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## ANALYSIS OF THE TACTICAL BEHAVIOR OF YOUTH ACADEMY SOCCER PLAYERS

### ANÁLISE DO COMPORTAMENTO TÁTICO DE JOGADORES DE FUTEBOL DE CATEGORIA DE BASE

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#### RESUMO

O objetivo do estudo foi comparar a eficiência do comportamento tático entre os jogadores de futebol de diferentes categorias etárias. A amostra foi composta por 400 jogadores divididos em quatro categorias (sub-11, sub-13, sub-15 e sub-17), que realizaram no total 23.855 ações táticas. Para avaliação da eficiência do comportamento tático dos jogadores foi utilizado o FUT-SAT. Para o tratamento estatístico, foram realizadas análises descritivas, os testes *Kolmogorov-Smirnov*, *Kruskal-Wallis*, *Mann-Whitney* e foi considerado um nível de significância de  $p < 0,05$ . Os resultados indicam que a eficiência do comportamento tático tende a aumentar ao longo do tempo, com exceção da categoria Sub-15 que apresenta uma queda acentuada em relação às demais. Assim é possível concluir que existem variações na eficiência do comportamento tático de jogadores de futebol de diferentes categorias etárias.

**Palavras-chave:** Futebol. Comportamento tático. Categorias etárias.

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#### ABSTRACT

The aim of this study was to compare the tactical behavior efficiency between soccer players from different age levels. The sample comprised 400 players from four age groups (Under-11, -13, -15, and -17), who performed 23,855 tactical actions. Players' tactical behavior efficiency was assessed through FUT-SAT. Statistical procedures included descriptive analysis and the tests *Kolmogorov-Smirnov*, *Kruskal-Wallis* and *Mann-Whitney*. The significance level adopted was  $p < 0.05$ . Results indicated that the tactical behavior efficiency tends to increase over time, except for the U-15 age level, that displayed an accentuated drop in relation to the others. It is concluded that the efficiency of tactical behavior of the players in soccer displayed differences across different age levels.

**Keywords:** Soccer. Tactical behavior. Age levels.

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#### Introduction

In soccer, the tactical component is key for the game, as it regards the position and movements performed by players within the playing space, thus supporting an organization for building up tactical actions<sup>1</sup>. This organization enables the players to perform actions with and without the ball in the offensive and defensive phases, as well as in occasional events and set-pieces, thus highlighting their tactical behavior<sup>2</sup>.

The tactical behavior is the response provided by the players to the different situations that occur in the game<sup>3</sup>. This behavior might be grouped into core tactical principles, which are a set of rules that guide players' movements in order to deal with the constraints in a soccer match<sup>4-7</sup>.

The assessment of the tactical principles enables the possibility to verify the quality of the actions performed, i.e. the players' tactical behavior efficiency<sup>8</sup>. Tactical behavior efficiency takes into account the frequency of the actions performed by the players and their respective accuracy rate, hence describing whether the action was successful or not<sup>2,9</sup>. The identification of this aspect of the game allows to acknowledge substantial gains and losses by the part of the player with respect to the tactical component through time, thus being a

variable that might support the control of this component during the development process that players undergo<sup>10</sup>.

Lately, some studies have reported differences regarding the tactical behavior efficiency between different age levels. Teoldo and colleagues<sup>11</sup> compared the tactical behavior efficiency of players from the U-11, U-13, U-15 and U-19 age levels. The authors verified that the players from the older level display a higher frequency of actions, and were more efficient, when compared to the other levels. Such fact was related to the ability to understand the logic of play that is learned across the years, influenced by cognitive aspects, such as motor awareness and knowledge about the game, due to an increase of the technical and motor skills<sup>13</sup>.

Also, in a study conducted by Giacomini and Greco<sup>14</sup>, findings showed that the older the age level (chronologically speaking), the greater the players' procedural tactical knowledge. In addition, the same authors reported similar results with respect to the declarative tactical knowledge, whereas the players from younger age levels displayed lesser knowledge than their older counterparts<sup>15</sup>. The authors justify these findings by accounting for the fact that players from older age levels display higher amount of practice and experience acquired through sport-specific training.

Accordingly, it is possible to notice that players need to develop their cognitive processes in order to better understand and perform their tasks during the game<sup>16</sup> and each age level displays its own particularities<sup>17</sup>. Hence, it is important to assess the tactical behavior efficiency across different age levels, in order to understand how this variable behaves during the development process, and to identify the attributes that need to be improved for practice. Thereby, it is reasonable to propose a methodological guide for teaching soccer, taking into account the changes in behavior that occur in each age level<sup>17-18</sup>.

In order to support these aforementioned aspects, the aim of the present study is to compare the tactical behavior efficiency between soccer players from different age levels.

## Methods

### *Sample*

The sample comprised 400 male soccer players, from the U-11 (n=100), U-13 (n=100) and U-17 (n=100) age levels of youth clubs from the countryside of the state of Minas Gerais. These players performed 23,292 tactical actions [U-11 (5,179); U-13 (5,269); U-15 (5,996) and U-17 (6,848)].

As inclusion criteria, the players should take part in systematic sport development programs aimed for performance, with at least three soccer-specific training sessions per week, and play in regional and/or state championships. The players should be participating in these training programs for at least one year, in the U-11 level, two years, in the U-13 level and three years in older levels.

### *Ethical procedures*

The present study had the approval of the Ethics Committee of the Universidade Federal de Viçosa (CEPH. Of. 132/2012) and meets the standards of the Declaration of Helsinki for research with human beings (2008). Data were collected with permission of the clubs' representatives. Parents or guardians signed a written informed consent form, authorizing players to take part in the research.

### *Instrument for data collection*

For the assessment of the players' tactical behavior efficiency the System of Tactical Assessment in Soccer (FUT-SAT)<sup>8</sup> was used. This instrument enables the assessment of tactical actions performed by players with and without ball possession, based on then core tactical principles of soccer. The core tactical principles of soccer are divided in two groups, being 5 principles of the offensive phase and five principles of the defensive phase, as displayed in Figure 1<sup>19</sup>.

Category	Sub-categories	Variables	Definitions
Core tactical principles	Offensive	Penetration	Movement of player with the ball towards the goal line.
		Offensive Coverage	Offensive supports to the player with the ball.
		Mobility	Movement of players between the last defender and goal line.
		Width and Length	Movement of players to extend and use the effective play-space.
		Offensive Unity	Movement of the last line of defenders towards the offensive midfield, in order to support offensive actions of the teammates.
	Defensive	Delay	Actions to slow down the opponent's attempt to move forward with the ball.
		Defensive Coverage	Positioning of off-ball defenders behind the “delay” player, providing defensive support.
		Balance	Positioning of off-ball defenders in reaction to movements of attackers, trying to achieve the numerical stability or superiority in the opposition relationship.
		Concentration	Positioning of off-ball defenders to occupy vital spaces and protect the scoring area.
		Defensive Unity	Positioning of off-ball defenders to reduce the effective play-space of the opponents.

**Figure 1.** Core tactical principles of soccer.

Source: Teoldo et al.<sup>7</sup>.

*Data collection procedures*

FUT-SAT’s field test (GK+3 vs. 3+GK) was conducted in a field of 36 meters long by 27 meters wide, during four minutes. Participants were randomly arranged in teams (with the purpose of balancing the quality of the teams, the coach helped in this process) of three players and a goalkeeper. The bouts were performed by teams from the same age level. Players wore numbered vests of different colours, so as to help in their identification during video analysis. Players were asked to perform the test considering all the rules of the soccer game.

Prior to the start of each session, players were informed about the purposes of the test and were given 30 seconds in order to familiarize with test procedures.

*Material*

To record the field tests a Sony HDR-XR100 digital camera (SONY<sup>®</sup>, Japan). Video footage was converted into '.avi' digital format, through a laptop computer (Intel Core<sup>™</sup> i3 DELL<sup>®</sup> Inspiron N4030) via USB cable, by *Format Factory for Windows*<sup>®</sup>. Video processing and analysis were performed through *Soccer Analyser*<sup>®</sup>. This software enables the insertion on the video of the test's spatial references and allows for the reliable assessment of the tactical actions, based on players' movements and positions on the field.

### Statistical analysis

Descriptive analysis (means and standard deviation) was used. *Kolmogorov-Smirnov* test was used and displayed a nonparametric distribution of data. The comparison of tactical behavior efficiency with respect to the performance of the principles between age groups was performed through the *Kruskal-Wallis* test. Mann-Whitney test was used as a post-hoc procedure in order to display between each categories the differences occurred.

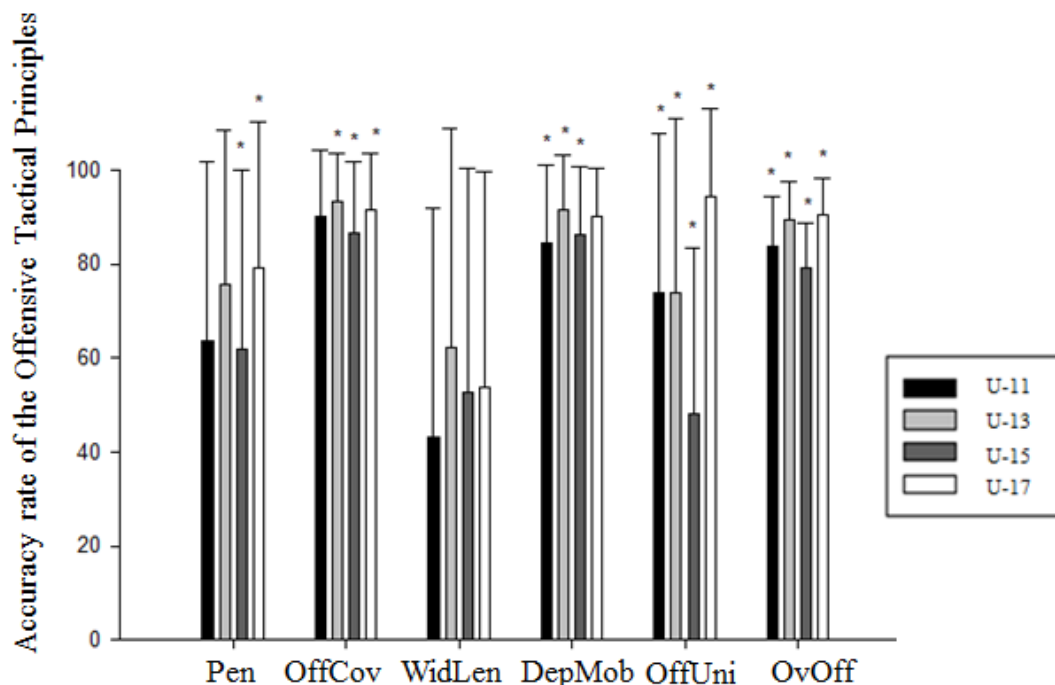
All statistical procedures were conducted through SPSS for Windows<sup>®</sup>, version 20.0. In order to account for the multiple comparisons, the significance level was corrected through the Bonferroni method. Thus, the corrected significance level was set at  $p < 0.0083$

### Reliability

Test-retest reliability was performed. A three-week interval was respected before reanalysis, in order to avoid task familiarity<sup>20</sup>. Reliability was calculated through Cohen's Kappa test, whereas 4,290 actions (17.98% of the overall sample) were reassessed. This value is superior than the reference value established by literature<sup>21</sup>. Retest results displayed values of intra-observer reliability between 0.823 (SE=0.015) and 0.987 (SE=0.006). For inter-observer reliability, results displayed values between 0.847 (SE=0.033) and 0.987 (SE=0.005).

### Results

Figure 1 displays the results regarding the offensive tactical behavior efficiency (assessed through the accuracy rate of the core tactical principles) for the different age levels.



**Figure 1.** Accuracy rate of the Offensive Tactical Principles.

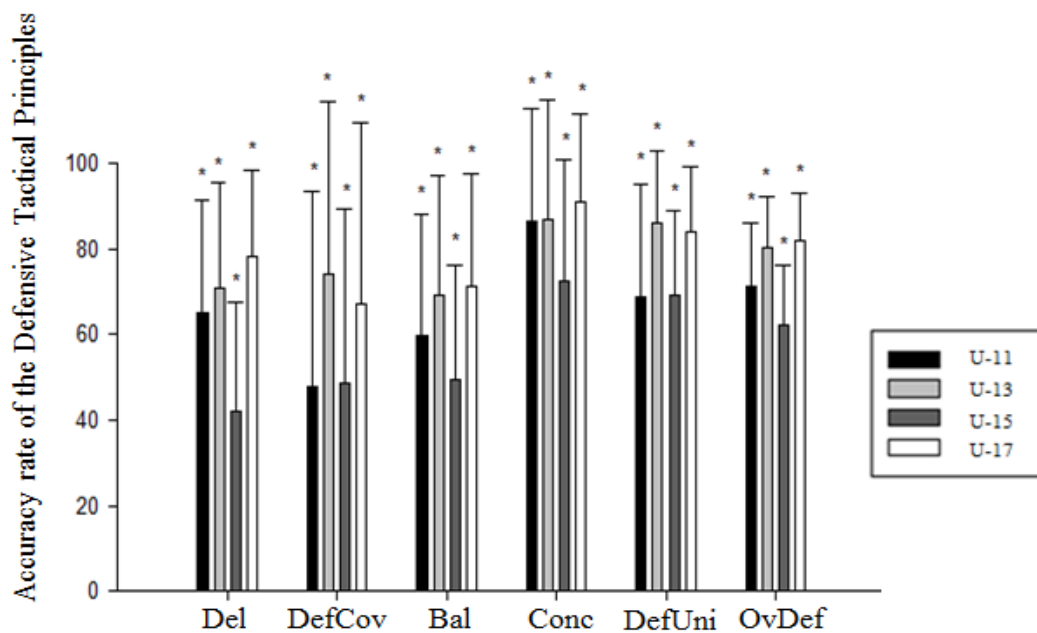
\*Significant differences: U-11 x U-13: Width and Length ( $p=0.001$ ) and Overall Offensive ( $p<0.001$ ); U-11 x U-15: Offensive Unity ( $p<0.001$ ) and Overall Offensive ( $p=0.002$ ); U-11 x U-17: Offensive Unity ( $p<0.001$ ) and Overall Offensive ( $p<0.001$ ); U-13 x U-15: Offensive Coverage ( $p<0.001$ ), Width and Length ( $p=0.001$ ), Offensive Unity ( $p<0.001$ ) and Overall Offensive ( $p<0.001$ ); U-13 x U-17: Offensive Unity ( $p=0.001$ ); U-15 x U-17: Penetration ( $p=0.008$ ), Offensive Coverage ( $p=0.005$ ), Offensive Unity ( $p<0.001$ ) and Overall Offensive ( $p<0.001$ ).

Source: The authors.

Through the results, it is possible to observe that players from the U-17 and U-13 age levels were more efficient when performing offensive tactical principles (OvOff) ( $90.32 \pm 7.86$  e  $89.25 \pm 8.32$ , respectively), followed by the players from the U-11 ( $83.59 \pm 10.54$ ) and U-15 ( $79.29 \pm 9.20$ ) age levels.

In addition, it was noticed that the offensive principles performed more efficiently were Offensive Coverage (OffCov) and Width and Length (WidLen). On the other hand, the principle of Depth Mobility (DepMob) displayed the lowest values of performance efficiency.

Figure 2 displays the results regarding the defensive tactical behavior efficiency in the different age levels.



**Figure 2.** Accuracy rate of the Defensive Tactical Principles.

\*Significant differences: U-11 x U-13: Defensive Coverage ( $p=0.003$ ), Balance ( $p=0.008$ ), Defensive Unity ( $p<0.001$ ) and Overall Defensive ( $p<0.001$ ); U-11 x U-15: Delay ( $p<0.001$ ), Balance ( $p=0.007$ ), Concentration ( $p<0.001$ ) and Overall Defensive ( $p<0.001$ ); U-11 x U-17: Delay ( $p<0.001$ ), Balance ( $p=0.002$ ), Defensive Unity ( $p<0.001$ ) and Overall Defensive ( $p<0.001$ ); U-13 x U-15: Delay ( $p<0.001$ ), Defensive Coverage ( $p<0.001$ ), Balance ( $p<0.001$ ), Concentration ( $p<0.001$ ), Defensive Unity ( $p<0.001$ ) and Overall Defensive ( $p<0.001$ ); U-15 x U-17: Delay ( $p<0.001$ ), Defensive Coverage ( $p<0.001$ ), Balance ( $p<0.001$ ), Concentration ( $p<0.001$ ), Defensive Unity ( $p<0.001$ ) and Overall Defensive ( $p<0.001$ ).

Source: The authors.

It is possible to notice that the players from the U-17 ( $82.26 \pm 10.81$ ) and U-13 ( $80.44 \pm 11.92$ ) age levels were more efficient when performing the defensive tactical principles (OvDef), followed by the players from the U-11 ( $71.39 \pm 14.85$ ) and U-15 ( $62.11 \pm 13.96$ ) age levels.

In addition, it was observed that the defensive principle more efficiently performed was the Concentration (Conc). On the other hand, the principles of Defensive Coverage (DefCov) and Delay (Del) displayed the lowest values of performance efficiency.

Broadly speaking, results allow to observe an increase in the tactical behavior efficiency from the U-11 ( $77.49 \pm 14.23$ ) to the U-13 ( $88.85 \pm 11.17$ ) age levels, a decrease in the U-15 ( $70.71 \pm 14.59$ ) and again, an increase in the U-17 ( $86.29 \pm 10.26$ ) age level.

## Discussion

The aim of this study was to compare the tactical behavior efficiency between soccer players from different age levels.

Results suggest that the players from the U-11 age level are less efficient when performing tactical actions in comparison to the players from the U-13 and U-17 age levels, which might be explained by the fact they are undergoing an initial stage of understanding the logic behind the soccer game<sup>16</sup>. These findings corroborate the study by Teoldo et al.<sup>10</sup>, which compared the tactical behavior efficiency between players from the U-11 to the U-20 age levels. In this study the authors found that the younger players are less efficient than their older counterparts, since, as the player progresses throughout the development process he will learn through the constraints, the training sessions and the competitive demands.

It is also possible to infer that these younger players might display limitations in space management and performance of the core tactical principles, taking into account that these principles involve abstract thinking and testing hypotheses for better positioning and movement of the players across the playing space<sup>22-23,16</sup>. Considering that players from this age level have not yet reached their full cognitive development, training sessions focusing on the improvement of the core tactical principles should begin at the age of 12/13, a period in which the players's cognitive development is probably at its peak or close to it<sup>22,24,23</sup>.

In the U-13 age level, players display an increase in the tactical behavior efficiency, in comparison to the U-11 age level, a fact that could be anticipated and that was corroborated by studies such as that by Teoldo et al.<sup>12</sup> and Vaeyens et al.<sup>25</sup>. The authors indicate that players from this age level display superior tactical knowledge about the game and attempt to position themselves behind the ball line when their teams are attacking, thus enabling passing actions. Therefore, they decrease the difficulty of performing the core tactical principles and display better results for the tactical behavior efficiency.

On the other hand, in the U-15 age level, results indicate a decrease in the tactical behavior efficiency. These findings suggest the need for special attention with this age level, as besides the body changes that occur due to the peak height velocity that may interfere in technical movements and motor skills<sup>26</sup>, there is also a modification of the social environment. In this period young boys begin to develop an interest in other 'social attractions', thus experiencing a marked drop in focus, what apparently influences the sporting aspect<sup>27</sup>. Besides this, Greco and Benda<sup>17</sup>, and Barth<sup>28</sup>, indicate that, at this age, there is a need for adapting, since, as the players are starting the direction phase, a stage in which the number of competitions is increased, and so is the pressure on the players. Thus, it is necessary that coaches and practitioners within this field pay special attention to players from this age level.

Lastly, results of the U-17 age level indicate that these players were more efficient when compared to their U-11 and U-15 counterparts. One of the factors that may have influenced this result regards the fact that the players are already adapted to the training and introduced to the specialization phase, having already consolidated the tactical knowledge about the game<sup>17</sup>. In the studies by Giacomini et al.<sup>29-30</sup>, it was evidenced that players from the U-17 age level display superior procedural and declarative tactical knowledge in comparison to the players from younger levels. Furthermore, Machado et al.<sup>13</sup> report that players from this age level improve their performance by more efficiently executing the principles of 'Width and Length' and 'Penetration'. These principles demand greater knowledge about the playing space and superior technical skills, and consequently a better cognitive structure in order to make appropriate decisions.

Besides this, it is likely that players from the U-17 age level had more amount of specific sport practice at their disposal, thus displaying greater knowledge about the organization of the playing space<sup>31-32</sup>. Hence, players from this age level are better capable of

understanding the tactical principles of play, even though the difficulty imposed by the opponents has increased. This enables them to make better decisions and, consequently, to increase their tactical behavior efficiency in the game<sup>33-34</sup>.

Future research may extend these results, by comparing other age groups and competitive levels, with the purpose of examining whether the tactical behavior efficiency is similar or different, when it comes to other groups of players. Besides that, we suggest a longitudinal research in order to follow-up the development of a given group of players since the beginning of their development process up to the senior team, with the purpose of analysing the progress throughout the entire development process.

## **Conclusion**

Based on these results, it is possible to conclude that there are differences in the tactical behavior efficiency between youth academy players. We observed that there was an overall evolution from the younger to the older age levels. The exception were the players from the U-15 age level, who displayed results that show a decrease in the tactical behavior efficiency.

According to these findings, it is advisable that the coaching staff gradually introduce the teaching of the core tactical principles of play for the U-11 age level, through less complex drills. These drills may focus on tactical principles that occur within the center of play, such as penetration and offensive coverage, in the offensive phase, and delay and defensive coverage, in the defensive phase, as they are less complex. In the U-13 age level it is already possible to deepen the teaching of the core tactical principles, as players already display an abstract thinking of the soccer game. Therefore, drills that exercise the tactical principles performed close to the center of play, such as width and length, in the offensive phase, and concentration and defensive balance, in the defensive phase, are highly recommended.

For players from the U-15 age level, a gradual progression with respect to the complexity of training, patience when facing a potential decrease in performance due to the accentuated body changes during this age, and also attention to the social issues that usually occur in this age are suggested. Besides this, the tactical principles performed further from the center of play may be exercised with greater emphasis on this age level: depth mobility and offensive unity, in the offensive phase, and defensive unity, in the defensive phase. Moreover, in the U-17 age level, it is important to train with more emphasis on the principles that will significantly improve players' performance, such as creating spaces in the offensive phase, reducing the effective play-space in the defensive phase and improving technical skills to achieve better performance in the tactical principles through contact with the ball. Another specificity of this level is the possibility of practicing different core tactical principles, according to the players' positional roles, since these players are already undergoing a final sport development stage. Thus, it will be possible to develop more intelligent players, who are capable of making the best decision when facing the difficulties of the game during the entire development process.

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