

## THE CHARACTERISTICS OF DOUBLE KICK IN THE AIR DURING ACTIVE AND PASSIVE ATTACK FOR ELITE TAE-KWON-DO ATHLETES

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The purpose of this study is to discuss the reaction time and movement time of the double kick in the air (DKA) of the active and passive attacks for elite tea-kwon-do athletes. The experiment takes six male tae-kwon-do athletes (average age: 20.5 year-old; average height: 174.8cm; average weight: 63kg) who won the national match in the past 2 years as the subjects. A high speed camera (120Hz) was used to shoot their movements, which is quantified by a Silicon Coach at the same time. Based on the experimental result, the DKA can be a long, short, or rapid jumping attack movement, whose vertical displacement is large and the rolling angle of the body in the air is large. Therefore, it is suitable for the combo attack after the active attack in the competition.

**KEY WORDS:** tae-kwon-do, attack, DKA

### INTRODUCTION:

Since tae-kwon-do became a formal competition at the Olympics in 2004, many countries have devoted talent and capital to research tae-kwon-do. These countries strive for good performances in the Olympics. The roundhouse kick is the best attack movement compared to all the other movements for its attack time and attack rate for both males and females in the match. The roundhouse kick is the movement whose attacked speed is the swiftest among all the attacked movements (Zhou, 1995; Cai, 1997). And the DKA is also the main kick attack skill among all the roundhouse kick movements (Huang, 2002).

As a result of changes in the rules, high frequency attacks have become the new tendency of tae-kwon-do matches. In tae-kwon-do, the legal scoring part of the mid twisting attack is the range which is protected by the chest protector, and the area the chest protector protects includes the parts of the front side and back side. The DKA is the movement that kicks both the front side and back side and so it is possible to get 2 scores during one DKA. The purpose of this study is to discuss the reaction time and movement time of the double kick in the air (DKA) of the active and passive attacks for elite tae-kwon-do athletes.

### METHODS:

The research subjects for this study were the six male athletes (age: 20.5±2.4 years-old; height: 174.8±2.5cm; weight: 63±5.5kg; sport age: 11±2.7 years) who placed in the top three in the nation-level competition within 2 years. A high speed camera (120Hz) 10cm away from the movable target dummy device for TKD to shoot the movements, and uses the Silicon Coach to qualify them. This study will use the latest equipment (movable target dummy device for TKD).

The moment that the movable target dummy device for TKD moves is taken as the beginning sign. Active attack is that the subject attacks forward to reach the target, passive attack is that the subject attacks backward to reach the target. Each subject will first kick the active DKA five times, and then kick the passive DKA with the same sequence, in which were showed in Figure 1. According to the reaction time, the two data set recording the fastest time and the lowest time will be deleted. Therefore, 3 data set will be recorded the active and passive kicks for each subjects.

The subjects start to attack at the moment the movable target dummy device for TKD moves as a starting signal. The difference in time between the movement of the movable target dummy device for TKD and the moment the back foot leaves the ground is the reaction time RT; and the active and passive reaction time will be determined. The time after the foot leaves the ground and before it kicks the movable target dummy device for TKD is the movement time MT; and the movement time of the first and second kicks will be determined.

This study compares to the reaction time and movement time for the active and passive first and second kicks of DKA.



Figure 1 illustration of double kick in the air

**RESULTS:**

Table 1 show the active and pass reaction time, movement times of DKA. The performance of reaction time is the key condition to win the competitions. The result of this study indicates that, the reaction time of active is 0.66sec, the reaction time of passive is 0.76 sec. The movement time is the most important factor determining whether a player can kick the competitor. The first kick for movement time of active is 0.53sec, and the second kick for movement time of active is 0.45sec. The first kick for movement time of passive is 0.44sec, and the second kick for movement time of passive is 0.44sec. The reaction and movement time of active and passive, in which were showed in Figure 2 and 3.

**Table 1 Mean and standard deviation of active and pass reaction time, movement times in DKA**

		reaction time		movement time	
		M	SD	M	SD
Active	First kick	0.66	0.07	0.53	0.03
	Second kick			0.45	0.03
Passive	First kick	0.76	0.04	0.44	0.04
	Second kick			0.44	0.01

Unit: Second

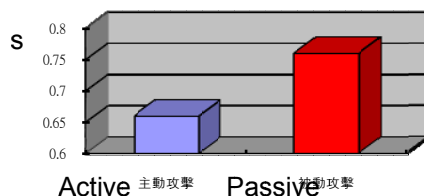


Figure 2 Illustration of active and passive reaction time

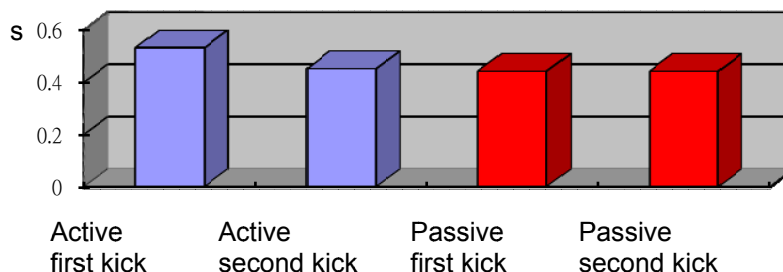


Figure 3 Illustration of active and passive movement time

**DISCUSSION:**

This research finds that there are different reaction times for different closed movements. When players perform closed movements, they stand in the front sides, and the toe of the startup foot is faced forward, which makes the attack easier, and time won't be wasted on unnecessary movement. The reaction time also closely relates to the flexibility of the

competitor. Static flexibility and reaction time of the high twisting kick are significantly correlated (Luo, 2001). It suggests that, the coach should pay attention to the players' closed movements in training so as to advance the players' reaction time. Besides the daily reaction training, the coach must pay attention to the players' closed movements and train their pliability to react to each condition with better and faster reaction.

Based on table 1, we can see that the reaction time of active is faster than passive's. The main reason is that movable target move back when the active attack is started; the athletes worry that they can't reach to kick the target, so they will be more concentrate on the moment of movement. The passive attack may relatively change the knee ankle to obtain the attack space, therefore when the athlete active attack is easier to concentrate than a passive attack.

The movement time is the most important factor to decide whether the player can kick the competitor. Kicking the competitor in the shortest time is the most important topic in training, as well as the key to win the game. In order to have quicker movement times, the player can twist the waist to advance the movement time in training. The larger the difference of the angle between the shoulder and coxa is, the larger the drive generated from twisting the body is, and the shorter the movement time is (Xiao, 2004).

### **CONCLUSION:**

The purpose of this study is to analyze the dynamics of the DKA of the active and passive attack. This study finds that for the difference on the kick movements and closed movements, the reaction time and the movement time are different. Some subjects in this study are used to kick after jumping when performance the DKA, so the movement time is long, too.

The movement time for first kick of active attack is longer than the passive attack's. The main reason is the movable target moves back when the athlete does active attack, to kick the movable target, the movement time will be getting longer. This situation is similar as the real competition; therefore it suggests using movable target is good choice in paper in the future, the data that we get, is closer to real situation.

It suggests to the coach to emphasize the importance of closed movement for the kicking besides emphasizing the correctness of basic movements. The movable target dummy device for TKD in this study is different from the traditional fixed butt and is better for simulating actual competitions.

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### *Acknowledgement*

I would like to appreciate Ho Ph.D. for giving me a lot of instructions regarding my study, also appreciate Chin coach for training me so make me dedicate to tae-kwon-do. Especially thanks for my wife to give me big support.