



ISSN: 2456-0057  
IJPNPE 2019; 4(1): 491-493  
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www.journalofsports.com  
Received: 07-11-2018  
Accepted: 09-12-2018

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## The role of expertise on visual search strategies and action anticipation in field hockey players

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### Abstract

This study set out to assessing visual search strategies and action anticipation as two phases of cognitive process and also role of experience in male field hockey players with different expertise levels. 60 male field hockey players were selected randomly and they have been divided into two different expertise levels. Two questionnaires including general information questionnaire and decision-making quality questionnaire have been used for the purpose of gathering related information. Findings of the present study revealed that, there was a significant difference between two levels of experience in relation to visual search strategies and action anticipation process. We also found significant correlation between visual search strategies and action anticipation with regards to different expertise levels.

**Keywords:** Cognitive process, decision-making, experience, field hockey

### Introduction

Athletes not only need well-developed physiological and technical characteristics, but certain cognitive characteristics too (French and Thomas, 1987; Starkes, 1987; Williams *et al.*, 1993; Helsen and Starkes, 1999; Nougier and Rossi, 1999) [8, 14, 22, 10, 12]. This certainly applies to players of invasive games, in which players compete at the same field of action as their opponents. Invasive games are time dependent and can be subcategorized into goal-throwing (e.g. basketball), try scoring (e.g., rugby), and goal striking games (e.g., hockey). A characteristic of invasive game players is that they constantly need to adapt to opposition by punctual adaptation to new play configurations and to the circulation of the ball (Gréhaigne and Godbout, 1995) [9]. In this type of games, players have to deal with a complex and rapidly changing environment while invading the opposing team's area of the field to score (Almond, 1986; Williams, 2000; Hughes and Bartlett, 2002) [5, 21, 11].

Behavioral studies show that high level experience athletes exhibit high execution accuracy and excellent performance in action anticipation of rapid and complex motor tasks. In particular, high level experience athletes are able to make decisions within limited time when the game is in progress (Allard *et al.*, 1980; Starkes and Allard, 1983; Starkes, 1987; Bard and Goulet, 1994; Williams *et al.*, 1999) [4, 15, 16, 6, 20].

The difference between elite athletes and novices in action anticipation may be resulted from better visual perception in elite athletes compared to novices. Previous studies revealed that the methods elite athletes and novices used to extract visual information for action anticipation are different (Abernethy, 1990, 1991; Williams and Davids, 1998; Abernethy *et al.*, 2005) [1, 2, 19, 3] and that elite athletes might extract kinematic information of observed domain-specific actions to predict their future course more efficiently than novices (Ward and Williams, 2003; Overney *et al.*, 2008) [18, 13]. In this regard, many studies focused on the different contribution of motor and visual expertise in the perceptual advantage of elite athletes.

Action anticipation is highly relevant to motor skills. Visual perception is an active process of locating and extracting visual information from the environment and integrating them with other sensory inputs. In addition, various cognitive factors including past experience, motivation and development are involved in incorporating all the integrated information in visual perception. (Wu, Y. *et al.* 2013) [23].

The study focused on relationship between visual search strategies and action anticipation as two of different phases of cognitive process and also role of experience on visual search

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strategies and action anticipation to find out that visual perception is involved in the action anticipation in male field hockey players with considering their expertise levels.

## Method

### Participants

Sixty male field hockey players ( $Age = 19.65$  years;  $SD = 2.14$  years) participated in this study. They had ( $Mean = 7.63$  years;  $SD = 2.55$  years) playing experience in field hockey and Their playing position was goalie, forward, fullback or midfielder and they were playing in fix position at least for two years.

### Measures

According to the research objectives, general information questionnaire (individual) required by the study included demographic information and also decision-making quality questionnaire have been used. Each item has been assigned a score ranging from 1=very poor to 5=excellent based on self-rated on-field performance of the players. This questionnaire was loosely based on an inventory used by Elferink-Gemser *et al.* (2004).

Internal consistency and test-retest measure have been used to found out the reliability of the questionnaire that each one was at acceptable level. Validity of this questionnaire was

determined by helping some of expert coaches of field hockey of India.

### Procedures

Two questionnaires including general information questionnaire and decision-making quality questionnaire as evaluation tools, distributed between participants. They have been divided into two groups according to their playing experience ( $\geq 7$  years and  $< 7$  years playing experience). The participants were asked to answer the questions as they are, not as they think or desire to be. All completed questionnaires were collected after a few days.

### Results

Visual search strategies scores showed significance difference between two levels of expertise,  $t(58) = 2.50$ ;  $p < .05$ . The mean of visual search strategies scores in less experience group was ( $Mean = 3.09$ ;  $SD = .75$ ) and mean of high experience group was ( $Mean = 3.51$ ;  $SD = .55$ ).

Similarly, we found that there was a significant difference between two level of expertise in relation to action anticipation process  $t(58) = 3.63$ ;  $p < .05$ . The mean of action anticipation score in less experienced group was ( $Mean = 2.92$ ;  $SD = .75$ ) and mean of high experience group was ( $Mean = 3.53$ ;  $SD = .55$ ). The results appear in table 1.

**Table 1:** Comparison of visual search strategies and action anticipation between different expertise levels

Variables	t	df	Sig(2-tailed)	Mean difference	Std. Error Difference
Visual Search Strategies	2.50	58	.016*	.41951	.16828
Action anticipation	3.63	58	.001*	.60036	.16517

\*.significant at the 0.05 level

On the other hand, the findings of this study indicated that, there were a strong, positive and significant correlation between visual search strategies and action anticipation  $r(28) = .84$ ;  $p < 0.01$  in less experienced group and also between

visual search strategies and action anticipation  $r(32) = .59$ ;  $p < 0.01$  in group with higher experience. The results show in table 2.

**Table 2:** Relationship between visual search strategies and action anticipation in different experience levels

Levels of Experience	N	Pearson Correlation(r) between visual search strategies & action anticipation	Sig (2-tailed)
Low Experience	28	.84	.000*
High Experience	32	.59	.001*

\*. Correlation is significant at the 0.01 level (2-tailed)

## Discussion

This investigation examined the difference between visual search strategies and action anticipation in male field hockey players with different expertise levels; we also studied relationship between visual search strategies and action anticipation in different experience levels.

As predicted, athletes with more experience compared to less experience exhibited better scores in visual search strategies and action anticipation. The results were consistent with previous studies (Abernethy, 1990, 1991; Williams and Davids, 1998; Abernethy *et al.*, 2005; Urgesi *et al.*, 2012 and Y. WU *et al.* 2013) [1, 2, 19, 3, 17, 23] and suggested that expert athletes have higher abilities in visual search strategies and action anticipation; therefore it can be stated that along with the increase level of experience, visual search strategies and action anticipation will improve.

Previous studies have suggested that athletes have a higher ability in action anticipation and visual search strategies than novice but based on present investigation it can be concluded that level of experience significant effect on action anticipation and visual search strategies. As this study showed

there was significant difference between two level of expertise and this is highly related to better visual perception in athletes which is gained in long-term training. Also, field hockey players with more than seven years playing experience scored themselves higher in term of perceived on-field action anticipation and visual search strategies in compared with those players with less than seven years playing experience. The results of our study supported findings of Ericsson (1996) [7] that amount of experience and deliberate practice is required for each athlete to achieve a level of motor and cognitive expertise in sport and moreover sportsmen will able to make right decision in right moment. Additionally, prolonged playing of a sportsman in a specific sporting code, for example field hockey, can effect on sportsmen's mental capabilities associated with expert performance in that sport which will help to sportsmen to store on-field experience in long-term memory to inform and guide the decision made in every new playing situation.

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