

Analysis of sport fight structure in taekwondo during the Olympics in Beijing in 2008 and Senior World Championships in 2009 in terms of technical skills after regulation amendments and implementation of the electronic system of score recording

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Summary

Introduction. Taekwondo is a relatively new and dynamically developing sport discipline. As an Olympic discipline it was first introduced only 12 years ago during the Olympics in Sydney in the year 2000. The rules of competitions are continuously modified so as to make the sport fight more transparent and spectacular, both for the spectators and the media. The changes in regulations directly affect the course of sport fights. The cognitive goal of this study is the analysis of the technical structure of sport fight during the Olympics in Beijing in 2008 and the Senior World Championships in Copenhagen in 2009 as well as assessment of the technical changes in sport competitions after the implementation of the new scoring regulations and the electronic scoring system using sensors located inside the protectors during Championships.

Material and methods. The paper reports the analysis of 56 Olympic tournament fights in Beijing and 56 fights which took place a year later during the Senior World Championships in Copenhagen. 7 fights were investigated (quarter finals, semifinals and the final) in each weight category of the male and female athletes. The study used the method of direct secondary analysis using the observation sheet and the obtained data were subjected to statistic analysis. For the purpose of this study, only the techniques that had turned out advantageous for the competitors in terms of points gained during the fight were recorded; such factors as the fighting technique (attack and counterattack) and the scoring zones of the body and head were considered.

Results and Conclusions. The paper describes the structure of contemporary taekwondo fights at the highest, world class level. It also presents the changes in taekwondo fights after the modification of competition rules and the introduction of the electronic scoring system. The reported results enable to determine the direction of changes. The high techniques have recently become far more significant, the diversity of techniques increased as well as the competitors' activity during fights.

Introduction

Justification of the presented subject-matter

The analysis of the sport fight structure is one of the frequent issues of sports theory. Despite different opinions on the ways of analyzing each element of sport fight structure, all authors agree that such observations are necessary. Objective observation of competitions is becoming more and more popular in all sport disciplines, both measurable and immeasurable ones [1].

Obtaining concrete results in sport fights with the winner and the loser allows only determining the outcome of the actions performed by the competitors, but not the reason of such results. The latter will be found only when each component of the fight, such as the technique or tactics implemented during the fight is analysed [1].

The knowledge based on objective observation, certain tendencies, effectiveness of the technique employed and methods of finding solutions in different circumstances during the fight enables selection of optimal tactics which is, apart from

technical skills, physical training and the will to fight, a necessary factor contributing to winning the competition [2].

Roman Kalina [3] claims that the basic elements of national training in combat sports include the knowledge of possible tactics and the detailed fighting techniques.

The control of activities during the start phase requires considering concrete results and recording the parameters characterizing each component of the competitor's action during different parts, phases and elements of the exercises applied during this period. It enables to:

- determine the parameters the winners and the losers differ in,
- demonstrate the differences in the start activity indicators of the same competitor during different competitions or under different start conditions.

Research [4,5,6,7] has shown that technical and tactical training is one of the most important trainer's activities in combat sports. It requires the information based on fight course analysis during competitions. In order to determine the tendencies of the technical and tactical training of outstanding combat sport competitors, continuous analysis of the highest rank sports events is necessary. The observed tendencies should be considered in the development and modification of training programs.

Changes in regulations subject to analysis

Since it was first introduced to the family of Olympic sports, taekwondo has been continuously modified. The changes in the regulations aim at making the fight more transparent, attractive and spectacular for the recipients with maximum safety ensured for the competitors. The changes introduced after the last Olympics in Beijing in 2008 were for the first time implemented during the Senior World Championships in Denmark in 2009. These changes are substantial compared to the previous ones [8,9]. The new regulations may be regarded revolutionary, mainly for two reasons: the first is changing the scoring in favour of the more difficult (more spectacular) kicks and the introduction of electronic protectors and electronic scoring.

The novelty approach, as compared to the earlier competitions, involved the introduction of electronic scoring system contained within the competitors' body protectors for the first time during the World Championships in 2009. The protectors automatically record the score obtained in the body (Fig. 1). The points are gained using the techniques performed with the lower limb (foot) to attack the protected part of the body and the head protected by a mask, and using the upper limb (fist) only to attack the protected part of the body. Each effectively performed body attack technique allows the competitor winning "deukjeom" – a point (presently the score is automatically recorded by the electronic system). For round kicks in the body – which is a modification compared to the techniques used during the Olympics in Beijing in 2008 – the referees add one point. For each effective high kick in the head the competitor obtains 3 or 4 points in case of a round kick (in 2008 only 2 points were won for this kick).

The paper describes 7 techniques performed with the lower limbs with the versions used in sport fights. The remaining techniques are very rarely used. They are often characteristic for specific skills of individual competitors and are useless for the comparative analysis reported.

Research questions

How did the distribution of using various techniques change during the Olympics in 2008 as compared to these used during the World Championships in 2009?

Did the attack/counterattack efficiency ratio change in the analysed tournaments? If so, how did it change?

Did the change in scoring (introduction of three points for attacking the head and two points for a round kick in the body) and the introduction of electronic body protectors change the frequency of using various techniques in fights?

How did the fight change in Olympic taekwondo after the introduction of such substantial changes in the regulations? How should the process of technical preparation of the competitors to the highest international level competition change?



Fig.1. Protective equipment used during the tournament in Beijing in 2008 (left) and during the World Championships in 2009 (right)

Material and methods

The paper reports the analysis of 56 Olympic tournament fights in Beijing and 56 fights which took place a year later during the Senior World Championships in Copenhagen. 7 fights were investigated (quarter finals, semifinals and the final) in each weight category of the male and female athletes. The study used the method of direct secondary analysis using the observation sheet and the obtained data were subjected to statistic analysis. For the purpose of this study, only the techniques that had turned out advantageous for the competitors in terms of points gained during the fight were recorded; such factors as the fighting technique (attack and counterattack) and the scoring zones of the body and head were considered.

For the purpose of this study only two parameters of the observation sheet were used, namely:

- the kind of action undertaken (attack, counterattack),
- the kind of the applied technique (only effective techniques).

Results

The analysis of the number of effective techniques, applied during the fight, both during Olympics and the later World Championships, indicates that the number of effective strikes is similar in the analysed fights (Fig. 2). This may be the evidence of a similar intensity of the fights during the two discussed tournaments. However, the study does not consider the number of ineffective techniques, therefore the no definite conclusion can be drawn. The resultant number of effective techniques per one fight is almost identical. This means that the change in regulations did not affect the frequency of using effective techniques.

Both during the Olympics and World Championships the basic dollyo applied at the body level and its versions (Fig. 3) was the most frequently used technique. However, after changing the regulations, the frequency of using the basic version of this method during world Championships 2009 significantly changed by as much as 43%. Apart from the decrease in the number of dollyo chagi kicks, the frequency of using dwit chagi round techniques in the body decreased almost twice despite

the introduction of an additional point for using this technique. The analysis of the video recording indicates that this technique was used quite frequently during the World Championships. However, due to technical reasons resulting from sensors construction, it was not too often counted by the new electronic scoring system.

The performed analysis indicates an obvious increase in the frequency of using most of the techniques. The frequency of effective use of nare chagi technique increased as compared to that reported during the Olympics in Beijing by as much as 176%. Also the frequency of using five other 5 techniques significantly increased. These included:

- *dollyo chagi* with the striding leg *olgul* (2.1) in the head – increase by 600%.
- *dollyo chagi olgul* (3) – in the head – increase by 400%.
- *dwit dollyo chagi* (6) – in the head – increase by 300%
- *miro/yop chagi* (7) – in the body. So far the new technique has been rarely used by competitors. It was used only to push the rival forward and was not scored by the referees in Beijing. After changing the regulations, during the World Championships, it was used quite frequently thanks to the sensors inserted in the soles of sensory socks.
- *jiurugi* (8) fist blow in the body protector. Despite earlier acceptance of *jiurugi*, this technique was rarely scored by referees. Thanks to the modification of the regulations it is now more and more frequently used.

The three techniques (*dolge chagi* 1.2, *dollyo chagi* with the striding leg 2, *nerio chagi* 4) did not change significantly.

Apart from all the apparent changes in using different techniques, the analysis outcome indicates that the proportion of using basic kicks – *dollyo chagi* changed in comparison with other kicks (Fig. 4). According to the regulations from 2008, all the techniques were equally scored save the high techniques that were given twofold prevalence compared to the techniques performed in the body. This did not make the fights very diversified. Over 70% of all the actions involved the application of the basic *dollyo chagi* technique. Less than 30% action involved using all the remaining techniques. A year after changing the regulations these proportions significantly chan-

Table 1. Kinds and symbols of the used techniques considering the target height

Number	Name	Symbol	Target
1	dollyo chagi	1	body
	nare chagi	1.1	body
	dolge chagi	1.2	body
2	dollyo chagi with the striding leg	2	body
	dollyo chagi with the striding leg <i>olgul</i>	2.1	head
3	dollyo chagi <i>olgul</i>	3	head
4	nerio chagi	4	head
5	dwit chagi	5	body
6	dwit dollyo chagi	6	head
7	miro / yop chagi	7	body
8	Jurugi – fist punch	8	body

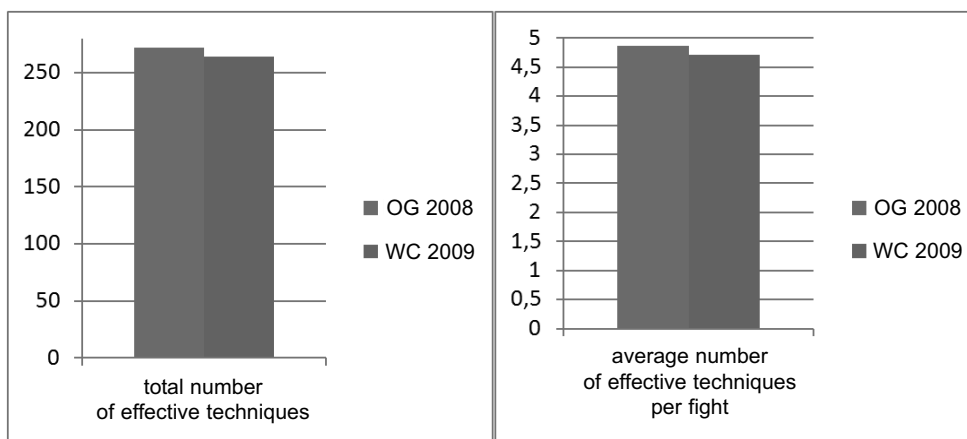


Fig. 2. The total number of effective techniques in all fights and the average number of effective techniques per one fight

ged. Although dollyo chagi was still the most frequently performed technique, but it was used only in 41% of actions while 59% of actions involved using all the remaining techniques. This indicates much greater diversity of techniques used during fights. It probably made the fights more spectacular, which is very important in every modern sport discipline.

Another studied factor was the change in technique effectiveness proportions during the attack and counterattack. Fig. 4 shows that these proportions changed after introduction of the new regulations. The role of attack apparently increased while the role of counterattack decreased. This indicates that the new system of electronic scoring and changes in the regulations improve the competitor's activity. It certainly made the fight more spectacular, which was one of the main assumptions when the scoring and judging system was changed. Attacks constituted

41% of all effective actions during the Olympics in Beijing and 47% a year later, during the World Championships in Denmark.

The biggest and most significant change in the regulations, introduced in 2009 was the increase in scoring high kicks – from 2 to 4 points. It enabled to gain a significant score prevalence, which was impossible during actions with single points won. On the other hand, it allows the competitor to compensate the loss of several points with one effectively performed action. The higher score for high techniques resulted in a significant increase in the frequency of using these techniques during the fight and made the fights more spectacular. As we can see on the graphs below (Fig. 6), the number of effective actions which gained 3 points constituted only 7% of all effective techniques, but after a year it increased three times – by 21%.

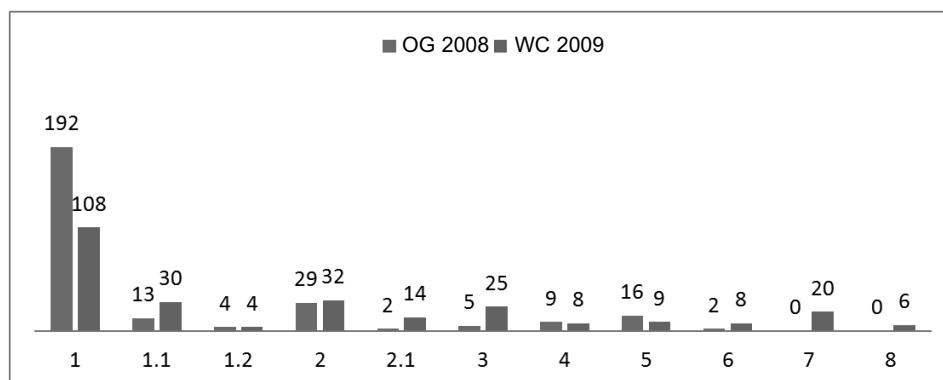


Fig. 3. The comparison of all effective techniques used during the Olympics 2008 and World Championships 2009

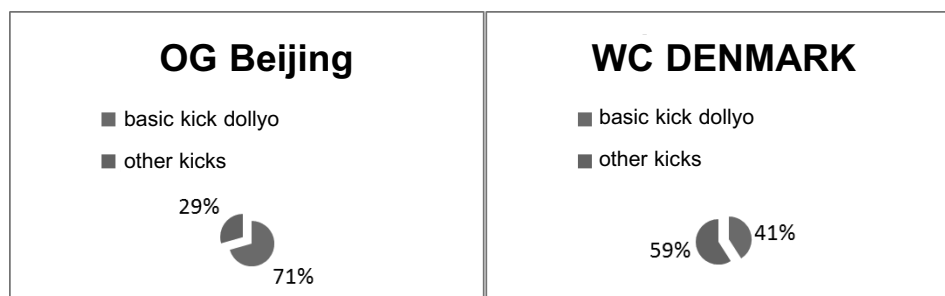


Fig. 4. The percentage of using the basic dollyo chagi technique and other kicks in all effective techniques

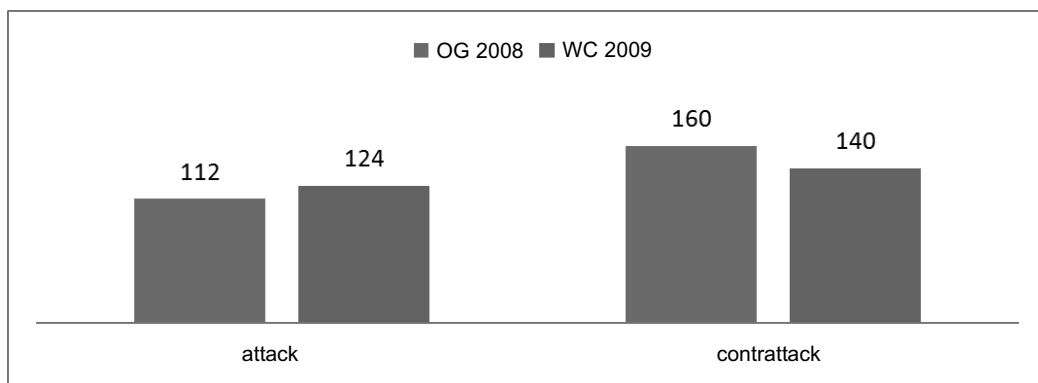


Fig. 5. The number of effective techniques of attack and counterattack during the Olympics 2008 and World Championships 2009

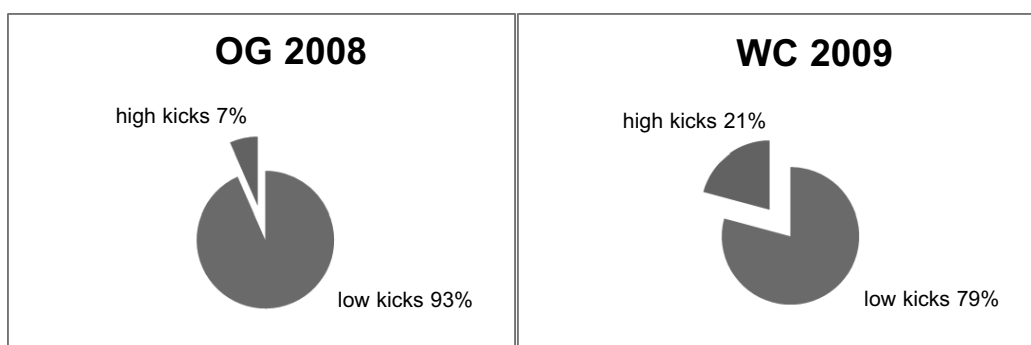


Fig. 6. The percentage of high and low kicks in the total number of kicks

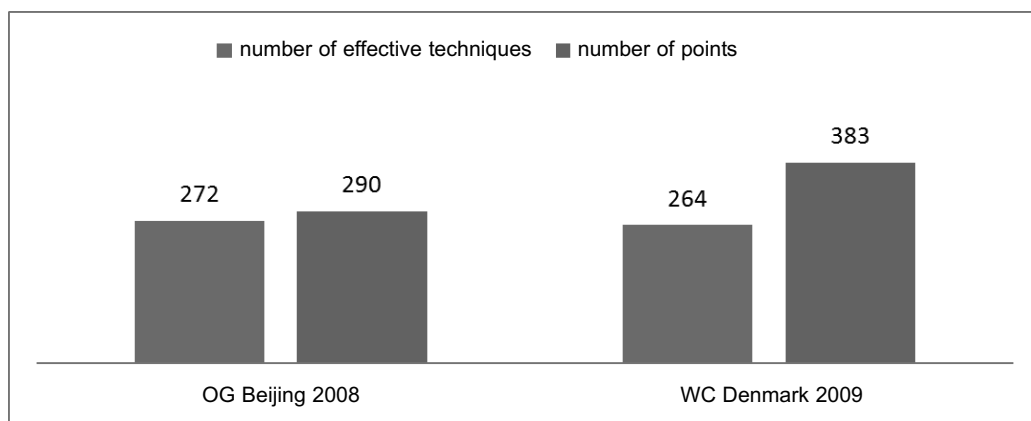


Fig. 7. The points gained for the applied techniques

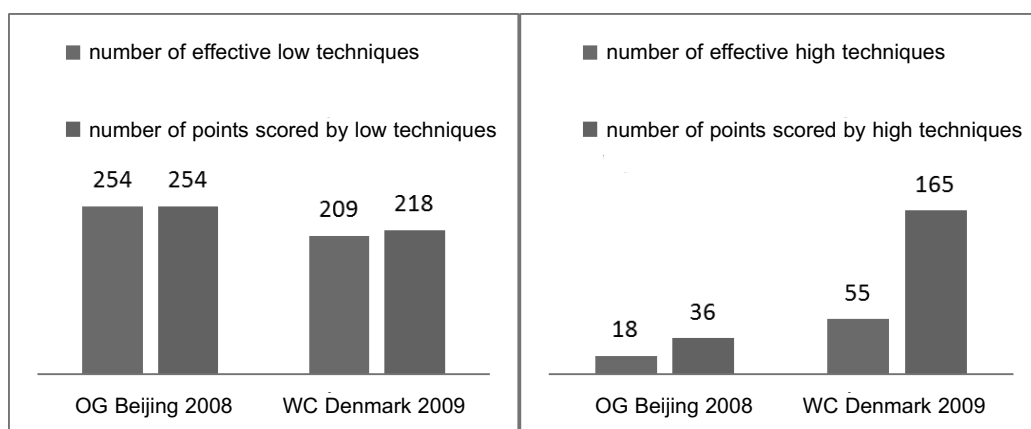


Fig. 8. The points for the low and high techniques

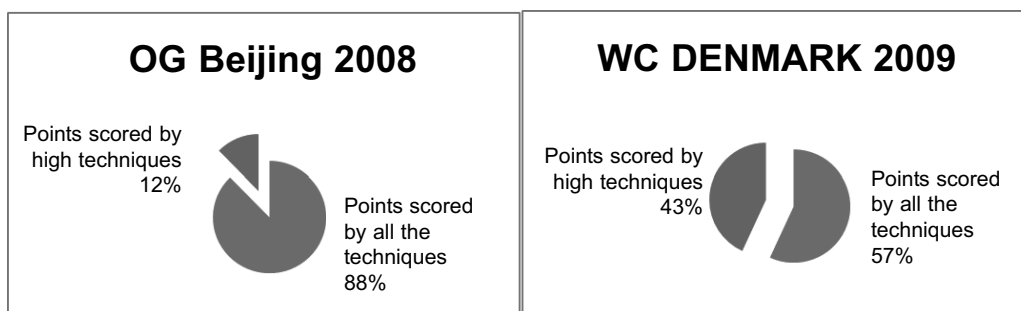


Fig. 9. The percentage of points for the high and low techniques

Analysis of the score obtained for the above technical actions indicates that the changes were substantial. The graphically presented comparisons (Fig. 7,8) show a slight difference between the number of performed techniques and the overall number of points gained during the Olympics in 2008. Conversely, during the highest rank event – World Championships in 2009 – the difference between the number of effective techniques and the number of points was significant. Such a big difference results, first of all, from the score obtained for high techniques.

Analysis of the percentage of the score gained for the high and low techniques during the two discussed tournaments clearly shows how the technical structure of sport fight changed in Olympic taekwondo (Fig. 9). The percentage of points gained for blows in the head increased from 12 % during the Olympics in 2008 to 43 % during the World Championships in Denmark in 2009. At the same time, the percentage of points gained for the low techniques decreased although most of the points are still gained for these techniques.

Discussion and Conclusions

The comparison of the techniques applied during the Olympics in 2008 and World Championships in 2009 definitely indicates that the percentage of various fighting techniques has significantly changed [8,9]. It can be noticed that the frequency of using less popular techniques has increased while the most popular ones are not so frequently used as before. A significant increase was noted in using dollyo chagi with the striding leg olgul (by 600%) dollyo chagi olgul (400%), dwi dollyo chagi (300%) and nare chagi (176%). The frequency of using low round kicks – basic dollyo chagi and dwit chagi kicks decreased (by 43,75 %). However, the decrease in dwit chagi popularity may be due to the difficulties in performing this technique with the new protective equipment, as during the World Championships it was very often used. Also new scored techniques were used, namely: miro/yop chagi and jjurugi hand technique. The frequency of using three techniques (dolje chagi, dollyo chagi with the striding leg and nerio chagi) did not change.

A slight yet notable change was observed in the competi-

tors' activity during attack which previously was more passive. The percentage of attack actions during the World Championships increased by nearly half – from 41 to 47%. Counter-attack actions, however, are still prevailing.

The modification of regulations after the Olympics in Beijing (introduction of three points for effective head attack, an additional point for round kicks in the body and the change of scoring the techniques of attacking the body – from the subjective referee's assessment to the objective electronic system) caused significant changes in using various techniques. The diversity of effective techniques applied definitely increased and the percentage of using these techniques among all the effective strikes definitely increased. Conversely, the role of low kicks, especially basic dollyo chagi, decreased. The biggest – actually enormous – increase was noted in using kicks in the head for which three points were gained. Also the pushing kicks, which were not previously used, have become more frequent.

Certainly, the authors of the regulations have achieved their goal. The studies unanimously indicate that the type of sport fight in Olympic taekwondo has changed. They obviously have become more spectacular. This entails increase in the requirements concerning the competitors' technical skills. High techniques are probably more spectacular. They are also more difficult. The increase in the percentage of using the so far rarely applied techniques has made the fights more attractive too. The score range for the techniques, from 1 to 3 points has also made the fight course more spectacular as the competitor with one effective kick can jump far back from the rival or reduce the rival's advantage. They can also win the previously lost two points and thus, win the fight within the last second. Observations of the competitors also indicate that the somatic pattern of the competitors, characterised by a very slim body constitution and a high range of kicks becomes increasingly important [10,11,12,13]. It is particularly desirable given the high scores for kicks in the head and, thanks to the new electronic protectors, for pushing techniques. The increase in the number of effective techniques performed also indicates higher technical individualisation and surprising the opponents with new technical and tactical solutions.

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