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RELATIONSHIP BETWEEN REACTION TIME AND DECEPTION TYPE DURING SMASH IN BADMINTON

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ABSTRACT

The purpose of the present study was to determine the relationship between reaction time and deception type and investigate the effect of deception type on reaction time during smash in Badminton. Sex Badminton players are high level athletes in the world participated in the last Olympic championship "London 2012", (mass 69.17±6.31 kg, length 178.00±0.06 cm. Reaction time is defined as the period of time that elapses between offensive player stroke the shuttle and opponent player move to shuttle direction. Smashes were analyzed of the last six matches in Olympic championship London 2012, two matches in Quarter-finals, two matches of Semi-finals, Bronze Medal Match and Gold Medal Match. Dartfish v.7 software motion analysis used to analysis 230 smashes and for the statistical analysis of the data the IBM SPSS Statistics 21 was used. The complex deception is more difficult types of deception for the opponents as the player use more than a tool during the striking and then the degree of difficulty followed by arm deception, while the performance of the smashes without deception gives a greater opportunity for an opponent to anticipate the strike and then stopped, and this means that the increase the degree of difficulty of deception increased the time of reaction necessary to repel the strike, thereby increasing the opportunity to make the point, therefore must specify a part in the content of the training programs for the smashes combined with different types of deception.

Keywords: Reaction time, Motion analysis, Complex deception, Arm deception, Smash stroke, Badminton.

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Contribution/ Originality

This study uses new estimation methodology to determine the reaction time for different deception types during smash in badminton. This methodology depended to use motion analysis software to determine the reaction time during a real situation in the match. These data may be important for badminton's coaches to smash performance training.

1. INTRODUCTION

Badminton is a popular sport which can be practiced by anyone regardless of age or experience. The game involves most of the body, and considered the fastest racket sport in the world, and hence, it demands from the player's quickness in planning, performing movements, temporal and spatial accuracy in the racket position for interception of the projectile (shuttlecock) (Bankosz *et al*., 2013).

Smash in a badminton game is an important shot used as an offensive starting point (Gowitzke and Waddell, 1991; Rambely *et al*., 2005). This shot may turn into a shot that determines a victory of a game (Osiński, 2003). At this time, speed change of a shuttle serves as a range from about 400km/h of initial velocity 0km/h (Hayashi *et al*., 2008; Maæka and Cych, 2011).

Two neuromotor variables have been commonly used for evaluation of the reactive ability of athletes of different sports modalities (Waddell and Gowitzke, 2000; Akarsu *et al*., 2009), including badminton (Dane *et al*., 2008; Solanki *et al*., 2012): reaction time (RT) and movement time (MT). RT is defined as the interval between the sudden presentation of a imperative stimulus and the beginning of the motor action, while MT is defined as the interval between the beginning and the end of the motor action. Due to badminton's swift pace, continuous changeability of the situation on the court as well as complexity and precision of players' movements, the decisive factor in the game is speed and all its constituents, i.e.:

– Reaction time (simple and complex – choice and differential),

– Speed of an individual movement,

– Frequency of movements (Raczek *et al*., 2003; Maæka and Cych, 2011; Nagasawa *et al*., 2012).

Reaction time acts as a reliable indicator of rate of processing of sensory stimuli by central nervous system and its execution in the form of motor response (Raczek *et al*., 2003). Numerous research results quoted in the literature show that reaction time substantially affects the acquired results – analysis of correlations between reaction time and effectiveness of effort prove that more experienced players react more quickly than their less advanced counterparts (Bankosz *et al*., 2013). The most advanced and experienced badminton players display the ability of quick analysis of the situation during the match and anticipation of the opponent's movements as well as the faculty for making instant decisions concerning the type of the opponent's move, its aiming position, the applied force (Bankosz *et al*., 2013).

The most important characteristic of a successful smash is deception. True deception relies on exploiting your opponent's court and his movements. Deception is about communicating with your opponent — but the message you're sending is a lie. You are lying to him with your body and your racket. Skill allows these athletes to plan and start their movements before the end of the opponent's stroke, and consequently, have higher chances to be successful in their moves. However, it is known by badminton coaches and players that expert players use deceptive movements during some strokes that make the shuttlecocks' trajectory and the approximate final

position unknown by the opponents until after it has touched the racket, which avoid the opponents from planning his/her movement in anticipation (e.g. before the shuttle contact the racket). Thus, the badminton players should be able to quickly react in the situations in which he/she is not able to anticipate the shuttle trajectory and final destination in order to be successful in this sport and reach high performance levels (Loureiro and Freitas, 2012).

Tactical thinking is directly linked to the ability of anticipate, and we are meaning of anticipation, the ability to infer the events of the responses by the opponent (called self-predicted responses). The player ability to anticipate of opponent responses is the most important creative capacities which is based upon the correct response for the player in the positions of different play, which helps the player to recognize and accommodate the objective intended by the opponent as well as the goal, and the same objective that the player is trying achieved. So the ability of anticipate contributes significantly to choose a tactically correct responses as soon as possible. (Grice, 2008; El-Gizawy, 2011).

The purpose of the present study was to determine the relationship between reaction time and deception type and investigate the effect of deception type on reaction time during smash in Badminton.

2. METHODS

2.1. Participants

Sex Badminton players are high level athletes in the world participated in the last Olympic championship "London 2012", (mass 69.17±6.31 kg, length 178.00±0.06 cm. The reasons for selecting the research Participants; tactical character in those games takes a great importance due to the convergence of levels, physical abilities, mental skills. They are the elite athletes in the world, and the Olympic championship is one of the best badminton tournaments championship in the world.

2.2. Procedures

Previous studies have shown that the reaction time measurement where the sitting participants are asked to press a button on a board or a key in a computer keyboard as quick as possible after presentation of a visual and/or auditory stimulus (Loureiro and Freitas, 2012)., or one button operated by the hand and a visual stimulus of green colour (Bankosz *et al*., 2013). In this study reaction time is defined as the period of time that elapses between the occurrence of a stimulus and initiation of movement of opponent by analysis the situation in the match. Reaction time is defined as the period of time from offensive player stroke the shuttle to opponent player move to shuttle direction. Smashes were analyzed of the last six matches in Olympic championship London 2012, two matches in Quarter-finals, two matches of Semi-finals, Bronze Medal Match and Gold Medal Match. Dartfish v.7 software motion analysis used to analysis 230 smashes.

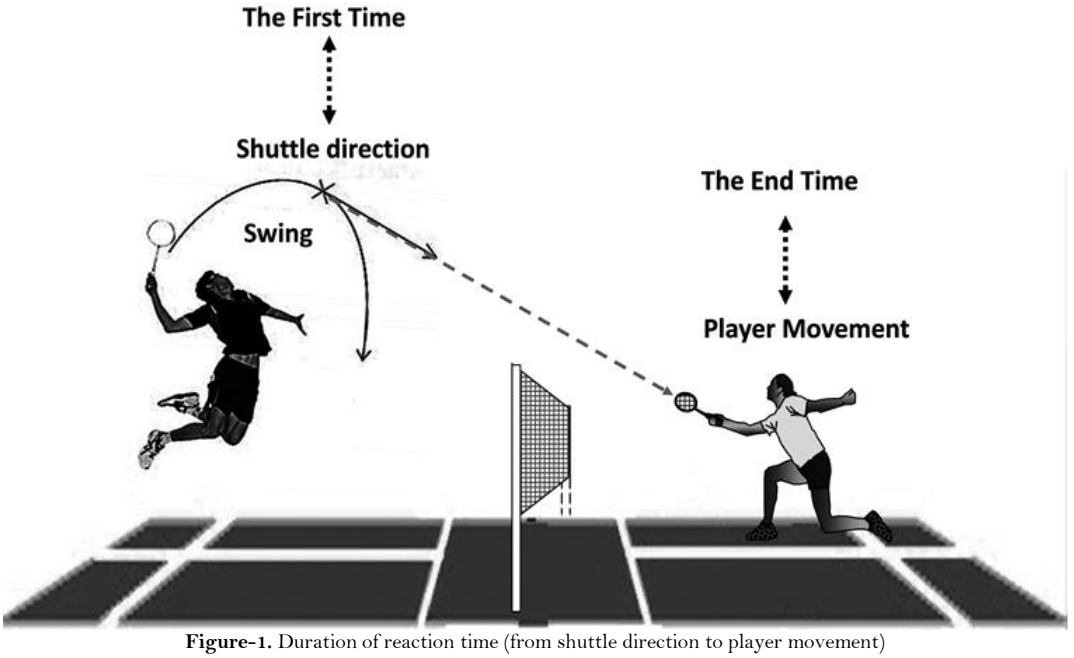

Figure-1. Duration of reaction time (from shuttle direction to player movement)

2.3. Statistical Analysis

For the statistical analysis of the data the IBM SPSS Statistics 21 was used. Descriptive statistics, Kolmogorov-Smirnov and Shapiro-Wilk tests were used to check data normality, and results showed that all parameters had a normal distribution. After that, the analysis of variance (ANOVA) was used to compare results for reaction time among Complex deception, and without deception, and the Pearson correlation was used to evaluate the relationships.

3. RESULTS

Table-1. Descriptive values (Mean, Std. Deviation, Minimum, and Maximum) of reaction time measured in Deception type Performance.

Deception type	N	Mean	Std. Deviation	Minimum	Maximum
Complex deception	69	281.16	56.56	200.00	360.00
Arm deception	70	174.29	44.15	80.00	240.00
Without deception	91	115.16	27.22	80.00	200.00

Table-2. The analysis of variance (ANOVA) of reaction time in deception type performance.

Parameter		Sum of Squares	df	Mean Square	F	Sig.
Reaction time	Between Groups	1088895.51	2	544447.75	295.18	.000
	Within Groups	418694.06	227	1844.47		
	Total	1507589.57	229			

Table-3. The significant differences between means with using L.S.D for reaction time in deception type performance.

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Reaction time	Complex deception	Arm deception	106.87*	7.29	.000	92.52	121.23
		Without deception	165.99*	6.86	.000	152.49	179.50
	Arm deception	Without deception	59.12*	6.83	.000	45.67	72.58

*. The mean difference is significant at the 0.05 level.

Table-4. Correlation matrix between reaction time, deception type, and result.

Parameters	Reaction time	Deception type	Result
Reaction time			
Deception type	0.839**		
Result	0.747**	0.408**	

**. Correlation is significant at the 0.01 level (2-tailed), Result; point = 1 and no point = 0.

4. DISCUSSION

Table (1) which is Special characterization for the reaction time showed that the opponent took to repel the smashes with different types of deception or without deception, and thus the results showed an increase in the reaction time of smashes performed using complex deception (281.16 ± 56.56 ms), followed by time of reaction of smashes performed using arm deception (174.29 ± 44.15 ms), while the reaction time to repel smashes without deception were less time (115.16 ± 27.22 ms).

The values of reaction time to repel the smashes using deception were varied, the greater value to repel the smashes was by using complex deception, that by the player use more than a tool of deception tools, when using this type of deception, such as changing the direction of the racket, arm, body, wrist and hand.

As for smashes performed using arm deception the player use only one tool of deception an arm deception ,thus the smashes performed without deceiving is due to the dependence of the player on one movement which often opponent realized and thus easily stopped and this is confirmed by the correlation results ,that there is a positive correlation in level 0.01 between the increase in reaction time and to make the point(0.747) and also correlation in level 0.01 between the type of deception and the reaction time (0.839) (table 4), which means that whenever the player used the smashes using complex deception leads to increase in reaction time that opponents takes to repel these strikes, which least the possibility to be stopped and thus make the point.

As deception consists of two movements, the first movement is false then the player surprise opponent by the real second movement, such as changing speed or direction, which makes the opponent takes longer time to recognize the direction of the strikes than the reaction time of strikes without deception (Grice, 2008).

The ability of deception is very important skill and the most effective because of the element of surprise, as their use often end the rally by get a point or at least coercion opponent to react weakly. And the most of basic strikes done with the same preparatory movements, but the most important thing is to hide the basic strike and demonstrate the first movement as a different moveement than the basic movement and thus it is difficult to opponent guess the strikes (Grice, 2008).

Table (2) shows the analysis of variance between the reaction time and the types of deception and there is a significant differences at the level (0.01) between the types of deception and the reaction time, and Table (3) shows the less significant difference (LSD) between the reaction and the types of deception there were significant differences in favor of the degree of difficulty of the type of deception where is clear difference between the complex deception and other types of deception in favor of the smash strikes that using complex deception, as shown the difference between the smashes that using arm deception and smashes without deception in favor of the smashes using arm deception. Researchers cleared that the degree of difficulty of deception type increased, the reaction time of the opponent increased in an attempt to repel the smashes which is cleared from the table (4) through the correlations between the reaction time and deception type, and the possibility of getting a point, when the degree of difficulty of deception increased the opportunity to get the point increased (Jones and Jarvis, 1998; Downey, 2007; El-Gizawy, 2007).

The players with the high level make the preparation for many different strikes looks perfect, so as to make their opponents cannot guess any strike will be performed. Many of the strikes could lead strongly to change direction and this allows the player to move his racket in contrary to the badminton direction, and therefore, when opponent trying to predicted strike will moves in contrary direction of badminton direction, and he will be Wrong Foot and may be unable to change the speed of his body at the time of the arrival of badminton, so he coercion to exit outside his base of support (Out of Position) or away from the central base area , which can cover all the empty areas by moving to different areas on the playground to fatigue opponents. Then opponent is trying to return once again to repel such attacks, leading to increasing opportunity of getting the points. Perhaps one of the most important variables that help the player to perform various deception types during the smashes is the coordination between the work of the arms and legs and the player use his potentials and capabilities beginning from jumping until moving arm to perform the smashes and integrated with one of the types of deception, which confirms the importance of the smashes as an offensive strikes increasing seriousness when integrate with different types of deception. So must focus during the development of training programs to allocate part of the training program for smashes and deception types (Jones and Jarvis, 1998; Downey, 2007; El-Gizawy, 2007; 2011; Akl, 2012; 2013).

5. CONCLUSIONS

Smashes as offensive strike considered one of the most important strikes during the match and in which they can make a point and increasing the chance to make the point when integrate smashes by one of the types of deception. The complex deception is more difficult types of deception for the opponents as the player use more than a tool during the striking and then the degree of difficulty followed by arm deception, while the performance of the smashes without deception gives a greater opportunity for an opponent to anticipate the strike and then stopped, and this means that the increase the degree of difficulty of deception increased the time of reaction necessary to repel the strike, thereby increasing the opportunity to make the point, therefore must specify a part in the content of the training programs for the smashes combined with different types of deception.

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