






# Fighting profiles in men's taekwondo competition in the under 68 kg category at the Olympic Games in Beijing (2008) and London (2012) – case studies

## Authors' Contribution:

-  **A** Study Design
-  **B** Data Collection
-  **C** Statistical Analysis
-  **D** Manuscript Preparation
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## Abstract

### Background & Study Aim:

Taekwondo WTF, together with wrestling, judo, and boxing, is a combat sports that is part of the Olympic Games programme. The changes occurring in refereeing rules of this competition influence its course. These recent changes in regulations, such as the introduction of additional points for kicks to the head and the introduction of an electronic hogo protector with the dae-do system, will definitely affect the course of sparring itself as well as training solutions. The purpose of this study was to answer the question: whether the changes in regulations that were introduced between the Beijing Olympics (2008) and the London Olympics (2012), influenced the content and profile of sparring in the under 68 kg men's taekwondo WTF.

### Material & Methods:

The research data comprised two matched between athletes weighing up to 68 kg. The contests had been recorded on DVD. The athletes were ST, a representative of Turkey who was both a bronze medallist at the Beijing Olympics and an Olympic champion at the London Olympics, and RN, an athlete from Afghanistan who was both a bronze medallist at the Beijing Olympics and a bronze medallist at the London Olympics. Both fighters participated in four fights at both Olympic Games. The under 68 kg weight category is the most popular category in Olympic taekwondo.

### Results:

It has been established that in subsequent Olympic Games (2008 and 2012) the profile used in taekwondo techniques changed. By increasing the ratio of front leg usage in relation to the back leg and increasing the number of actions aimed at the head, he clearly adapted to changes in regulations.

### Conclusion:

The change in the point system and the introduction of electronic trunk protectors changed the frequency and effectiveness of the techniques used, and thus altered the dominant technical profile of a taekwondo contest.

### Key words:

change competition rules · combat sports · electronic trunk protector

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*Chagui* – kick*Momtong* – trunk*Olgul* – head

## INTRODUCTION

According with World Taekwondo Federation (WTF) taekwondo has been recognised as an Olympic sport since 2000. From that time until present moment some studies involving the modality were developed in diverse areas such as biomechanics, psychology and exercise physiology [1-3]. Taekwondo WTF, together with wrestling, judo, and boxing, is a combat sport that is a part of the Olympic Games programme. The changes occurring in refereeing rules of this competition influence its course.

In taekwondo, there are two types of competition: the so-called arranged sparring and freestyle sparring. Arranged sparring proceeds along a set of fixed patterns – specific attacks and closely related elements of defence. Free sparring, which is included in the Olympic Games, involves full contact. The competition is judged and is subject to strict rules defining acceptable techniques of attack and defence, mainly performed with the athlete's legs. Furthermore, the hitting field is defined by regulations and protected by trunk, head, and limb protectors [4, 5].

At the Beijing Olympics the competition took place on a 10 m x 10 m mat with a 2 m safety zone. In order for a point to be awarded, at least three judges had to assess the technique as effective and press the appropriate button on the joystick. The result was displayed in real time on the point board. In taekwondo the hitting zones for which points were awarded were the head and the *hogo*, i.e., the trunk protector. At the Beijing Olympics, one point was awarded for kicks and fist punches to the trunk (*jiugi* technique), making an impression on the opponent. The head could only be hit with a foot, and such action was awarded with two points [6].

The winner was the athlete who earned more points, knocked out an opponent before time ran out, or who made the opponent unable to continue to fight. In case of a draw, an additional fourth round was held, where competitors sparred until one of them was awarded one point. In the event that neither athlete won, the winner was named by four general judges and the field judge. Athletes could also receive negative points for breaking the regulations. If one athlete received four negative points, they lost the fight by disqualification [6].

At the London Olympics, electronic *hogo* body protectors were introduced: upon contact with a sensor on the footpad (*dae-do* system), a point is automatically

awarded. At the same time the size of the combat field was changed to an 8 m x 8 m mat with 1 m safety zone on each side. These changes resulted in a decreased number of referees, whose role was limited to awarding extra points and assessment of kicks to the head. In the case of kicks to the head, referees began to award three points. In addition, an additional point was granted for a spinning strike to the torso. Spinning kicks to the head could be awarded a maximum four points. To reduce the number of referee errors at the London Olympics, a system of cameras was used to record each competition. A coach who observed an action assessed incorrectly was allowed to submit a request for reassessment of the situation in slow motion [7].

These recent changes in regulations, such as the introduction of additional points for kicks to the head and the introduction of an electronic *hogo* protector with the *dae-do* system, will definitely affect the course of sparring itself as well as training solutions.

The purpose of this study was to answer the question: whether the changes in regulations that were introduced between the Beijing Olympics (2008) and the London Olympics (2012), influenced the content and profile of sparring in the under 68 kg men's taekwondo WTF.

## MATERIAL AND METHODS

The research data comprised two matched between athletes weighing up to 68 kg. The contests had been recorded on DVD. The athletes were *ST*, a representative of Turkey who was both a bronze medallist at the Beijing Olympics and an Olympic champion at the London Olympics, and *RN*, an athlete from Afghanistan who was both a bronze medallist at the Beijing Olympics and a bronze medallist at the London Olympics. Both competitors participated in four fights at both Olympic Games. The under 68 kg weight category is the most popular category in Olympic taekwondo.

The observation included the assessment of the 15 most important techniques (and their variations) used in modern Olympic taekwondo [8-10]. This classification we treat as ordinal variable in the study results presentation.

***Dollyo chagi momtong* – back leg** (turning kick to the height of the trunk).

**Dollyo chagi olgul – back leg** (turning kick to the height of the head).

**Dollyo chagi momtong – front leg** (front leg turning kick to the height of the trunk).

**Dollyo chagi olgul – front leg** (front leg turning kick to the height of the head).

**Nare chagi – from the back leg** (double turning kick performed with a jump starting from the back leg).

**Nare chagi – from the front leg** (double turning kick performed with a jump starting from the front leg).

**Dwit chagi** (horse kick).

**Miro chagi** (frontal kick / push).

**Yop chagi momtong** (side kick performed with the front leg to the height of the trunk).

**Yop chagi ollgul** (side kick performed with the front leg to the height of the trunk).

**Dwi dollyo chagi** (back-turning kick performed towards the back to the height of the head).

**Naerio chagi – back leg** (crescent kick with the back leg to the height of the head).

**Naerio chagi – with back leg** (crescent kick with the front leg to the height of the head).

**Jiurugi** (simple fist punch to the trunk).

## RESULTS

*The athlete ST from Turkey, a bronze medallist at the Beijing and a gold medallist at the London Games*

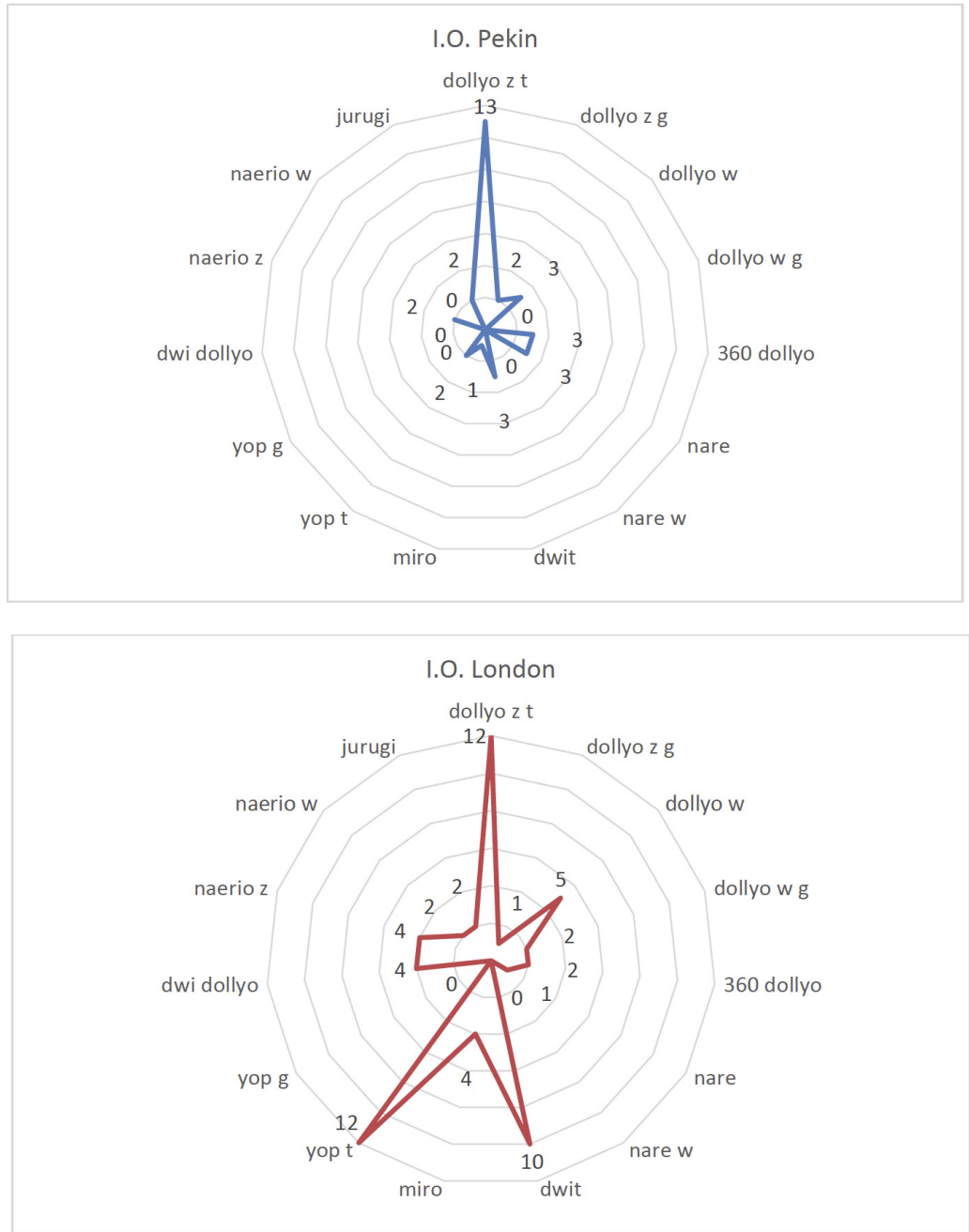
It was observed that during the Beijing Olympics, **ST** frequently applied the *dollyo chagi momtong* technique with back leg (an average of 13 times per fight), which accounted for 39% of all activities (Figure 1). **ST** performed many spinning and back strikes. Combining the *dwit chagi* technique, *dwi dollyo chagi* and 360° spins, the result was an average of six kicks in a fight (18% of the surveyed techniques). As regards other techniques, during the fight the athlete performed between 0 and 3 strikes.

During the London Olympics, a change was observed in the number and proportion (i.e., profile) of techniques used in comparison to the 2008 Olympics. Because an electronic protector was used, the Turkish athlete changed the previously most often used technique – *dollyo chagi* – to *yop chagi*. He used the latter on average of 12 times per fight (Figure 1), which accounted for 20% of all the kicks. It has been observed that the distribution of the techniques was more uniform (Figure 2), which proves the versatility of the athlete and the shift in the basic techniques used during the competition.

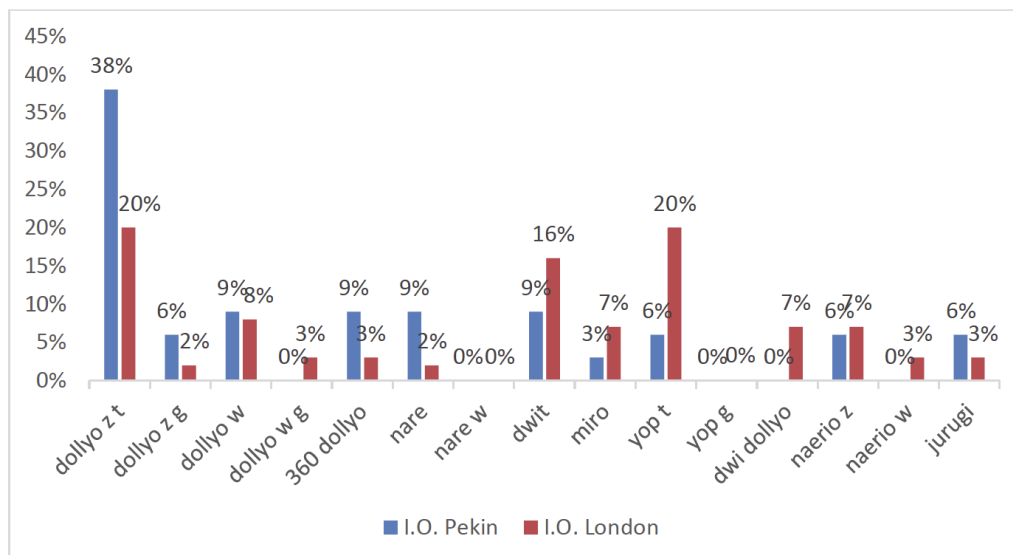
Observational data indicate that in Beijing **ST** performed 84% of strikes to the trunk and 16% to the head (Figure 3). Similar proportions were observed during the 2012 Olympics, where 80% of kicks used were *momtong* kicks and 20% were *olgul* kicks. It was also observed that the athlete used back leg techniques more often in both tournaments. In the Beijing Olympics, the above accounted for 85% of all activities, while front leg techniques comprised only 15% of all activities. After the introduction of the electronic protector, this ratio changed in the London games: back leg techniques accounted for only 65% of all actions; front leg techniques, 35%. In Beijing it was observed that **ST** performed 84% of strikes to the trunk and 16% to the head. Similar proportions were observed during the 2012 Olympics, where 80% of kicks used were *momtong* kicks and 20% were *olgul* kicks. Therefore, a 4% increase in the frequency of kicks to the head was observed. In both tournaments the athlete employed back leg techniques more often. In Beijing, these activities accounted for 85% of all the techniques; in London, it was 65%.

Determining the effectiveness of the athlete's actions allowed for specifying the degree of his activity during the fight. The representative of Turkey turned out to be more active in the tournament in London than in previous Olympic Games, as evidenced by the increase in efficiency and the number of points scored on average in one fight (Table 1).

During both Olympic Games, **ST** performed most actions in the attack. During the Beijing Olympics, they accounted for 36% of all the kicks, while in the London Games, they accounted for 45% of all the kicks. At the tournament in Beijing, the athlete used the techniques in counterattack more often (31%) than in London (26%). Elements of clinch and continued sparring constituted from 12% to 19% of his activities (Figure 3).



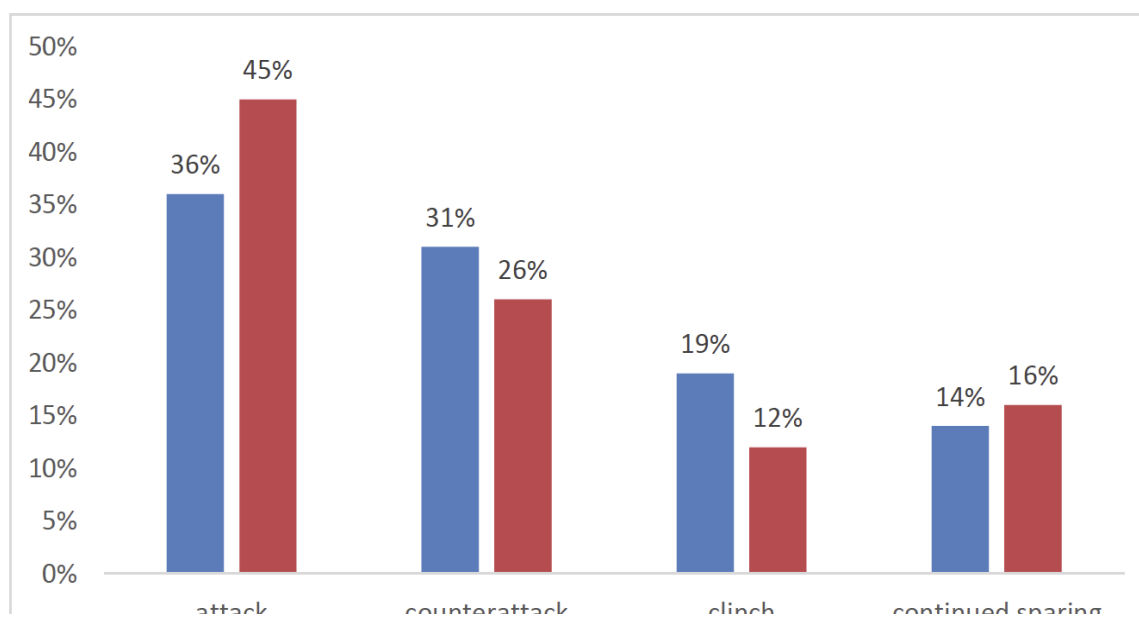
**Figure 1.** The use of particular techniques while sparring in the Beijing and London Olympics by *ST* (average values)



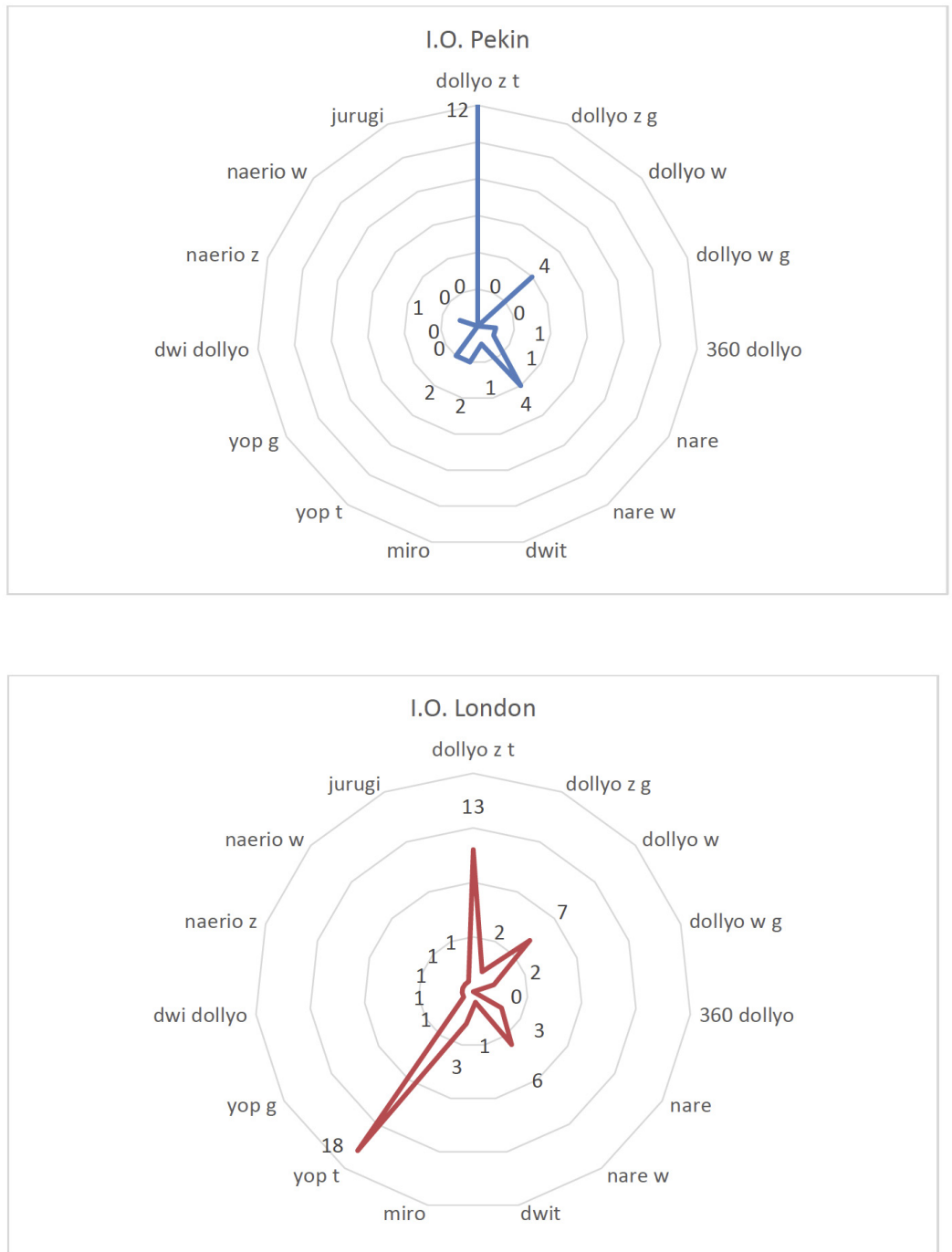
**Figure 2.** The share of particular techniques used by *ST* during the Beijing and London Olympics

**Table 1.** Comparison of the number of techniques used, effective actions, points scored, and average effectiveness of *ST* per fight in the Beijing and London

Quantitative and qualitative parameters of the fight	Beijing Olympic Games	London Olympic Games
The average number techniques used in one fight (n)	33.75	58.75
The average number of effective techniques in one fight (n)	2	4
The number of points gained on average in one fight (n)	2.25	6
Efficiency (%)	6	7
Point efficiency (%)	7	10



**Figure 3.** The moments when kicks were used by *ST* in the Beijing and London Olympics

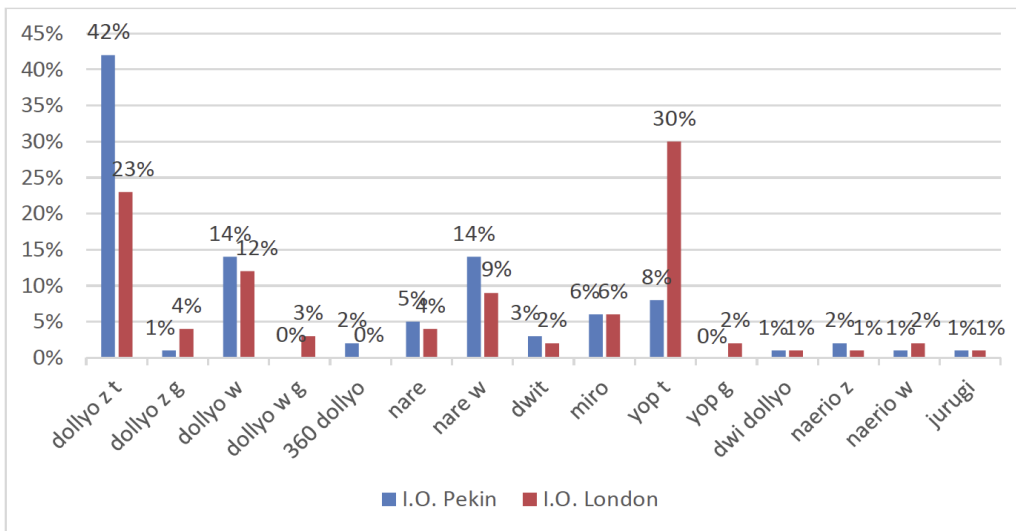


**Figure 4.** Average use of particular techniques by **RN** in fights during the Beijing and London Games (average values)

The Afghan athlete **RN** a bronze medallist at the Beijing and London Games.

It was observed that during the Beijing Olympics, **RN** most frequently applied the *dollyo chagi momtong* technique with back leg (an average of 12 times),

which accounted for 42% of all his activities. The next most preferred techniques were *dollyo chagi momtong* with front leg and *nare chagi* with front leg – an average of four times per fight (Figure 4). He rarely used other techniques (up to two instances in a fight).



**Figure 5.** The share of particular techniques used by **RN** during the Beijing and London Olympics

During the London Olympics, the athlete changed the proportions of applied techniques. Because an electronic protector was used, the Afghan athlete changed the previously most often used technique – *dollyo chagi* – to *yop chagi*, which he used on average 18 times (Figure 4). It accounted for 30% of all kicks. It has been observed that the distribution of the techniques used was more uniform, indicating the athlete’s versatility, which could be the result of the athlete’s training period, which was four years longer than that of the other athlete’s (Figure 5).

In Beijing the athlete performed 98% strikes to the trunk and 2% to the head. After the changes in regulations in 2012, 84% of kicks used by the athlete were *momtong* kicks and 16% were *olgul* kicks. Therefore, a 14% increase in the frequency of kicks towards the head was observed.

The analysis of front and back leg usage showed that in Beijing back leg kicks accounted for 62% of all the techniques used while the front leg accounted for 38% of all the techniques. In 2012, after the introduction of the electronic protector and changes in regulations, this ratio visibly changed: the athlete used front leg techniques more often (58%) than back leg techniques (42%).

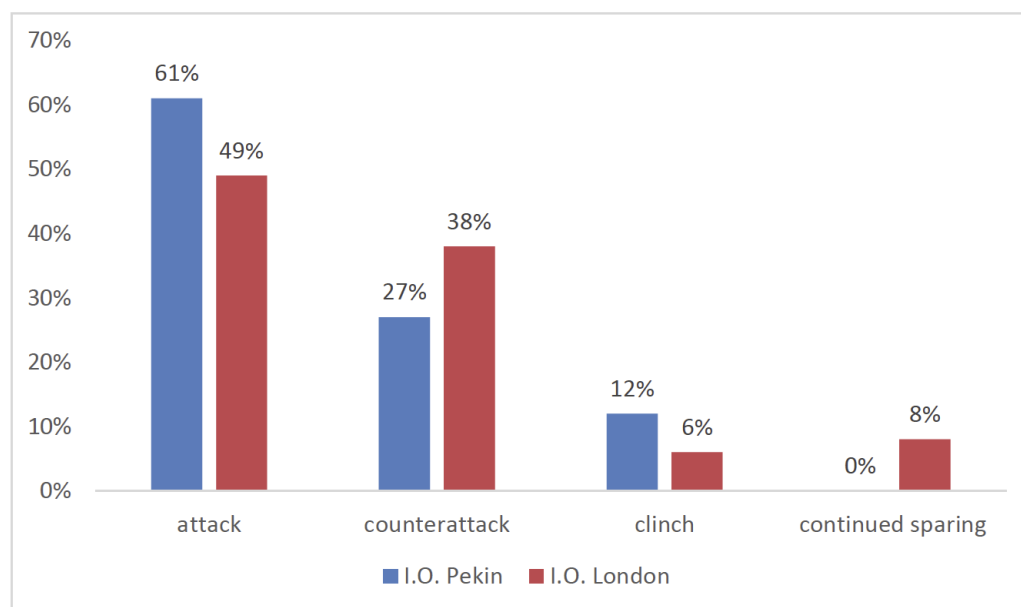
Analysing the average number of techniques used and their effectiveness, the representative of Afghanistan turned out to be more active in the tournament in London than in previous Olympics (56 techniques

were used in 2012; 27 in 2008), which resulted in the increase in efficiency and the number of points scored on average in one fight (Table 2).

**Table 2.** Comparison of the number of techniques used, effective actions, points scored and average effectiveness of **RN** in one fight both during the Beijing and London Olympics

Quantitative and qualitative indicators of the fight	Beijing Olympic Games 2008	London Olympic Games 2012
The average number of techniques used in one fight (n)	27.75	58.5
The average number of effective techniques in one fight (n)	3	4.5
The number of points gained on average in one fight (n)	3	7.75
Efficiency (%)	11	8
Point efficiency (%)	11	13

During both Olympic Games, the Afghan athlete performed most hits when attacking his opponent. In the Beijing Games, they accounted for 61% of all the kicks; in the London Games they accounted for 49% (Figure 6). Therefore, a 12% decrease was observed in the frequency of attacks performed by this athlete. In London, a decrease in the athlete’s activity during the fight was observed, as evidenced by the 11% increase in counterattack activities. In Beijing, **RN** often used clinch techniques (the so-called wedge).



**Figure 6.** The moments when kicks were used by **RN** in the Beijing and London Olympics

## DISCUSSION

Profiles of taekwondo athletes have often been described in literature. However, these descriptions primarily regarded the anthropometric measures: their height, weight, body mass index, and your demands nutritional, physical and physiological [11-15].

Second research conducted by Bedolla [16] and Ke-Tien [17] anaerobic endurance along with the explosive force are determining factors for success during the fight. However for Lin et al. [18], Sadowski *et al.* [19] and Wąsik [20, 21] beyond these physical factors mentioned above, the technical and tactical factors also are critical to good performance during the fight, and therefore should not be overlooked by coaches.

In combat sports achieving success depends on striving to perfect those activities during training that are decisive for winning the fight. In order to improve the effectiveness of training methods, one should have information concerning the behaviour of the contestant during the actual fight. Analysis of such activities allows verifying the means and methods of training and helps to prepare an effective training programme [22-24].

This study presented the profiles of the techniques used by leading taekwondo practitioners in Olympic Games in 2008 and 2012. Having assessed the profiles of the observed athletes, it may be concluded that that during the London Games the representative of

Turkey showed versatility and variety in techniques as well as the ability to use the above at different moments of the fight. By increasing the ratio of front leg usage in relation to the back leg and increasing the number of actions aimed at the head, he clearly adapted to changes in regulations introduced after 2008. The Afghan athlete showed a greater use of front leg and high effectiveness of undertaken actions aimed at the opponent's the head.

These findings corroborate with Cular *et al.* [25] and Sońdka [26], which suggests that work both sides of the body evenly and not only the dominant side can provide competitive advantage in combat.

Although the analysed athletes used back leg techniques during both games, after changes in refereeing and the introduction of the electronic protector, the proportions between the use of front and back leg became similar. It was found that during the London Games the frequency of front leg actions increased by 16%, and four times more points were scored with such actions than in the Beijing Games.

The athletes also increased the percentage of activities undertaken when attacking the opponent. They became more active after the electronic trunk protector was introduced. Pyciarz [27] observed a similar pattern in his study. He found that athletes increased their activity during fights at the world championships in 2009, as compared to the Beijing Olympics (2008).



## CONCLUSIONS

It has been established that in subsequent Olympic Games (Beijing 2008, London 2012) the profile used in taekwondo techniques changed. The action that used to be most popular, the back leg *dollyo chagi momtong*, began to be used less frequently. However, the increased use of other techniques was observed, and in that way fights became more varied. It has been observed that the total number of all the techniques used in sparring has changed. During one fight in London an average of 59 actions were performed; Beijing, it was 32. The average number of kicks increased by 54%.

The main technique used in both Olympic Games was back leg *dollyo chagi momtong*. This action, however,

was not the most effective. It was found that the most effective technique used in Beijing was front leg *nare chagi*; in London, it was the front leg *naerio chagi*.

The change in the point system (the introduction of three points for the blow to the head and one point for a spinning kick) and the introduction of electronic trunk protectors changed the frequency and effectiveness of the techniques used, and thus altered the dominant technical profile of a taekwondo contest.

## COMPETING INTERESTS

Authors declare no conflicts of interest.

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