

VISUAL SEARCH AND DECISION-MAKING OF VOLLEYBALL COACHES

BUSCA VISUAL E TOMADA DE DECISÃO DE TREINADORES DE VOLEIBOL

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ABSTRACT

The research aimed at comparing the decision making of volleyball coaches through visual search strategies (number and duration of visual fixations) based on their years of experience. The sample consisted of thirty-four volleyball coaches ($n = 34$) with a mean age of 32.5 ± 9.4 years. Thus, two groups were formed: beginners (2.8 ± 1.9 years of practice) and experienced (19 ± 7.2 years of practice). To assess the tactical knowledge related to aspects of decision-making, the coaches conducted the analysis of the end-attack scenes of the Declarative Tactical Knowledge Test in Volleyball. The results not related significant differences to the visual strategies, decision-making and declarative tactical knowledge in the analysis of the scenes between the two groups ($p > 0.05$), and the power of the effect ranged from small to moderate for the analyzed variables. In this context, it was noticed that the visual strategies used between the coaches with different times of experience were similar.

Keywords: Cognition. Expertise. Volleyball. Coaches.

RESUMO

A pesquisa objetivou a comparação da tomada de decisão de treinadores de voleibol por meio das estratégias de busca visual (número e duração das fixações visuais) em função dos seus anos de experiência. A amostra constituiu-se por trinta e quatro treinadores de voleibol ($n=34$) com idade média de $32,5 \pm 9,4$ anos. Assim, configuraram-se dois grupos: principiantes ($2,8 \pm 1,9$ anos de prática) e experientes ($19 \pm 7,2$ anos de prática). Para avaliação do conhecimento tático relacionado aos aspectos da tomada de decisão os treinadores realizaram a análise das cenas de ataque de extremidade do Teste de Conhecimento Tático Declarativo no Voleibol. Os resultados não apontaram diferenças significativas nas estratégias visuais, tomada de decisão e conhecimento tático declarativo na análise das cenas entre os dois grupos ($p>0,05$), sendo que o poder do efeito variou entre pequeno e moderado para as variáveis analisadas. Neste contexto, percebeu-se que as estratégias visuais utilizadas entre os treinadores com diferentes tempos de experiência foram semelhantes.

Palavras-chave: Cognição. Expertise. Voleibol. Treinadores

Introduction

Decision-making (DM) in collective sports is limited by time and demands knowledge and extraction of relevant information from the game environment in search of a solution to different situations¹. Thus, attention, visual search strategies, anticipation, selection and response execution are vital for good performance in collective sports^{2,3}.

From a cognitive perspective, cognition allows the interpretation of and attribution of meaning to events. In this context, previous experiences guide perception in search for cues that are relevant to the action by means of a connection between sensory mechanisms and memory mechanisms⁴. This connection enables the prediction of future events by filling in gaps in sensory data, adding information that has not been physically perceived, based on personal experience, knowledge (which involves memory processes), and task specificity⁵.

During visual search for relevant information, information about goals is stored, keeping people active to detect any stimulus corresponding to the desired one⁶. Prior knowledge of the environment, object, goals and cues that are relevant for the task allow high performance in DM, supported by visual strategies^{6,7}. In this context, experience leads to a better finding and extraction of visual information from the environment⁸, that is, use of effective visual strategies, resulting in a more efficient⁹, fast and accurate visual search⁹ in the recognition and recall of game patterns¹⁰, leading to a more precise DM¹¹, since it enables adequate interpretations from available information¹².

Among the roles that coaches play, tactical ability to analyze competitive situations stands out in order to develop action plans (strategic and tactical), to define game strategies, to enable adjustments during the competition and to make decisions that suit different match and training scenarios¹³, among other aspects. However, in the reviewed literature, no study that has analyzed the quality of coaches' DM on problems emerging from the game were found.

Thus, knowing that specific knowledge of the modality guides DM, the present study aimed to compare responses indicated by coaches for each specific extremity attack scenario, that is, positions 1, 2 and 4, as well as visual search strategies (number and duration of visual fixations) according to time of experience.

Methods

Participants

Thirty-four volleyball coaches (n=34) participated in this study voluntarily, with a mean age of 32.5 (\pm 9.4 years), selected in an intentional non-probabilistic way, composing a convenience sample.

Design

The coaches were split into two groups by expertise (total years of experience in the modality, and years as an athlete) in volleyball¹⁴. The group of beginner coaches had 2.8 (\pm 1.9) years of experience, while the experienced ones had 19 (\pm 7.2) years of experience. In addition, analyzing the time that the coaches were athletes, the group of beginner trainers had 7.1 (\pm 5.4) years of experience, while the group of experienced coaches had 6.4 (\pm 5.4) years.

The inclusion criteria were: not having any type of blindness, strabismus or any other vision problem that could compromise the study.

Procedures

At times individually scheduled with each volunteer, the latter was taken to a quiet room with proper lighting, suitable to the conduction of the study. In the room, only the volunteer and the researcher in charge were present. After initial instructions, the volunteers sat comfortably in a chair in front of a computer. At that moment, the Eye Tracking *SMI RED500*® (SMI, Berlin, Germany) was calibrated to be used for the recording and analysis of number and duration of visual fixations during the observation of the nine scenes of extremity attack (EA) situations of the Declarative Tactical Knowledge Test in Volleyball – DTKT:Vb¹⁵.

In visual strategies used by the coaches, the number of visual fixations refers to the number of times the volunteer fixed the gaze at one point for a period of time ≥ 100 ms¹⁶. The duration of visual fixations refers to the average duration of fixations by each volunteer, measured in milliseconds¹⁷. The present study presents results regarding total number and total average duration of visual fixations (ball and relevant cues), number and average duration of fixations on the ball and on relevant cues (not focusing attention on the ball).

DTKT:Vb scenes last four to six seconds and are shot in a way that allows the observer to have full court view and depth perception in the different scenes. Extremity attack situations start from the service, continue through the reception and setting, with the image being interrupted at the attack time. At the end of the video scene, possible responses for each scenario appear on the screen for five seconds. At that moment, the volunteer says what the best option for action would be.

At the end of the analysis of the nine extremity attack scenes of the DTKT:Vb, a final score is obtained from the volunteer. At the time of validation of the test scenes, the experts, Brazilian national volleyball team coaches with more than 10 years of experience in the role, distinguished response options for each scenario, from best option to worst option for each scenario. Thus, in the extremity attack scenes, the best option, pointed by the Brazilian volleyball team coaches, scored with 4 points, the second with 3 points, the third with 2 points, and the fourth with 1 point. At the end of the test, the points for each volunteer were summed, evaluating the quality of the DM. The maximum possible score in the test is 36 points. The present research was authorized by the research ethics committee with COEP No 821.295.

Statistical Analysis

Descriptive analysis was performed by mean and standard deviation (SD). The data were then subjected to the Kolmogorov-Sminov test, confirming their normality. In order to verify the existence of differences between level of declarative tactical knowledge (DTK) by expertise, and visual search strategies (number and duration of fixations), the t test was used to compare the means obtained by the experienced group in relation to beginners. The effect size was calculated using Cohen's *d*; the significance level adopted was 5% ($p \leq 0.05$), and SPSS for Windows, version 20.0, was used.

Results

Inferential analysis of visual behavior showed no differences ($p > 0.05$) between groups as to visual search strategies and scene evaluation (Table 1).

Table 1. Comparison between beginner and experienced coaches in the DTKT extremity attack scenes:Vb

Extremity Attack	Beginner	Experienced	<i>P</i>	95% CI		<i>d</i>
	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>		Inf	Sup	
DTKT:Vb total score	27.10±4.01	29.50±3.32	0.06	-4.93	0.139	0.65
Total of fixations	118.9±17.06	117.2±15.40	0.76	-9.47	12.80	0.10
Total of fixations on the ball	1.90±2.00	2.30±2.90	0.57	-2.11	1.19	0.19
Total of fixations on relevant cues	61.50±20.20	55.30±13.10	0.30	-5.66	18.07	0.37
Average duration of fixations	323.2±73.30	324.0±58.80	0.97	-46.29	44.62	0.01
Average duration of fixations on the ball	51.10±51.40	66.30±78.40	0.49	-59.39	28.86	0.23
Average duration of fixations on relevant cues	320.0±118.5	320.0±83.20	0.98	-70.41	71.94	0.01

Note: CI = confidence interval; Inf - Inferior; Sup = Superior; M = Mean; SD = Standard deviation

Source: The authors

Discussion

The present study compared the quality of volleyball coaches' DM, as well as visual search strategies used in this DM process as a function of time of experience. The results did not show significant differences between groups as to DM quality and visual strategies during the analysis of DTKT:Vb extremity attack scenes. This finding is in agreement with researches in the field that have shown no differences between DTK by time of practice in volleyball attack situations¹⁸. In volleyball, for the resolution of problem situations under pressure of time and precision, decisions tend to be taken based on the recognition of the "typicality" of the situation¹⁹. Experienced players or coaches detect relevant cues and direct attention according to specific demands of the situation, as a result of practice and experience in the task²⁰. In the present study, considering that most of the coaches used to be volleyball players and that the highest attack frequency occurs at the extremities – 44% in zone 4 and 32% in zone 2²¹ –, the analysis scenario was typical, favoring the similarity between coaching groups. Moreover, all beginner coaches worked in under-15 categories or lower ones, in which a tendency of matches played at the extremities prevails, since they are formation categories that, in accordance with the regulations of Minas Gerais's volleyball federations, have limitations as to use of match systems that are valid during championships.

Results on visual strategies, which take into account number and duration of visual fixations, showed similarity between both groups analyzed – experienced and beginner coaches. These results are in line with Vansteenkiste et al.²², who compared visual search strategies in adult female volleyball players of three levels (beginner, intermediate and elite), and observed that the movements of the eyes did not present significant differences. Castro et al.⁷ used the DTKT:Vb and compared the visual behavior of young individuals who played and did not play volleyball. In that study, the authors did not find differences between groups as to number and duration of fixations for extremity situations. Afonso and Mesquita²³ conducted an investigation with 15 female volleyball players split into two groups (skilled and less skilled) and observed no difference as to number and duration of visual fixations in the comparison between groups, corroborating with the results found in the present study.

However, the results are not in line with those of Liu² and Piras, Lobietti and Squatrito³, who conducted studies with volleyball athletes and showed faster fixations in experts compared to beginners. Afonso et al.¹⁷, in turn, showed that more skilled female athletes had longer fixations compared to less skilled ones. Thus, these studies suggested that experts have more specific knowledge of the modality, use available information more and have faster patterns of visual search in the environment, focusing their attention on relevant tasks and less on non-relevant areas. This allows them to encode and retrieve information efficiently and make more appropriate decisions.

Among possible reasons for the divergence found between the above study and the present research, it can be mentioned that in this one, the division of coach groups was based on the individuals' time of practice as coaches, regardless of their time and quality of practice as athletes. In this context, it may be that aspects related to deliberate practice as an athlete have contributed to the similarity of results. In addition, studies on visual strategies have been conducted, to date, primarily with athletes. Thus, for this type of analysis, time of practice or the category in which the athletes are training and competing make a difference in the knowledge about the sport¹⁷.

Although the results showed similarity, it should be considered that the data collection procedure occurred on a screen, a factor that can alter the analysis of DM processes compared to situations that take place onsite¹⁷. In addition, the size of the 21-inch screen may have limited the interpretation of attention focus spots, since the reduced size of the scenes relative

to the real situation facilitates the extraction of distinct information from a single point of attention, due to the reduced distances caused by the screen size.

Conclusions

It is concluded, with the results of the present study, that, despite differences in the coaches' experiences, DTK and visual strategies are not the only cognitive factors that delimit DM success in extremity attack situations in volleyball. Practical experience as former athletes also influenced the results found. It is inferred that the formation of coaches should be based on the experiencing of varied situations, with distinctive time-space limitation, and allow coaches to reach a greater cognitive and visual efficiency to solve problems arising from the game.

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