



Decision Making in Soccer: Interactions with Physical and Technical Performance

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¹Department of Physical Education, State University of Maringá, Maringá, Brazil, ²Student of Associate Post-graduate Program in Physical Education UEM/UEL, Maringá and Londrina, Brazil, ³School of Physical Education, Physiotherapy and Occupational Therapy, Federal University of Minas Gerais, Belo Horizonte, Brazil

ABSTRACT

Rechenchosky L, Menegassi V, Borges P, Praça G, Greco P, Oliveira A, Kravchychyn C, Costa L, Rinaldi W. Decision Making in Soccer: Interactions with Physical and Technical Performances. **JEPonline** 2017;20(3):122-129. The purpose of this study was to analyze the relationship between declarative tactical knowledge, physical fitness, and technical tasks in young soccer players. Sixty-eight regional soccer players (12.83 ± 2.43 yrs) participated in the study. To assess the decision making, physical fitness, and technical performance the declarative tactical knowledge, Yo-Yo Intermittent Recovery Test 1, Counter Movement Jump, Speed 30 m, Shuttle Run with the ball, and General Soccer Ability Skill Test Battery were used. Non Hierarchical K-Means Cluster Analysis was realized to create three groups related to level of tactical knowledge. The Chi-Squared Test and the Pearson Correlation Coefficient were performed to identify the relationship between variables ($P < 0.05$). Results showed significant associations between age groups and clusters ($\chi^2 = 23.85$; $P < 0.001$) and moderate correlations between declarative tactical knowledge and age ($r = 0.41$), YYIRT1 ($r = 0.45$), speed ($r = 0.42$), agility ($r = -0.56$), dribbling ($r = -0.59$), and shooting ($r = 0.40$). The main findings indicate that physical and technical performances are related to declarative tactical knowledge and tactical knowledge increases according to age.

Key Words: Declarative Tactical Knowledge, Physical Fitness, Soccer, Technical Skills

INTRODUCTION

According to Bouchard et al. (3), individuals are not born equal and certain individualities may favor some people to succeed in certain sports to the detriment of others. However, other studies have shown that in order to achieve expertise in an activity, individuals need to practice a considerable number of hours in an effort to improve the movements and techniques related to the modality until they become specialists (7,13).

While it is not possible to refute any of the above assumptions, Williams and Hodges (26) argue that hereditary factors are crucial in explaining individuals' responses to training. However, skills are highly trainable and modifiable throughout the training process. This learning occurs, among other factors, due to the neuromuscular plasticity and adaptability of the cells of the different tissues and organs that compose the human body (9,19). Therefore, providing quality training and monitoring the development of individual player performance, such as technical, cognitive and perceptual skills, and physical and psychological attributes are decisive for player's success.

Regarding the importance of cognition for the manifestation of sports talent, studies by Ward and Williams (24) and Williams and Davids (25) report that variables such as visual search strategy, central and peripheral visual perception, attention, and anticipation of time and movement are decisive to support decision making during a game. The information processing to perform the tactical actions is directly related to these cognitive components, which in turn are linked to central nervous system maturation and player learning (23).

Investigation into the interaction between tactical, technical, physical, and psychological dimensions to determine sport success is required by new investigations whose central focus is the relationship between these variables. Information on this theme will allow elucidation of whether the practitioners with greater specific tactical knowledge of the modality are those that have higher indices of physical and technical performance. Thus, the aim of this study is to analyze the relationship between declarative tactical knowledge, physical fitness, and technical skills in young soccer players.

METHODS

Subjects

In total, 140 young soccer players participating in an extension project at the State University of Maringá were pre-selected to participate in this study. The following inclusion criteria were adopted: (a) being enrolled in the project; and (b) presenting the Consent Form signed by parents or guardians allowing participation in this study. The exclusion criteria were: (a) not attending the previously scheduled evaluations; (b) the presence of musculoskeletal lesions; (c) attending training less than 2 times·wk⁻¹. The final sample consisted of 68 soccer players (12.83 ± 2.43 yrs). The study was approved by the local Institutional Review Board (Opinion: 653.698)

Procedures

Decision making in soccer was assessed through the Declarative Tactical Knowledge (DTK) proposed by Mangas (18). The protocol consists of 11 offensive scenes, presented in video format, that are paused at a fundamental moment of decision making. Four possible solutions

are then presented and the player being evaluated is required to select the best solution for each situation. For each best answer, 1 point is awarded, but the total values are transformed into a scale of up to 10 points. Tests of aerobic power, strength of lower limbs, speed and agility were performed to quantify physical fitness of the young players. The Yo-Yo Intermittent Recovery Test level 1 (16), Counter Movement Jump (2), Speed 30 m (8), and Shuttle Run with the ball (5) tests were executed. To evaluate technical skills (dribbling, passing, and shooting), the General Soccer Ability Skill Test Battery (21) was used.

Statistical Analyses

Normality of data was tested using the Kolmogorov-Smirnov test and graphic analysis through skewness and kurtosis. Three different clusters were created in function of declarative tactical knowledge: High DTK (n = 25), Moderate DTK (n = 30), and Low DTK (n = 13), using a multivariate statistical method called Non Hierarchical K-Means Cluster Analysis. To analyze the associations between the level of DTK and age groups, the Chi-Squared test was used. The relationship between tactical, physical, and technical variables was evaluated through the Pearson Correlation Coefficient. Data were processed using SPSS 20.0. The level of significance was set at 5%.

RESULTS

Table 1 shows the descriptive characteristics of young soccer players divided by level of tactical knowledge. In general, players with low DTK also presented a low level of physical fitness and were younger than the other groups.

Table 1. Descriptive Data of the Subjects.

	Low DTK (n = 13)	Moderate DTK (n = 30)	High DTK (n = 25)
	Mean ± SD	Mean ± SD	Mean ± SD
Age (yrs)	10.63 ± 2.36	13.20 ± 2.47	13.54 ± 1.75
DTK (score)	6.56 ± 0.56	8.13 ± 0.26	8.96 ± 0.34
YYIRT1 (m)	283.07 ± 176.22	524.00 ± 292.87	604.18 ± 255.94
CMJ (cm)	20.44 ± 4.36	22.02 ± 5.81	22.48 ± 6.14
Speed 30 m (m·sec ⁻¹)	5.60 ± 0.89	6.31 ± 0.77	6.44 ± 0.60
Agility (sec)	13.74 ± 2.87	11.62 ± 1.13	11.18 ± 1.13
Dribbling (sec)	24.59 ± 8.85	18.61 ± 3.67	16.49 ± 1.86
Passing (score)	2.92 ± 2.25	4.26 ± 1.81	4.00 ± 1.75
Shooting (score)	30.61 ± 23.89	45.73 ± 22.71	60.32 ± 20.82

DTK = Declarative Tactical Knowledge; YYIRT1 = Yo-Yo Intermittent Recovery Test Level 1;
CMJ = Counter Movement Jump

In Table 2, significant associations were observed between age groups and clusters ($\chi^2 = 23.85$), which indicate a prevalence of under-11 players in the low tactical knowledge grouping.

Table 2. Association Between the Level of Tactical Knowledge and Age Groups.

	Low DTK % (f)	Moderate DTK % (f)	High DTK % (f)	P
Under-11 (n = 22)	50.0 (11)	31.8 (7)	18.2 (4)	<0.001
Under-13 (n = 14)	7.1 (1)	57.1 (8)	35.7 (5)	
Under-15 (n = 21)	0.0 (0)	42.9 (9)	57.1 (12)	
Under-17 (n = 11)	9.1 (1)	54.5 (6)	35.4 (4)	

DTK = Declarative Tactical Knowledge. Data are expressed as percentage (%) and absolute frequency (f).

Regarding the relationship between DTK and physical and technical variables (Figure 1), significant correlations were identified between DTK and age ($r = 0.41$), YYIRT1 ($r = 0.45$), speed ($r = 0.42$), agility ($r = -0.56$), dribbling ($r = -0.59$), and shooting ($r = 0.40$).

DISCUSSION

The aim of the study was to analyze the relationship between declarative tactical knowledge, physical fitness, and technical skills in young soccer players. As soccer is characterized as a multidimensional sporting phenomenon, sports success is not only related to physical variables, since there is no guarantee that these advantages will be maintained after the end of adolescence (20). In this context, tactical intelligence, supported by specific knowledge, positioning, deciding skills (14), and team organization plays an important role in player performance.

In relation to the tactical dimension, younger players presented lower values of DTK, which reaffirms the correlation found between age and DTK (Figure 1). Vanttinen et al. (23) reported that important perceptual and motor characteristics for the enhancement of sports talent increase over the years, especially between 12 and 14 yrs of age, and this process is related to the concentration of blood testosterone (maturational indicator used). Possibly, the low number of experiences and limited exposure to systematized competitions, as well as the process of neural maturation, are factors that contribute to the presentation of lower values of DTK in younger players. Giacomini et al. (11) found significant improvement in declarative and procedural knowledge with increasing chronological age, or consequently in an individual's experience in the modality, highlighting the importance of the teaching-learning-training process in improving knowledge and transferring it to practice.

With regard to physical and technical attributes, the advance in DTK is related to aerobic power, speed, agility, and better scores in dribbling and shooting. As DTK increases according to age, it is natural that this variable also presents a relation with physical and technical tasks, since physical performance increases over the years during adolescence (17) and the battery used to assess technical skills is influenced by YYIRT1, CMJ, and speed (1).

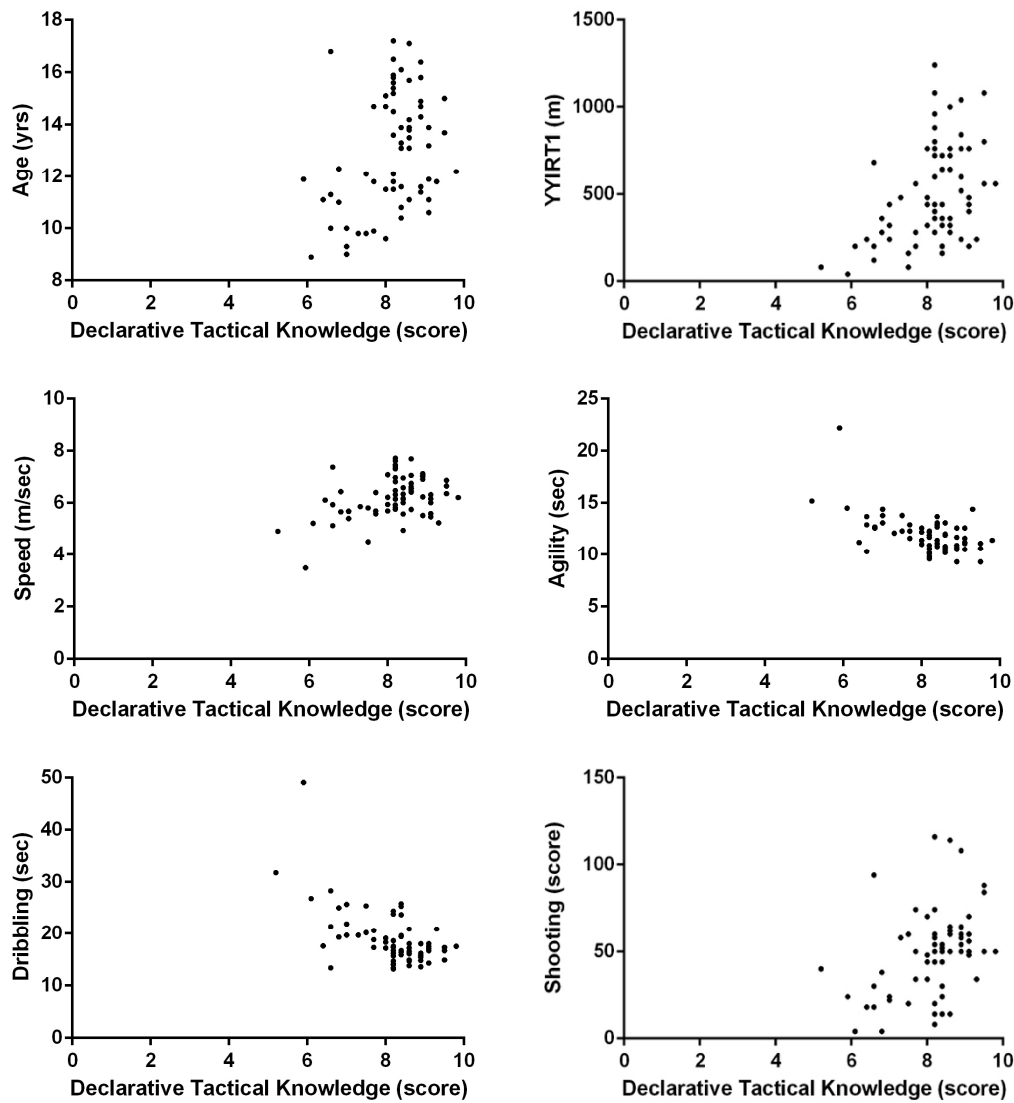


Figure 1. Correlations between Declarative Tactical Knowledge, Physical Fitness, and Technical Skills.

As practical applications of the present study, it is suggested that teaching-learning-training methodologies are adopted with central proposals related to intentionalized movements of collective sports modalities, such as Teaching Games for Understanding (4), Ball School (15), the SMART-ER model (22), and the Universal Sports Initiation (12), among other models. Filgueira and Greco (10) argue that training situations in game formats allow the development of all the aforementioned capacities. In addition, decision-making should be recognized as a guiding objective of the proposed activities, which are directed to the overall development of the three pillars of training (technical-tactical-physical).

Limitations of this Study

We should highlight, as possible limitations of the study, the protocol used and the regionalized characteristic of the sample. The first uses scenes that occurred only at the

moment of offensive organization, which makes the evaluation of specific knowledge of organization in defensive situations and its transitions difficult. The second limitation may hinder the generalization of the results to other samples, since regional athletes tend to underestimate the values of high-level players (6). However, the results emphasize the need to teach soccer players to make decisions in contextualized situations of play starting from the youngest ages, since the sub-11 category presented lower levels of tactical knowledge.

CONCLUSIONS

The main findings of the study indicate that younger players presented lower values of declarative tactical knowledge compared to older players. Moderate and significant correlations were also observed between physical and technical indicators and the score reached in the DTK. Thus, declarative tactical knowledge is related mainly with age and tends to increase during adolescence following the development of body systems and technical and physical aspects.

ACKNOWLEDGMENTS

The authors would like to express thanks to the Coordination of Improvement of People of Higher Education (CAPES) for the master degree scholarship conceded to Vanessa Menegassi.

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