



## DIFFERENCE IN DECLARATIVE TACTICAL KNOWLEDGE BETWEEN U-11 AND U-15 SOCCER PLAYERS

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### ABSTRACT

**Purpose.** The aim of this study was to compare the level of declarative tactical knowledge between U-11 and U-15 academy players.

**Methods.** The sample comprised 36 U-11 ( $n = 18$ ) and U-15 ( $n = 18$ ) soccer players, with practice time of  $1404.00 \pm 469.52$  hours and  $2663.55 \pm 594.91$  hours, respectively. The players' practice time was collected through a recording questionnaire. Declarative tactical knowledge was assessed through a verbal report used during a video simulation test. The answers provided during the test were scored as follows: best solution (1 point); second best solution (0.75 points); third best solution (0.50 points); fourth best solution (0.25 points); wrong solution (0 points). For statistical analysis, descriptive analysis was performed, as well as the Shapiro-Wilk and Mann-Whitney tests, with significance level set at  $p < 0.05$ . For statistical purposes, the SPSS 22.0 software was applied.

**Results.** Significant differences were observed in declarative tactical knowledge between the U-11 and U-15 age groups. Players of the older age group displayed longer practice time and higher scores than their younger counterparts.

**Conclusions.** Players with longer practice time (U-15) possess greater declarative tactical knowledge than those with less practice time (U-11), and declarative tactical knowledge is a factor that differentiates soccer players aged 11 and 15 years.

**Key words:** association football, practice time, youth levels

### INTRODUCTION

During a soccer game, rapid changes occur where players must acknowledge, interpret, and process much information simultaneously (e.g., ball position, teammates, and opponents) before deciding appropriately on the basis of the transient objective (strategic and tactical) in an interrelation with other factors (e.g., technical ability, physical ability) [1]. Those decisions are frequently performed under pressure, with opponents trying to restrain the 'time' and 'space' of execution [1]. Therefore, one of the essential conditions for soccer players to compete at a high level is to possess fairly high tactical knowledge [2, 3].

Studies have shown that players with higher tactical knowledge in sport show higher performance [4, 5]. A higher tactical knowledge facilitates access to information contained in the work memory, thus aiding in the accomplishment of tasks [6, 7]. Previous studies [8, 9] propose two types of tactical knowledge: procedural and declarative. In sport, procedural tactical knowledge is related to perceptive-cognitive-motor skills and refers to an appropriate action in a game, in the context of know-how. Declarative tactical knowledge is related to tasks, mnemonic structures of the tasks, considering the knowledge about the rules and objectives of a game, and refers to knowing what to do [10].

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Literature advocates that with the increase of declarative tactical knowledge, the development of the procedural tactical knowledge will be facilitated [2, 8]. The increase of knowledge helps players better understand the game, its rules, roles of different positions, defensive and offensive strategies, and the competence to properly apply the tactical principles of the game [11–13]. These increments of declarative tactical knowledge prove to be relevant mainly in the first years, a period in which acquired knowledge has a fundamental role in the players' decision-making skills [14, 15] and can be developed faster than procedural tactical knowledge [16, 17].

One way to increase the level of declarative tactical knowledge is to experience specific training of the given sport [18]. In a study by Moreira's et al. [19], declarative tactical knowledge of U-14 and U-15 academy players were compared. The results show that even though they belong to the same academy category, U-15 players presented a higher declarative tactical knowledge compared with U-14 players. The authors suggested that the main reason for these results longer practice. Costa and Reyes [20] compared declarative tactical knowledge among U-15, U-17, and U-20 academy players, failing to find a difference of knowledge among them. Thus they proposed that in the early years of development there is a substantial gain of declarative knowledge and an attenuation of tactical knowledge in more advanced academy soccer players.

Beyond practice time, the characteristics of player development phase influence the quantity of acquired knowledge [21]. In soccer, players begin the development process at the age of 11, when they need concrete tasks to facilitate the understanding of the game, being ready to learn the general and operational principles [21, 22]. The cognitive development of these players is not yet sufficient for understanding the dynamics of cooperation and opposition in invasion team sports like soccer [13]. From 12/13 years of age and beyond, players are capable of abstract thinking; they become ready to comprehend core principles of the game when a child's cognitive development stage is mature or in the final maturing phase [21].

Therefore, it becomes pertinent to verify if players in the beginning of soccer development process present a difference of declarative tactical knowledge in comparison with those who are more advanced. Therefore, this study aims to compare the level of declarative tactical knowledge among U-11 and U-15 academy soccer players.

## MATERIAL AND METHODS

### Sample

The sample comprised 36 soccer players, grouped equally within the U-11 ( $n = 18$ ) and U-15 ( $n = 18$ ) teams of a Brazilian championship first division club. The average age of the players was  $10.22 \pm 0.43$  years in the U-11 team and  $15.33 \pm 0.49$  years in the U-15 team. The data referring to the players' time practice are presented in Table 1.

The sample was chosen with the consideration of the clubs systematized practices in all categories, the U-11 team having three training sessions a week, and the U-15 team – five training sessions a week. Each training session lasted approximately 1 hour and 30 minutes. As an inclusion criterion, the players had to participate in state and national tournaments.

Regarding the practice time, Table 1 presents the means and standard deviations of this variable between the U-11 and U-15 teams.

All research procedures were conducted in agreement with the ethical guidelines established by the resolution of the National Health Council (466/2012) and by the Declaration of Helsinki (2013) treaty for research performed among human beings. The participants signed the term of free ascent and enlightenment, the parents and/or guardians signed the consent term informing that they were aware of the participation in the research. The number of the ethics committee document of approval is 412.816.

Table 1. Means and standard deviations of practice times in the studied groups

	U-11 (mean $\pm$ SD)	U-15 (mean $\pm$ SD)	<i>t</i>	<i>p</i>	<i>r</i>
Practice time (hours)*	1404.00 $\pm$ 469.52	2663.55 $\pm$ 594.91	-7.051	< 0.001	-0.76

\* significant difference between the groups  
Significance level set at  $p < 0.05$ .

### Instruments of data collection

The instrument used to evaluate the players' declarative tactical knowledge was a video simulation test validated by Mangas [23]. A Union of European Football Associations (UEFA) expert panel validated the test; all experts were managers or researchers. Each expert examined the total of 31 scenes independently. At the end of expertise, 13 video scenes were used to compose the test; they were unanimous choices of the experts. The 13 scenes were submitted to a new expert group composed of football coaches and teachers of a university football office; 11 video scenes were approved unanimously by all the six experts. Protocol adaptations that consisted in not presenting the answer options ensured that the evaluators were not influenced in their decision making. They had to decide on the basis of their own perception and knowledge of problem situations presented.

The selected video sequences lasted 5–13 seconds. Just before the scene was finished, the video was occluded and the evaluator was to answer as fast as possible what the player with the ball possession 'should do'.

The verbal reply was recorded with a voice recorder. The verbal reply protocol followed the recommendations by Ericsson and Simon [24]. The verbalization was transcribed and segmented with the use of natural talk and other syntactic markers.

### Data collection procedures

In the process of evaluating their declarative tactical knowledge, the participants were placed in a closed space, without external interference. The images were presented to them by projection, on a retractable projection screen (TES – TRM 150V, matte white), with the dimensions of  $3.04 \times 2.28$  m. The video scenes were projected with the use of an HD projector (Epson Powerlite X14) linked to the ceiling, with XGA of  $2.0 \times 2.0$  m resolution. The participants were positioned 2.5 m from the screen and standing.

The verbal answers were recorded in an MP4 file. After recording, the obtained audio material was transcribed to a digital format, a Word® document, on a laptop computer (POSITIVO T 3300 model, Intel® Core™ i3 processor). Before the test beginning, the participants were trained how to think out loud and provide a retrospective verbal report. The implemented training and instruction protocol was developed by Ericsson and Kirk [25] and was an adaptation of the original Ericsson and Simon [24] protocol.

The training session included instruction and practice of thinking aloud and giving an immediate retrospective verbal report through the resolution of a series of generic tasks of a specific domain. The transcribed data were analysed and compared with the official expert panel of the test. The obtained data concerning declarative tactical knowledge referred to the percentage of correct choices of the best answer provided by the expert panel. Before the beginning of the experimental task, test procedures were properly explained. Each test application procedure lasted approximately 30 minutes.

With the aim to establish scores for the presented solutions, the answers were divided as follows: best solution (1 point); second best solution (0.75 points); third best solution (0.50 points); fourth best solution (0.25 points); wrong solution (0 points).

### Statistical analysis

The independent variable of the study was group age. The dependent variable was the declarative tactical knowledge.

To compare the declarative tactical knowledge among the U-11 and U-15 teams, descriptive statistics were used to obtain the average and standard deviation of the data. To verify data distribution normality, Shapiro-Wilk test was applied, pointing out that the data did not have a nonparametric distribution. The mean differences of scores between age groups were compared with Mann-Whitney test. For this analysis, the effect size was presented through the value of  $r$ , with the interval of under 0.29 for small effect, 0.30–0.49 for medium effect, and over 0.50 for large effect [26].

Reliability was calculated with Cohen's kappa test. A 3-week interval was respected before reanalysis in order to avoid task familiarity. Retest results displayed values of intra-observer reliability of 83%. For inter-observer reliability, the results revealed values between 84% and 98%. These values are classified by literature as 'almost perfect' [27].

For all analyses, the significance level of  $p < 0.05$  was assumed and the SPSS 20.0 software was used.

### Ethical approval

The research related to human use has been complied with all the relevant national regulations, institutional policies and in accordance the tenets of the Helsinki Declaration, and has been approved by the authors' institutional review board or equivalent committee.

Table 2. Means and standard deviations of the overall declarative tactical knowledge test scores in the studied groups

Answers	U-11 (mean $\pm$ SD)	U-15 (mean $\pm$ SD)	<i>P</i>
Best answer*	5.39 $\pm$ 0.27	6.89 $\pm$ 0.27	< 0.001
Second best answer	2.00 $\pm$ 0.18	1.78 $\pm$ 0.24	0.384
Third best answer	1.56 $\pm$ 0.25	0.94 $\pm$ 0.15	0.060
Fourth best answer*	1.33 $\pm$ 0.16	0.67 $\pm$ 0.11	0.003
Wrong answer	0.72 $\pm$ 0.18	0.72 $\pm$ 0.16	0.931

\* significant difference between the groups  
Significance level set at  $p < 0.05$ .

## RESULTS

Table 2 presents the means and standard deviations of declarative tactical knowledge in the U-11 and U-15 teams.

In Mann-Whitney test, significant statistical differences were found amongst the categories in the best answer ( $U_{(35)} = 55.500$ ;  $p < 0.001$ ;  $r = -0.94$ ) and fourth best answer ( $U_{(35)} = 78.000$ ;  $p = 0.003$ ;  $r = 0.92$ ). In the correct answers (score 1), where the players identified the best solution to the scene, the U-15 (6.89  $\pm$  0.27) participants had a higher score than the U-11 (5.39  $\pm$  0.27) players. In the fourth best solution to the scene (0.25 score), the U-11 (1.33  $\pm$  0.16) players had higher scores than the U-15 (0.67  $\pm$  0.11) ones.

In the second best solution (0.75 score), third best solution (0.50 score), and wrong solution (score 0), there was no significant difference between the two categories.

## DISCUSSION

The study aimed to compare the level of declarative tactical knowledge amongst U-11 and U-15 soccer players. The results indicate that the U-15 players had a higher declarative tactical knowledge than the U-11 participants.

These outcomes could be related to the characteristics of the players' development phase, since U-11 players are at the beginning of their development and remain unable to comprehend the complexity of the game. In this phase, younger players must be stimulated by simpler tasks with lower complexity level and through concrete tasks that promote fewer alternatives of decision making. This enables better game understanding, favouring learning progression in the

teaching and practice process in the participants [21, 22]. In turn, U-15 players are in the mature stage of their cognitive development or in the final stages of maturing, and thus are able to have abstract thoughts and to test hypotheses to make decisions, even with various alternatives [21].

One aspect of improving players' declarative knowledge is experience in practicing soccer. Such experience allows the acquisition and retention of players' declarative knowledge, where knowing facilitates doing and doing facilitates knowing [2]. Studies show that athletes in U-15 teams display differences in declarative tactical knowledge, which is in accordance with the findings of the present study. These differences were found among basketball players from U-10 and U-12 youth teams [10], among soccer players when comparing players aged 8–12 years [28], among soccer players from U-14 and U-16 youth teams [19], and among U-14 soccer teams as compared with those from U-15 and U-17 youth teams [29]. As for athletes from U-15 youth teams on, studies show that there is no difference between the U-15 and U-17 players' declarative tactical knowledge [29] or among U-15, U-17, and U-20 squads [20].

Alongside these findings, it is noticed that declarative knowledge can be a factor capable of distinguishing players of younger ages [10, 30]. At more advanced ages, it is ideal that this type of knowledge is comprehended because the quantity of declarative knowledge is a facilitator to the learning process and development of the procedural tactical knowledge [2]. This fact is important as players from U-15 youth teams onwards are capable to comprehend the core tactical game principles and this is the ideal age to participate in systematized training [21]. In this way, the importance to increase declarative tactical knowledge in the initial years is emphasized because it contributes to the development of young players' abilities [31], which will possibly be a factor that influences future sports success.

Therefore, greater practice time in the sport along with the cognitive development of the players supports their increased game understanding, knowing 'what to do' in the different situations that arise during the game. This allows the coaching staff to comprehend the differences of players' game understanding in the various youth teams, seeking to elaborate practices that fit the players' age. Furthermore, it is suggested that coaches adjust the training by progressing the level of complexity according to the abilities detected in the group of team players. In addition, with U-15 teams, it is possible to design practices with a higher

level of difficulty and with more alternatives to stimulate the players' development according to the open conditions of the soccer environment.

A limitation of the study was that only offensive situations were evaluated, players with ball possession were analysed, and the participants' procedural tactical knowledge was not assessed. It is suggested that future studies include longitudinal monitoring of the declarative and procedural tactical knowledge throughout the player's development phases, as well as evaluate players with and without ball possession, in the offensive and defensive phases of the game. Thus, it will be possible to verify the evolution of players' knowledge through years and to examine if players with better comprehension are more efficient and present a better performance when executing game actions.

## CONCLUSIONS

It is concluded that players from older age groups display greater declarative tactical knowledge in comparison with their younger counterparts. This may be associated with the longer practice time of the older players. This information indicates that declarative tactical knowledge is a factor that differentiates between soccer players aged 11 and 15 years and may be used as a parameter to qualify the soccer teaching process at such ages.

## Disclosure statement

Disclosure statement: No author has any financial interest or received any financial benefit from this research.

## Conflict of interest

Authors state no conflict of interest.

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