Comparison of Gaze Behavior between Advance and Beginner Badminton Players

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Abstract

Eye-tracking technologies become an integral part of scientific researches. With the help of this technologies, scientists can detect human eye-gaze behaviour and analyze human cognitive processing of visual information. Visual attention is one of the imperative factors that may affect the performance in the wide range of sports.The purpose of the research was to compare the gaze behaviour of advance and beginner badminton players. It is hypothesized that advance badminton players would more fixations of gaze than beginner badminton players. The experiment was conducted on 20 badminton players. Eight (8) advanced players with the age ranged between 20-24 years (mean & SD 21.75 ± 1.28) and beginner players with age ranged between 10-14 years (mean & SD 12.58±1.68). The fixation of gaze was measured with the help of Tobii-Pro Glasses 2 while hitting 20 drive shots. Two feeders randomly feed the shuttles from the opposite side of the players position in the badminton court. From the result it was found that the advanced players tend to fixates more numbers with the short duration focusing most of the badminton court. Where as in contrast with the advanced players, the beginner players fixates fewer numbers with longer duration and focus on the very specific area from where the shuttles were feed. Due to rapidly fixation on the badminton court, expert players gain critical information through the use of many fixations of short duration, helps the players to select the appropriate strokes and execute in the right area.

Introduction

Fixations are important because focusing ability is limited to 3 degrees (Kluka, 1991). The eye has the ability to focus ensuring fine details only within a small arc. To overcome this, our eyes depends on the much wider peripheral vision which eventually plays a very important role in every activity, especially in sports. A sports person when on field, gathers information of its surroundings using all his senses but mostly collected through the visual sense. A player is mostly in time pressured situation, and to execute correct reactions at correct time, one must read each situation and delivered each skilled motor movement efficiently. The players mostly depend on perceptual and cognitive processes to gain the environmental information thus performed a strong skill execution. Decision-making in many fast-based team sports is therefore reliant on the ability to detect and interpret perceptual information and compare internalized memory structures with situational events (Williams, Davids & Williams, 1999). However, it is unclear if the elite performer's superior attainment is due to the rapid acquisition of visual cues as reported by Williams et al, or the cognitive economy reported by Helsen & Pauwels (1992). Thus the question arises out of the two approaching studies, whether the elite players of various team games who usually have the bigger playing areas have rapid eye movement intending to gather as many critical information through the use of more

fixation with relatively low fixation duration or reversely have fewer fixation spot with longer fixation duration?

With advancement of science and technology, visual search techniques have found to be used to examine the information processing abilities elite and novice athlete in various sports. The study consisted of recording their eye movements as they view photographs or videos showing tactical problem of specific sport. In the mean, the athlete is required to make a decision or perform other cognitive tasks relative to the scene viewed. Research of this nature has yet to produce a consensus on the perceptual-cognitive aspects of expertise (Abernethy and Russell, 1987; Abernethy, 1990; Helsen & Pauwels, 1992; Williams, Davids & Burwitz, 1994; Williams, Davids, Williams, 1999). For example, Helsen & Pauwels (1992) found that expert soccer players employed an efficient visual search process, consisting of a lower frequency of fixations of longer duration than non-experts. Presumably, this economical process assisted in locating and processing relevant information used in decision-making. On the other hand, Williams et al (1994) and Williams and Davids (1998) investigated the gaze behaviour of elite soccer players in 1 on 1, 3 on 3, and 11 on 11 soccer tactical situations and found that elite players in 11 on 11 situations had a higher frequency of fixation and lower relative duration than non-experts, while in the 1 vs 1 and 3 vs 3 no differences were found. The present study is to explore the knowledge of different gaze behaviour between advance and beginner badminton players.

Method

The experiment was conducted on 20 badminton players, eight (8) advanced players' age ranged between 20-24 years (mean & SD 21.75 ± 1.28) and twelve (12) beginner players' age ranged between 10-14 years (mean & SD 12.58±1.68) which were randomly selected. The visual attention was measured with the help of Tobii-Pro Glasses 2 while hitting 20 drive shots. Two feeders randomly feeded the shuttles from the opposite side of the players position in the badminton court. The eye-movement of the subjects was recorded with the help of Tobii-Pro Glasses 2. Further the recorded videos were analysis with the help of Tobii-Pro Analyser.

Result and Discussion

Figure 1(a). Heat map of fixation of gaze for drive of advanced players

Figure 1(b). Gaze plot of fixation of gaze for drive of advanced players

Figure 2(a). Heat map of fixation of gaze for drive of beginner players

Figure 2(b). Gaze plot of fixation of gaze for drive of beginner players

Fixation of gaze (eye movement) can be shown in two ways, i.e. gaze plot and heat map. Figure 1 shows the fixation of gaze in the form of gaze plot, where the circle indicates the gazing point and the sequence of the gaze pattern was indicates in numbers. The size of the circle over the snapshot represent the duration of fixation on the particular point, the bigger the circle denote the longer the fixation duration. The different colours of the fixation marked circles indicates different players, each with unique colour. The more circles appeared on the snapshot shows the more frequency of the fixation occurred.

Figure 2 shows the fixation of gaze in the form of heat map over the snapshots. Warmer colour (red/orange/yellow) in the snapshot represent more gazing time and cooler colour (green) indicates less gaze time.

The results showed that advanced players have more number of fixations with short duration and focus on most of the areas of the badminton court (shown in figure 1.a & 1.b). On the other hand beginner players have fewer fixations on the opponent count with longer duration of fixations and focus more on the centre (shown in figure 2.a & 2.b) area where the shuttles were coming.

Thus, the more number of fixations with short duration allows the players to focus on the shuttle as well as the necessary areas as a result advanced players focus most of the areas of the badminton court.

Discussion and Conclusion

Hubert (1998) says smaller number of visual fixations was found in experienced athletes in comparison to beginners of the same sport, and they do not gaze only toward specific targets of interest, but also towards points in the space that although void of relevant contain several sources of equally remarkable information.

Badminton is a game where the players have to search the space areas along with the shuttle and the positions of the players also, so that he/she may be easier to execute the appropriate stroke in the particular areas. So, one has to play attention in several different areas.

Within the limits and limitations of the study and on the basis of obtained results it was found that advanced badminton players have more numbers of fixation with shorter duration and focus on most of the areas of the badminton court. The results of the present study to a great extend is in consonance with the findings of the study conducted by Mark, Keith, Davids, Les & John (1994) in some of the similar parameters.

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