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# Discrepancies in fighting strategies between Taekwondo medalists and non-medalists


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## ABSTRACT

Kwok HHM. Discrepancies in fighting strategies between Taekwondo medalists and non-medalists. *J. Hum. Sport Exerc.* Vol. 7, No. 4, pp. 806-814, 2012. The aim of this study was to compare the fighting strategies between medalists and non-medalists in Taekwondo. A total of 107 matches from the 16th Asian Games had been video-taped for notational analysis. Round house kick was the most frequently used kick by the medalists in the competition (63.29%) while cut down kick (9.26%) and push kick (7.08%) were ranked second and third respectively. Aggressive mode of attack was the dominant fighting strategy used by the medalists (63.17%). Discrepancies in fighting strategies between Taekwondo medalists and non-medalists were found in this study including mode of attack, use of turning attack, and number of types of kick employed. **Key words:** MARTIAL ARTS, NOTATIONAL ANALYSIS, ATTACK.

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## INTRODUCTION

Taekwondo is one of the popular martial arts forms characterized with high speed and diversified kicking attacks. Its recent acceptance as an official event in the Olympic Games generated great interest among scholars to search for contributors to performances in sparring competitions. For example, Kazemi and associates (2009) found significant anthropometric differences between Olympic medalists and non-medalists. The medalists tended to have a taller stature, longer limbs and a lower body mass index which, in combination, provided them with a biomechanical advantage over their opponents. High performance Taekwondo athletes were also found to have better reaction time, flexibility, muscle strength, explosive power, agility, anaerobic capacity and coordination than recreational Taekwondo practitioners (Lam, 2001; Hwang & Lee, 2008; Zar et al., 2008; Ghorbanzadeh et al., 2011). Other than physiological differences, psychological differences were also evident. For example, in a study comparing winners with losers, winners were found to exhibit lower cognitive anxiety, lower somatic anxiety and higher self-confidence than the losers (Chapman et al., 1997). In addition, better Taekwondo athletes were found to have higher perceived control and lower physiological anxiety (Cheng et al., 2011).

While the accumulation of evidence on the physical and mental characteristics of Taekwondo athletes has helped us understand the essential attributes necessary for being a high level performer, another strand of knowledge that can further enhance this understanding pertains to the study of their fighting strategies. Fighting strategy, also known as tactical knowledge, is one of the key determinants of expert performance (Janelle & Hillman, 2003). Unlike other non-motor domains, tactical knowledge in sports is very unique as it involves not only ones ability to select the strategy appropriate for the situation but also ones successful execution of the skill within the constraints of the situation (Starkes, 1993). Prior studies in this area had led to some interesting findings. For example, Tsai and associates (2009) found that the roundhouse kick was the most frequently used technique in competitions and this finding was consistent with findings of an earlier study conducted by Luk and associates (2001). Luk and associates (2001) explained that the frequent use of the roundhouse kick was due its mechanical advantage, namely, it can produce a relatively higher momentum on impact than other types of kick and thus provided a greater chance of stunning an opponent.

Although the roundhouse kick was the most frequently used technique in the competitions, the ability to score with this kick was not always evident. For example, Chou and Chiu (2009) conducted a notational analysis on female finalists of the 2008 Taiwan National Presidential Taekwondo championship and found that the ability for the athlete to score with the roundhouse kick was the highest among all other techniques they used. However, a different result was obtained by Tsai and associates (2009) in their study on female Taekwondo medalists of the 2008 Taiwan National High School Athletic Games. They found their ability to score with the cut down kick was the highest followed by the roundhouse kick. Hence, the discrepancy between the commonly used kick and the ability to score with that particular kick in competitive situations demands the need for continued efforts to study fighting strategies. Hence, this study aimed to make some contribution by examining the fighting strategies used by medalists and non-medalists in the 16th Asian Games. It is hoped that the findings from this study can add evidence to the literature as well as provide some insight for coaches' practical use.

## MATERIAL AND METHODS

### *Participants*

The subjects of this study were the quarter-finalists in the 16 th Asian Games which was held in November 2010 in Guangzhou, China. Over 230 Asian Taekwondo athletes participated in this event with 123 of them entered the quarter-finals (64 males and 59 females). All participants represented their nations competing in 8 male and 8 female weight categories. The competition had adopted the single elimination tournament system with one gold medalist, one silver medalist and two bronze medalists in each weight category. In this study, those quarter-finalists who entered the semi-finals would be classified as medalists while the remaining quarter-finalists would be classified as non-medalists.

### *Procedures*

The performances of the quarter-finalists were filmed with video cameras and the footages were used for analyzing the fighting strategies medalists and the non-medalists. A total of 107 matches with 3 rounds in each match were taped during the competition.

Notational analysis was performed by two assigned coders on record sheets while watching the tapes. Two coders were used so as to enhance coding reliability. Training was provided by the researchers to ensure that the coders were familiarized with the coding procedure and that a high inter-rater reliability was achieved before proceeding further.

### **Statistical analysis**

Descriptive data such as means and standard deviations were obtained by SPSS Statistics 19. Comparison on fighting strategies between medalists and non-medalists was performed through the Mann-Whitney U test. For all analyzes, 5% was adopted as the significance level as recommended by Zar (1999).

## RESULTS

### *Prevalence of attacks*

There are several permitted Taekwondo techniques that can be used by the athletes in the competitions. Descriptive data on the prevalence of attacks by medalists and non-medalists are displayed in Table 1. For both medalists and non-medalists, roundhouse kick and cut down kick ranked first and second in the prevalence of attacks respectively. With the other attacking modes, the Mann-Whitney U test results revealed significant differences in the utilization of back side kick, push kick, reverse kick and punch between medalists and non-medalists (Table 2). The mean rank of the percentage of utilization of back side kick by medalists was 72.83 while the one achieved by non-medalists was 50.25. This suggested that medalists had a higher tendency to use the back side kick in the competition than their non-medalists counterpart. Similar results were obtained in push kick, reverse kick and punch. For these three choices of attack, higher mean ranks were achieved by the medalists. Hence, the results suggested that medalists had a higher prevalence of using the push kick, the reverse kick and the punch than the non-medalists.

**Table 1.** Descriptive data on choice of attack by medalists (n=64) and non-medalists (n=59)(means±SDs).

	Medalists	Non-medalist
Percentage of Roundhouse kick per match (%)	63.29±14.19	68.67±16.81
Percentage of Cut down kick per match (%)	9.26±5.32	10.19±8.89
Percentage of Push kick per match (%)	7.08±6.15	4.48±4.83
Percentage of Back side kick per match (%)	5.49±4.58	3.56±5.77
Percentage of side kick per match (%)	6.61±6.00	6.45±6.18
Percentage of Reverse kick per match (%)	2.02±2.22	1.46±2.36
Percentage of 360° Roundhouse kick per match (%)	0.70±1.26	0.62±1.48
Percentage of Double Roundhouse kick per match (%)	3.36±4.22	3.35±5.39
Percentage of Triple Roundhouse kick per match (%)	0.57±2.41	0.84±2.45
Percentage of Punch per match (%)	1.62±3.67	0.38±.97

**Table 2.** Discrepancies in the percentage of the utilization of attacks between medalists (n=64) and non-medalists (n=59).

	U	Z	P value	Effect size
Percentage of Roundhouse kick per match (%)	1523.50	-1.845	0.065	0.17
Percentage of Cut down kick per match (%)	1886.00	-0.010	0.992	0.00
Percentage of Push kick per match (%)	1308.50	-2.936	0.003	0.27
Percentage of Back side kick per match (%)	1195.00	-3.557	0.000	0.32
Percentage of side kick per match (%)	1779.50	-0.550	0.582	0.05
Percentage of Reverse kick per match (%)	1446.50	-2.377	0.017	0.21
Percentage of 360° Roundhouse kick per match (%)	1681.00	-1.330	0.184	0.12
Percentage of Double Roundhouse kick per match (%)	1678.00	-1.120	0.263	0.10
Percentage of Triple Roundhouse kick per match (%)	1859.00	-0.216	0.829	0.02
Percentage of Punch per match (%)	1414.50	-3.011	0.003	0.27

When making comparisons on the prevalence of attacks between medalists and non-medalists with respect to gender difference, a slightly different result was obtained from making comparison on medalists and non-medalists alone. For male medalists and male non-medalists, a significant difference in the percentage of utilization of attacks was evident in the push kick ( $U = 335.50$ ,  $z = -2.371$ ,  $p = 0.018$ ,  $r = 0.30$ ). Although differences in the prevalence of utilization of other attacks were also found among male medalists and male non-medalists, the results were not statistically significant. For female medalists and female non-medalists, the Mann-Whitney U test results revealed significant differences in the utilization of the roundhouse kick, the back side kick, the reverse kick and the punch. Female medalists have shown a higher tendency in using the back side kick, the reverse kick and the punch in the competition than their non-medalists counterpart. Although the roundhouse kick is the most frequently used attack for both female medalists and female non-medalists, a higher mean rank was achieved by the female non-medalists in the Mann-Whitney U test which indicated that female non-medalists used roundhouse kicked more frequently than female medalists.

### *Site of attack*

For both medalists and non-medalists, over 81% of the attacks are executed to the trunk. 18.12% and 18.90% of the attacks are executed to the head for medalists and non-medalists respectively. When making a comparison between medalists and non-medalists with respect to gender differences, no significant difference was found.

### *Mode of attack*

Both medalists and non-medalists relied heavily on an aggressive mode of attack. 63.17% of medalists' attack and 68.31% non-medalists' attack are executed under this mode. The Mann-Whitney U test result revealed a significant difference in mode of attack between medalists and non-medalists ( $U=1457.00$ ,  $z=-2.182$ ,  $p=0.029$ ,  $r=0.197$ ). By comparing the percentage of aggressive mode of attack between medalists and non-medalists, a higher mean rank (69.31) has been found in non-medalists while the mean rank of medalists was 55.27. This result indicated that non-medalists had a higher tendency to initiate an attack as compared to medalists.

Statistically significant difference was found between female medalists and non-medalists ( $U=441.00$ ,  $z=-0.953$ ,  $p=0.041$ ,  $r=0.265$ ) with respect to percentage of aggressive attack. The mean rank of female medalists in the percentage of aggressive mode of attack was 25.81 while the one of female non-medalists was 34.96. A higher mean rank was obtained from female non-medalists which indicated that female had a higher tendency to initiate an attack in the competition than those female winners. Although a discrepancy was found in mode of attack between male medalists and male non-medalists, the result was not statistically significant ( $p=0.340$ ).

### *Use of turning attacks*

Turning attack is a rotational attack which is performed with a previous spinning action (Serina and Lieu, 1991). A higher score will be awarded to valid turning attacks as compared with those non-turning attacks (WTF, 2012). In this study, the Mann-Whitney U test result revealed a significant difference in the use of turning attacks between medalists and non-medalists ( $U=1333.00$ ,  $z=-2.822$ ,  $p=0.005$ ,  $r=0.25$ ). A higher mean rank (70.67) was found in medalists than non-medalists (52.59) and this result revealed that medalists used turning attacks more frequently than their less-skilled counterparts.

The percentage of male medalists using turning attacks in the competition was 8.62% and the one of male non-medalists was 7.34%. No statistically significant difference was found between these two groups. However, discrepancy was found between female medalists and female non-medalists in this aspect. The percentage of female medalists using turning attacks in the competition was 6.12% while the one of female non-medalists was only 1.70%. Significant difference between female medalists and female non-medalists was evident in this area ( $U=177.50$ ,  $z=-3.938$ ,  $p=0.000$ ,  $r=0.512$ ).

### *Number of types of attacks being used*

There are various forms of kicks and punch which can be used for scoring in Taekwondo competitions; however, not all types of attacks will be used by the athlete in a single match as most of the athletes had their own preferences in the choice of attacks used. There are totally 10 types of attacks being notated in this study which includes roundhouse kick, side kick, push kick, cut down kick, back side kick, double roundhouse kick, triple roundhouse kick, 360° roundhouse kick, reverse kick and punch. Significant difference was found in the number of types of attacks being used by medalists and non-medalists. Results suggested that medalists tended to include more different types of attacks in the competition than the non-

medalists ( $U=953$ ,  $z=-4.78$ ,  $p=.00$ ,  $r=.43$ ). On average, the number of types of attacks being utilized by the medalists in the competition was 6.95 while the one of the non-medalists was 5.20.

Significant gender difference in the number of types of attacks being used by medalists and non-medalists was also obtained. On average, the number of types of attacks being recruited in the competition by male medalists was 7.91 and the one of male non-medalists was 6.16 ( $U=243.5$ ,  $z=-3.65$ ,  $p=0.00$ ,  $r=0.46$ ). A similar pattern was found between female medalists and non-medalists. Female medalists tended to utilize more different types of attacks in the competition ( $n=6.00$ ) than female non-medalists ( $n=4.07$ ). The discrepancy between these two groups was statistically significant ( $U=146$ ,  $z=-4.42$ ,  $p=0.00$ ,  $r=0.58$ ).

## DISCUSSION

The purpose of this study was to find out the discrepancy in fighting strategies between Taekwondo medalists and non-medalists. It is unquestionable that tactics play an important role in sports competitions including Taekwondo. Researcher concluded that elite athletes usually possess high levels of tactical skills (McPherson, 2008). Hence, understanding the gap of utilizing tactics in competitions between medalists and non-medalists can provide useful information to athletes for reviewing their own fighting strategies and coaches to design the practice sessions.

Although there are several permitted skills which can be used in Taekwondo competitions, roundhouse kick is still the most popular kicks being utilized by both medalists and non-medalists. The result from this study is similar to the study conducted by Luk and associates (2001) who also found that roundhouse kick was the most frequently used form of attacks by athletes. Previous studies (Pieter & Pieter 1995; Sung, 1987) indicated that the roundhouse kick is the fastest form of kick among all Taekwondo techniques. Pieter and Pieter (1995) also reviewed the force output of different types of Taekwondo kicks and found that the roundhouse kick ranks second in the force output. Speed and force output are the keys for scoring in Taekwondo competition and hence, these biomechanical advantages make the roundhouse kick the most frequently used technique in the competitions.

In this study, no statistically significant difference was found between medalists and non-medalists in the prevalence of attacks. However, a slightly different result was obtained from making comparison between medalists and non-medalists with respect to gender difference. The percentage of using the push kick in the competition was the only discrepancy between male medalists and male non-medalists. However, when comparing the prevalence of attacks between female medalists and non-medalists, statistically significant differences in the percentage of utilization of the roundhouse kick, the back side kick, the reverse kick and the punch were obtained. A greater difference in this aspect was found between female medalists and non-medalists than that of male counterparts. This discrepancy suggested that gender difference occurred in the utilization of strategies in Taekwondo. In order to enhance the strategy utilization of those less-skilled Taekwondo athletes and make them pursue the standard of those outstanding athletes, coaches can consider implementing different training programs for male and female athletes.

Gender difference was not evident in the prevalence of attacks between medalists and non-medalists. In fact, a similar result was found in the mode of attack between medalists and non-medalists. In this study, mode of attack has been classified as either an aggressive attack or a passive attack. When comparing the percentage of aggressive attack between male medalists and male non-medalists, the result obtained was not statistically significant. However, result in this study indicated that significant difference was found between female medalists and female non-medalists in this aspect. Female non-medalists have a higher

percentage in using aggressive mode of attack than those female winners. In fact, aggressive attack is easier to execute as compared with passive attack. Passive attack is a more complicated technique as it requires athletes to anticipate the situation and be able to execute the attack earlier within a combat sequence (Hermann et al., 2008). Hence, a more complicated process has to be gone through in the stimulus identification stage and response selection stage of the information processing model. According to Schmidt and Wrisberg (2004), skilled athletes are more adept than their less-skilled counterparts at perceiving and acting upon relevant environmental information. Skilled athletes also exhibited superior anticipation skills than those less-skilled athletes which facilitate those athletes to have better sports performance (Williams & Elliott, 1999). In order to avoid going through these complicated process, less skilled Taekwondo athletes tend to minimize the use of passive attack. However, since Taekwondo is a typical example of open-skilled sport, athletes are unavoidably playing under an unpredictable environment. As a result, athletes need to be familiarized with both aggressive and passive attacks. Coaches are recommended to design more specific training on use of this strategy for athletes, especially for female athletes to ensure that they are familiarized with passive attack.

It is worth to note that higher percentage of head attack was obtained in this study as compared with a previous notational analysis study on Taekwondo competition conducted by Luk and associates (2001). In their study, only 8.6% of attack was directed to the head. The addition point awarded to head attack is the major reason for the dramatic increase of making head attacks. This result not only exhibits the importance of increasing the attempt to head attack in the competition but it also discloses the significance of enhancing athletes' flexibility through specific stretching practice. According to Erie and associates (2007), lower limb flexibility is important for Taekwondo athletes as it allowed athlete to kick higher, which can result in higher scoring. Hence, coaches should ensure that sufficient time is allocated to stretching during regular practices. Besides, flexibility should also be included as one of the selection criteria when recruiting athletes for national or professional team.

Other than awarding additional point to valid head attack, additional point is also awarded to valid turning attack (WTF, 2012). A statistically significant difference between medalists and non-medalists in the use of the turning attack has been found in this study. Although it is obvious that using the turning attack in the competition can increase the chance of getting a higher score, the frequent use of the turning attack was only observed among the medalists. The explanation of this phenomenon is that the spinning action of turning kick requires athletes to have good equilibrium after executing the attack. If the athletes fail to maintain his or her balance after using the turning attack, he or she may risk losing a score from receiving a warning (Kyong-go) from the judge as declared in the case of intentional falling down. Failure to maintain equilibrium after executing the turning kick also puts an athlete in a risky situation as he or she is more likely to lose a point from receiving a counter attack from the opponent. This is because athletes usually lose their capability in protecting themselves from an attack when they are loss balance. Hence, athletes with lower technical or fitness levels seldom used the turning attack in the competition. However, turning attacks such as the back kick and the reverse kick are good strategies in the competition as the spinning nature of the attack facilitates the athletes to generate the kick at a greater force. Hence, it is worthwhile to devote more time on practicing the turning attack.

According to this study, medalists tended to include more different types of attacks in the competition than those non-medalists and this phenomenon applies for both genders. In fact, there are various forms of kicks that can be used for scoring in Taekwondo competitions; however, not all of them will be used by athletes in a single match as most of the athletes had their own preferences in the choice of kicks used. Having a diversify attacking strategy is an advantage in the Taekwondo competition because it helps to



upset an opponent's reaction time when responding to the attack. According to the Hick's law (1952), longer reaction results from a greater number of stimulus-response (variations). Thus, athletes need to take a longer time to anticipate an opponent's action or reaction if the variation in fighting strategies of the opponent is high. Though it is apparent that athletes should diversify their attacks in order to increase the chance of winning, athletes normally do not use those attacks in competitions unless they feel competent to do it. Hence, it is important for coach to increase the variation of attacks when training and encourage athletes to include different types of attack during the free-sparring practice.

## CONCLUSIONS

This study revealed that significant discrepancies in fighting strategies existed between medalists and non-medalists. Medalists tended to use more advance techniques in the competition and these strategies enabled medalists to earn more points in the competition than the non-medalists. However, to execute these techniques during competitions, a substantial level of skill mastery as well as physical fitness is essential. Hence, in order for athletes to obtain a better chance to winning medals, coaches should ensure that their athletes work on these aspects so as to be competent in using these techniques in competitions.

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