	23.5(19-25.5)	14(11.25-20.75)
June[4]	20.5(17-23.5)	15.5(11.25-18.75)	25.25(20.25-32.25)	15(10-21.75)
August[5]	20(15-24)	12(10.25-16.75)	20(18.25-27)	20(14.5-24)
September[6]	19.5(15-23.5)	15.5(12.38-18.75)	21(19-26.25)	17(12-23.75)
October[7]	20.5(14.5-23.75)	15(10.25-21.75)	20(16.25-27.5)	18(15.25-25)
November[8]	16.5(13.25-20.75)	11(8.5-15.75)	25.5(22.5-28)	14.5(11-17.75)
December[9]	19(17.25-23)	10.5(5.25-15)	20.5(17.25-23)	18(16.25-20)
F	14.25	18.51	12.38	7.094
p-value	0.075	0.017*	0.135	0.526
Post Hoc		$^{2}>^{9}$		

* Significant differences.

Finally, Table 4 presents the comparison of the percentage of positive tactical principles throughout the season. Results indicate an improvement in the percentage of positive offensive (F = 15.367, p = 0.001, moderate effect) and defensive (F = 6.642, p = 0.001, moderate effect) tactical principles throughout the season.

Table 4: Comparison of the percentage of positive offensive and defensive tactical principles throughout the season.

	% Positive offensive principles	% Positive defensive principles
March[1]	0.58 (0.09)	0.50 (0.15)
April[2]	0.78 (0.09)	0.69 (0.15)
May[3]	0.69 (0.13)	0.54 (0.24)
June[4]	0.79 (0.08)	0.56 (0.25)
August[5]	0.78 (0.09)	0.60 (0.20)
September[6]	0.79 (0.09)	0.59 (0.20)
October[7]	0.71 (0.10)	0.53 (0.16)
November[8]	0.85 (0.08)	0.73 (0.13)
December[9]	0.92 (0.05)	0.87 (0.07)
F	15.367	6.642
P-value	0.001*	0.001*
Effect size	0.484	0.289
Post-Hoc	$^{9}>^{1,2,3,4,5,6,7}$ $^{8}>^{1,3,7}$ $^{1}<^{2,3,4,5,6,7}$	$^{9}>^{1,3,4,5,6,7}$ $^{8}>^{1}$

* Significant differences.

DISCUSSION

This study aimed to compare the tactical behavior of youth soccer players throughout a sports season. Results have shown consistent differences along the season only in the incidence of offensive unit actions. Improvement in tactical defensive and offensive actions throughout the analyzed period was also observed.

Aquino et al.[13] reported an improvement in the offensive and defensive tactical performance indexes of 10 and 11-year-old practitioners after 37 soccer training sessions guided by a tactical-based teaching model. Similarly, the present study pointed to improvements in both offensive and defensive tactical behavior of athletes throughout the sporting season, with higher values for both variables in the last test procedure compared to the first measurement. The acquisition of tactical skills is justified by the constant exposure of athletes to learning situations, which allow them a better use of knowledge structures, which results in greater capacity to perceive-act in problem situations of the game[22].

In a complementary way, consistent longitudinal modifications were observed throughout the sports season in only one fundamental tactical principle. This result is in line with the findings of Souza et al.[12], who reported differences in the incidence of only one tactical principle after 20 training sessions in soccer. At this point, previous studies have also shown differences in a few tactical principles among U-14 and U-15[8] athletes, although there is a greater convergent and divergent tactical knowledge in U-15 athletes compared to U-14 athletes[23] and a higher percentage of positive tactical principles in athletes of higher training levels (U-17)[24]. Literature also reports no effect of age on the incidence of technical actions in soccer, although greater efficacy is observed[25]. In this sense, it is suggested that the soccer training process allows athletes not only to acquire knowledge about "what to do", but, at the same time, leads to the development of knowledge structures related to "how", "where" and "when" to do[26], that is, the ability to manage decision-making to solve problems and to relate, in the game, declarative and procedural tactical knowledge. Thus, throughout the sporting season, in spite of performing similar actions (same incidence in different tactical principles), athletes are able to execute them with higher quality (greater percentage of positive principles), which represents an improvement in tactical skills. At this point, the present results reinforce the "proceduralization" model of tactical knowledge[27], that is, the transfer from declarative knowledge - what to do - into procedural knowledge - how to do.

Previous studies have shown lower incidence of offensive unit actions in small-sized games 6x6 compared to 3x3[28], in addition to lower incidence of this principle in midfielders compared to attackers[11]. In both cases, it is suggested that this lower incidence is related to the greater participation of players in places near the game field, either by the increase in the number of players[28], which allows more athletes to go to areas further away from

the playing field, or by the specificities of each positional status[11]. In this sense, it is suggested that the reduction in the incidence of offensive unit actions shown in the present study represents an increase in the players' ability to position themselves near the game field, increasing support to the player with the ball and creating closer pass lines, a process also resulting from the improvement in the tactical capacity discussed above.

This study represented the first attempt to characterize the tactical skills of youth players throughout a sports season. However, limitations regarding the sample size and specificity of the team play model suggest caution in extrapolating the present results to other practice contexts. Specifically, the behaviors observed in this study refer to elite athletes of the U-15 category, for which future studies are recommended, including athletes from lower-level teams (regional and local) and other age groups. In this sense, further studies complementing the information presented here are suggested, namely by performing interventions in the T-L-T processes. Thus, through the manipulation of training contents and teaching models, the possibility of qualified intervention of coaches and teachers for the development of tactical skills in youth soccer players will be expanded.

CONCLUSION

This study reported an improvement in the percentage of positive offensive and defensive tactics throughout the sports season, accompanied by a change in the incidence of offensive unit actions. Results indicate changes in tactical skills as a result of a sports season in U-15 athletes.

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