

Tactical knowledge of handball players considering time of practice and position in the competition

O conhecimento tático de jogadores de handebol considerando o tempo de prática e a classificação obtida na competição

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Abstract – This study aims to identify the level of declarative tactical knowledge (DTK) of handball players considering the classification obtained in the competition, the time of practice and the participation of athletes in national competitions for both genders. Furthermore, the relationship between subjacent cognitive processes and tactical knowledge was verified. The sample was composed of 119 handball players, 83 men (21.37±516) and 36 women (18.25±4.44) who participated in a competition. The Test of Declarative Tactical Knowledge in Handball was applied, which evaluates the DTK level of players in order to assess perception and decision-making. The DTK-objective level of finalist teams was higher for both sexes ($p=0.011$ and $p=0.015$, respectively), when compared with teams that have not passed the group phase. In both sexes, no statistically significant differences were found for the DTK-objective and DTK-exploratory in relation to the time of practice. The DTK level was higher in athletes who took part in national competitions for male gender ($p=0,017$). Positive moderate correlation between decision-making and DTK-objective ($r=0.595$) was found, which was strong between perception and DTK-objective ($r=0,890$), strong between decision-making and DTK-exploratory ($r=0.858$), and moderate between perception and DTK-exploratory ($r=0.561$). Based on the results found, it could be concluded that the classification obtained in the competition and the participation in national competitions are factors that interfered in the tactical knowledge level of handball players.

Key words: Sport; Perception; Decision Making.

Resumo – O estudo teve como objetivo identificar o nível de conhecimento tático declarativo (CTD) de jogadores de handebol considerando, a classificação obtida na competição, o tempo de prática na modalidade e a participação dos atletas em competições nacionais para ambos os sexos. Além disso, verificou-se a correlação entre os processos cognitivos subjacentes ao conhecimento tático. A amostra foi composta por 119 jogadores de handebol que participaram de uma competição, sendo 83 homens (21,37±5,16) e 36 mulheres (18,25±4,44). Aplicou-se o Teste de Conhecimento Tático Declarativo em Handebol que avalia o nível de CTD dos jogadores aferindo a percepção e a tomada de decisão. O nível de CTD-objetivo das equipes finalistas da competição foi superior para ambos os sexos ($p=0,011$ e $p=0,015$, respectivamente) quando comparados às equipes que não passaram da fase de grupos. Em ambos os sexos não se encontraram diferenças estatisticamente significativas para o CTD-objetivo e CTD-exploratório em relação ao tempo de prática. O nível de CTD foi superior para atletas com participação em competições nacionais no sexo masculino ($p=0,017$) comparado a atletas que nunca disputaram este nível de competição. Encontrou-se correlação moderada entre a tomada de decisão e o CTD-objetivo ($r=0,595$), forte entre a percepção e CTD-objetivo ($r=0,890$), forte entre a tomada de decisão e o CTD-exploratório ($r=0,858$) e moderada entre a percepção e CTD-exploratório ($r=0,561$). Com os resultados encontrados concluiu-se que a classificação obtida na competição e a participação em competições nacionais são fatores que interferiram no nível de conhecimento tático dos jogadores de handebol.

Palavras-chave: Esporte; Percepção; Tomada de decisão.

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INTRODUCTION

The teaching-learning-training process of handball players must be geared towards quick solutions to problems found in the game situation, aiming at flexible tactical behavior and various technical and motor solutions¹. The periodic evaluation of cognitive processes underlying the tactical knowledge brings to light the organization of training to be applied for athletes, keeping in mind that there are models² that include participation in competitions as a phase of this process.

Experience in time of practice, effective training that involves the acquisition of motor skills and the level of competitive experience are factors that may interfere in the level of tactical knowledge of athletes³. Results of empirical studies regarding these factors are found in tennis³, with 111 juvenile athletes with mean practice time over seven years, pointing out that the number of state level competitions (above 11) interferes in the level of declarative tactical knowledge (DTK).

In indoor soccer, the findings are contradictory. When measuring the DTK level of 12 male athletes from the University of Ceará, it was found that long time of practice in the modality is directly related to higher score in the DTK test⁴, whereas in another study, no significant results were found for this variable, using 59 players from six women's teams participating in a championship⁵. In soccer, the findings show that the time of practice from 4.5 years leads to better DTK score of 48 athletes from two U-17 category teams⁶. Also in soccer, the DTK level was higher for U-15 categories when compared to the U-14⁷ category and, in relation to age, 20-year-old athletes were superior to those of lower ages⁸.

In handball, the DTK level of 14 adult female athletes was measured before and after an intervention of 12 training sessions through situational (507.81 minutes), analytical (172.2 minutes) and practice of formal game (16.06 minutes) methods. No association was found between the teaching methods applied and the level of athletes' DTK, which remained at the two testing moments in the classification of "potential evolution", ranging from weak, evolving, average, above average and excellent⁹. In another study, the average DTK level of 40 female handball athletes aged 12-17 years, belonging to the youth, cadet and juvenile categories, was 42.18 points, equivalent to 49.6% of accuracy in the test score. These athletes had an average of 2.5 years of practice time¹⁰. The authors suggest the differentiation of the occlusion time of scenes that compose the instrument as a form of adaptation differentiated by categories, believing that thus the final score of the test can produce differentiated scores.

Among studies that sought to correlate the DTK level with other variables, the DTK level of 39 soccer players in different categories (U-14, U-15, U-17 and U-20) was investigated and it was found that increasing age implies higher scores in the test¹¹. In volleyball, the DTK of 35 male youth athletes participating in the Youth Championship was verified, and the team with the best DTK (61.84%) was the second placed in the com-

petition, showing that DTK does not linearly determine the performance of volleyball teams¹². Also in volleyball, the DTK level of 53 male athletes of the juvenile category - special division participants of the Brazilian Championship of Selections was evaluated, revealing that the team with the best DTK was the second placed in the competition, with mean of 69% of hit in the test, and the champion team was in fourth place regarding the DTK level, with mean of 66.5%, showing that DTK correlates with other sports performance variables¹³.

Studies that used DTK as dependent variable and that analyzed the DTK level considering the results obtained regarding the classification of teams in competitions were performed in volleyball, but not in handball. A factor that draws attention in this study refers to data collection, which was performed during the competition, bringing the level of knowledge of athletes temporarily to the actual condition of momentary performance of athletes.

Therefore, the present study had the aim of identifying the DTK level of handball athletes considering the time of practice, the classification obtained in the competition and participations in national competitions. In addition, the relationship between decision-making and DTK and perception and DTK was verified, since they are cognitive processes underlying declarative tactical knowledge.

METHODOLOGICAL PROCEDURES

Sample

The sample consisted of 119 handball players, 83 men (21.37 ± 5.16) and 36 women (18.25 ± 4.44) participants in a competition held in the State of Minas Gerais and to obtain comparison effect, competitive experience was divided into two groups: 1 to 6 years and 11 months and 7 years on¹⁴. In order to participate in the research, subjects under 18 years of age signed the Term of Assent and their legal representatives, together with subjects older than 18, signed the Free and Informed Consent Form (ICF), containing the objective, procedures and all ethical information of the research. Therefore, a total of 10 male and 4 female teams agreed to participate in the study.

Instruments

Demographic questions related to the identification of athletes regarding the team they belonged, gender, age, time of practice in the modality and participation in national competitions were applied. Subsequently, the Tactical Knowledge Test in Handball¹⁵ was chosen to measure the tactical knowledge of athletes in a game situation by means of decision-making and perception of the relevant signs (justification) according to standardized game situations through slides. The final DTK value is given by the sum of the underlying decision-making processes and the perception of relevant signs (justification) in each scoring situation.

The test consists of two actions: The first contains eight distinct

decision-making animations and has two options of actions such as: “pass or throw?” and “dribble or pass?”, and the participant must choose one of these alternatives and justify it (figure 1), writing in the answer sheet. This part of the test has a more objective feature because this decision-making choice is predetermined, one being correct and the other wrong. In the results, this dependent variable is designated as DTK-objective.

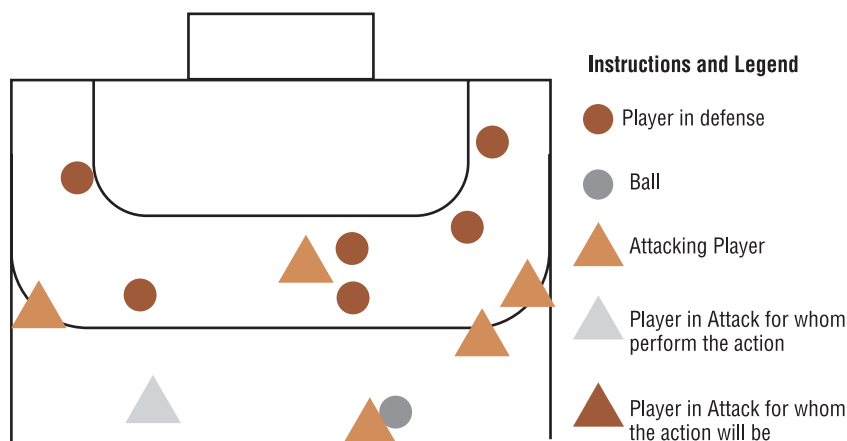


Figure 1. Example of situation of the Tactical Declarative Knowledge Test in Handball

The second section is composed of six different animations in which the player, in possession of the ball, should favor his teammate in finishing the play. However, at this time, there are no alternatives. The participant decides in writing the chosen decision making, justifying it. Each animation takes 15 seconds and 60 seconds are allowed for the written response. This part of the test is characterized as exploratory, since it does not present decision-making options for the participant. In the results, this dependent variable is presented as DTK-exploratory. For each game situation (animation), the participant can score 2 points, 1 point for the correct decision and 1 point for the correct justification. The justification will only be scored if the participant chooses the correct decision. Therefore, for the DTK-objective, the maximum score is 16 points and for the DTK-exploratory, 12 points.

Procedures

The research project was approved by the Ethics Research Committee of the Federal University of Minas Gerais - COEP/UFMG under protocol number - 55603316.4.0000.5149 and data were collected in the “Open Handball Competition” held in the city of Belo Horizonte / MG. The test was applied, with average duration of 30 to 40 minutes, pre-scheduled with coaches in the early morning hours and before the games as soon as the athletes arrived at the gym. A classroom was used so that one team at a time would respond to the test. Participants received a response sheet and a pen to perform the test and the classification obtained by teams in the competition was provided by the referee at the end of the game.

Data treatment

In order to determine the choice of inferential tests to be applied, data were first checked by the Shapiro Wilk test for female teams and Kolmogorov-Smirnov for male teams according to the total number of subjects that composed each group by sex. Therefore, data are presented by means of descriptive statistics (absolute and relative frequency, median and interquartile range) and non-parametric inferential statistics (Kruskal-Wallis test and Mann-Whitney U test) and Spearman's correlation test. The static program used was SPSS version 18.0 and significance was set at $p \leq 0.05$.

RESULTS

Based on demographic data, information about classification obtained in the competition, time of practice in the modality and participation of athletes in national competitions for males (table 1) and females (table 2) is presented below.

In "classification obtained in competition" variable for males, it is understood as finalists only teams that participated in the finals and, in the group phase, teams that lost in the qualifying phase. Thus, teams that advanced to the qualifying phase and lost in the quarterfinals, not reaching the final, were excluded from the analysis, thus maintaining extremes regarding classification in the competition.

Most athletes of both sexes affirmed to have practiced the modality for less than seven years. Regarding male athletes, 54.2% reported never

Table 1. DTK level considering classification, time of practice and participation in competitions for males

		f	%	DTK-O		P	DTK-E		P
				Md	IIQ		Md	IIQ	
Classification in competition	Finalists	16	19.3	11	(9.25-12)	0.011*	3	(2-4)	0.573
	Group phase	29	34.9	9	(7.5-11)		2	(2-4)	
Time of practice	1 to 6 years and 11 months	50	60.2	10	(8-11)	0.220	2.5	(2-4)	0.279
	7 years and over	33	39.8	11	(9-11)		3	(2-4)	
Participation in national competitions	Never participated	45	54.2	10	(8-11)	0.017*	3	(2-3)	0.124
	Participated	38	45.8	11	(9-12)		3	(2-4)	

Legend: DTK-O: objective declarative tactical knowledge; DTK-E: exploratory declarative tactical knowledge; f: relative frequency; Md: median; IIQ: interquartile range; * $p \leq 0.05$.

Table 2. DTK level considering classification, time of practice and participation in competitions for females

		f	%	DTK-O		P	DTK-E		P
				Md	IIQ		Md	IIQ	
Classification in competition	Finalists	19	52.7	11	(10-12)	0.015*	3	(2-4)	0.227
	Group phase	17	47.3	10	(8-10)		2	(1.5-5)	
Time of practice	1 to 6 years and 11 months	19	52.8	10	(9-11)	0.771	3	(2-4)	0.897
	7 years and over	17	47.2	10	(9-11)		3	(1.5-4)	
Participation in national competitions	Never participated	23	63.9	10	(8-11)	0.121	2	(2-4)	0.451
	Participated	13	36.1	11	(10-11)		3	(2-3)	

Legend: DTK-O: objective declarative tactical knowledge; DTK-E: exploratory declarative tactical knowledge; f: relative frequency; Md: median; IIQ: interquartile range; * $p \leq 0.05$.

having participated in national competitions, and for females, this percentage increased to 63.9%.

Statistically significant difference was found for both sexes and finalist teams were superior at DTK-objective level when compared to teams that did not go through the group phase in the competition. At DTK-exploratory level, no significant differences were found between finalists and the group phase.

No statistically significant differences were found for the DTK-objective and DTK-exploratory for both sexes considering the time of practice. However, it is worth mentioning that 85.71% of male athletes of the winning team declared to have practiced the modality for seven years, whereas among athletes of losing teams, 35.53% had similar experience. In the comparison of female winning team athletes, 53.85% have practiced the modality over seven years and for losing teams, 43.48% had the same time of practice.

It was observed that even if there was no statistically significant difference in the DTK level considering the time of practice, winning teams of both sexes presented, descriptively, longer time of practice.

There was a statistically significant difference for the DTK-objective level of male athletes who have participated in national competitions to the detriment of athletes who never participated in these competitions. No statistically significant differences were found for DTK-exploratory. About 100% of winning team athletes reported that they had participated in this level of competition and of these, 85.71% reported they had more than seven years of practice in the sport. In contrast, only 40.79% of athletes of losing teams reported they had participated in national competitions and 48.39% declared having more than seven years of practice in the modality.

Regarding female athletes, there was no statistically significant difference for objective and exploratory DTK considering participation in national competitions. In winning team, 69.23% of athletes participated in national competitions, while only 17.39% of athletes of losing teams declared that they had participated.

Table 3 shows the correlation coefficient values of cognitive processes for different forms of application of declarative, objective and exploratory tactical knowledge test used in the research.

Table 3. Correlation coefficient among cognitive processes

	TD-O	JUST-O	DTK-O	TD-E	JUST-E	DTK-E
TD-O	-	0.211	0.595**	0.066	-0.003	0.072
JUST-O	-	-	0.890**	0.021	0.151	0.074
DTK-O	-	-	-	0.048	0.15	0.109
TD-E	-	-	-	-	0.113	0.858*
JUST-E	-	-	-	-	-	0.561**
DTK-E	-	-	-	-	-	-

Legend: TD-O: objective decision making; JUST-O: objective justification; DTK-O: objective declarative tactical knowledge; TD-E: exploratory decision-making; JUST-E: exploratory justification; DTK-E: exploratory declarative tactical knowledge. * significance level ($p = 0.01$).

There was a moderate correlation between TD-O and DTK-O ($r = 0.595$) and strong correlation between JUST-O and DTK-O ($r = 0.890$). The correlation between TD-E and DTK-E variables was strong ($r = 0.858$) and moderate for JUST-E and DTK-E ($r = 0.561$).

DISCUSSION

Due to the lack of studies that have investigated variables that can interfere in DTK in handball, studies have been conducted in other sports modalities, aiming to discuss issues addressed in this work. Taking into account specific objectives, when verifying the DTK level considering the classification obtained in the competition, athletes of both sexes presented a statistically significant difference for the DTK-O level, a result that corroborates findings in a study in indoor soccer⁵, because the DTK level of winning teams was superior compared to losing teams and a study in volleyball that pointed out that the male team with the best DTK was the second placed in the competition¹², since finalist teams in this research were part of the same grouping. However, the results of this study differ from results of another study in volleyball, which found no statistically significant difference for classification in the competition¹³. In this sense, it is understood that there are many external factors (physical, psychological, among others) that determine the final position of a team in the competition, which does not mean that losing teams have linear relationship with low DTK level.

When considering the time of practice in handball, there was no statistically significant difference for objective or experimental DTK level for both sexes, corroborating the study with indoor soccer athletes with longer time of practice that did not reach the best DTK results⁵. However, in tennis, time of practice interfered in the DTK level of athletes who practiced the modality for more than seven years and who competed at state levels³. Two other studies have shown more accurate DTK with more experienced soccer players when compared to less experienced ones^{4,6}. Considering that the competition was an open championship, not indicating specific criteria for team participation, the heterogeneity of enrolled subjects should be considered, which could interfere in results of the relationship between time of practice and competitive experience. Although the present study did not present interference of the time of practice on the DTK level, it is well known that experience in the modality is fundamental for the development of tactical capacities, since it increases the repertoire of actions in a game situation.

As for participation in tennis competitions, a study showed that coaches classified their tennis players as experienced from the history of performance in national competitions¹⁶. Therefore, it was decided to investigate the DTK level considering the participation in national competitions, a factor not yet investigated in handball. The assessment of the DTK-objective level was statistically superior for athletes participating in national male competitions versus athletes who never participated. The same result was found in the study of tennis in which athletes with participation in

more than 11 competitions had better DTK results compared to the others³. However, in volleyball, it has been reported that athletes of different competitive levels do not present statistical differences in this variable¹⁷.

Correlations between the cognitive processes underlying tactical knowledge found moderate to strong correlations between perception and tactical knowledge and decision making and tactical knowledge, pointing to interdependence of such processes. Aburachid³ correlated the results of the decision-making with justification and not each of these two cognitive processes in a way underlying the tactical knowledge, finding no correlation between them. The teaching-learning-training process of perception and decision-making in game situations should be extensively explored through contemporary methodological proposals and also constantly evaluated so that the verification cycle of these performance capacities is observed¹⁸.

It was not possible to collect data with all teams participating in the competition due to the denial of some coaches who justified loss of concentration of their athletes before games. Difficulty of interpretation of participants regarding the exploratory section of the test was observed. This section was not sensitive enough to differentiate the subjects' DTK level, since there was a greater degree of difficulty of correctness among athletes, perhaps due to the complexity of diagrams, to the detriment of actual game images with which they are accustomed.

This study proposes the use of tests that simulate playing situations with real images and that differentiate the occlusion time of the images according to categories (youth, cadet and juvenile). Responses of athletes may have changed due to the level of anxiety that a competition provides because data were collected in the competition environment. This aspect raises future study goals, which can assess the tactical knowledge of athletes at different times, such as in training and competition.

The level of tactical knowledge associated with the classification of teams in competition was verified only in two studies in volleyball, as well as the relationships between the processes underlying the tactical knowledge in a study in tennis, showing results derived from handball. These contributions lead to the conduction of specific studies in handball, assigning values regarding the development of cognitive abilities in training applied to perception and decision making in the context of game with high time pressure.

CONCLUSION

The classification in the competition was an interference factor on the declarative tactical knowledge level, as well as participation in national competitions, in this specific case for the male gender. Moreover, the interdependence of processes underlying tactical knowledge empirically proves the relationships between the quality of decision-making, perception, and declarative tactical knowledge.

These findings contribute to studies previously carried out and propose

new investigations about tactical capacity, also providing coaches subsidies for the planning of trainings. Thus, training programs must ally the application of technical actions in game situations, adapting to the reality of athletes, also taking into account that the experience in competitions should be part of this process, thus forming intelligent and creative athletes.

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