

# Relationships between the rules and the way of struggle applied by top world male judoists

## Authors' Contribution:

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

### Background and Study Aim:

Refereeing rules were changed many times (in 2006, 2009, 2010). In 2006 liberalized the interpretations of the rules concerned penalties and edge situations. In 2009 made the golden score fight shorter and forbidden of the grip for the trousers. That grip was punished "shido". From 2010 referee must disqualify contestant who grips below the belt. The aim of this study was way of struggle top world judoists depend of refereeing rules.

### Material/Methods:

Method of measurement struggle dynamics by Kalina was used. The ratio of the number of effective events to all events in given category is the measure of those struggle components (category). Indices describes struggle dynamics are: AI – activity index, EA – index of effective offensive actions, EC – index of effective counterattacks, ED – index of effective defensive actions, SDI – global index of struggle dynamics. Detailed analysis was made according to Kodokan Judo order. Research material was recordings of 40 gold medal contests from top world judo tournaments in 2005, 2008, 2009 and 2010. 72 top world judo male players from 32 countries were in research group.

### Results:

Struggle dynamics components were similar between players from different weight categories. However there was a significant difference in terms of contestants' activity in the years 2005, 2008, 2009 and 2010. Systematically decreased effectiveness of attacks and increased effectiveness of defense from 2005. In 2010 judoists rarely used the sacrifice throws and more leg throws. Effectiveness of throws in each group did not exceed 10%. Decreased the most effective hand throws. Average time of contests gradually increased since 2005, every year. Number of "ippons" remained at the high level, but significantly increased the number of golden score fights.

### Conclusions:

Despite the liberalization of the rules dynamics decreased (players rarely attack, the average time of contests has extended). Changes of refereeing rules should be come to increase struggle dynamics. It is necessary to examine what influences the attractiveness of judo contests as a show.

### Key words:

judo • combat sports • refereeing rules • judo in distance • judo in self-defense • struggle dynamics

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## BACKGROUND

Judo (from Japanese the "gentle way") is a Japanese hand-to-hand martial art developed in the second half of the XIX century by professor Jigoro Kano on the basis of the techniques of various ju-jitsu schools. The system, which bases on using the strength of the opponent, soon became a popular form of combat and self-defense, used by e.g. the Japanese Police. Judo became the basic method of physical education at schools and universities. Jigoro Kano – a member of the International Olympic

Committee – dreamt of introducing judo to the program of the Olympic Games. Initially, judo fights were considered more like presentations during which the correctness of techniques executed was evaluated. The first World Championships, during which contestants competed in direct combats, took place in Tokyo in 1956. European Championships took place earlier, in 1951 [1].

The regulations for combats back then were considerably different than today's. In the beginning, contestants fought without being divided into weight categories

**Judo** – means “gentle way” is a modern Japanese martial art and combat sport that was created by Jigoro Kano on the basis of the techniques of various ju-jitsu schools.

**Struggle dynamics** – as restricted to sport contests, is a specific reflection of the functioning ability of subjects competing in a direct contest and combines their disposition (biological and mental potentials, training experience, etc.) and situational capacity of functioning of both contestants, limited by mutual interfering, observing sport rules and unpredicted incidents (e.g. injuries). It depends also on the tactics used, related to the momentary status of the fight.

(those were implemented in the 60's of the XX century, after which limits were changed several times – for the last time in 1998). The duration of fights differed depending on their rank (medal fights were longer than elimination fights). Contest did not finish after acquiring one full point (*ippon*), as it is currently performed. From the 50's of the XX century, numerous changes of regulations concerning sports combats were noted. The motives for changes differed; some caused controversies, particularly among the more conservative Japanese. The latest changes aimed primarily at making judo more attractive as a sports show. Multi-color uniforms (*judogi*) for contestants were introduced for easier reception – white and blue, the traditional red-green mat colors (*tatami*) were dismissed, and horizontal combats (*newaza*) were limited. Attempts were made to motivate contestants by means of introducing restrictive penalties for the so-called passivity that is restraining from offensive actions [2,3].

Considerable changes in the regulations were introduced in the first decade of the XXI century. Changes in the rules of fights introduced in 2006 aimed at limiting the role of the judge in contests. The regulations concerning conducting a fight on the edge of the mat in the vertical posture (*tachi-waza*) were changed – allowing the contestants to continue their actions when one of them has contact with the field. Before, when one of the contestants touched a safe zone which was not the field, such action was terminated. In 2006 and 2007, guidelines concerning the liberalization of notes for passivity were successively introduced, and penalties for the lack of activity were implemented [2,3].

In 2009, a restriction concerning one contestant grabbing the trouser leg of another contestant was introduced. One could grab the other contestant's leg, but not their trouser leg (such grapple was penalized with the *shido*). The lowest point note – the *koka* – was dismissed and the golden score fight time was shortened from 5 to 3 minutes [2].

In 2010, below the belt grapples were banned and disqualification penalty – *hansoku-make* was reintroduced. The below the belt grapple is only acceptable when it is a response for an offensive action by an opponent or a repetition of own offensive [2].

The main purpose of this study is relation between the regulations and the method of concluding fights by the best judokas of the world. The application goal is training assumptions and methodological directives concerning the optimization of combat strategies and tactics taking into account the current combat regulations.

## MATERIAL AND METHODS

The study was conducted on the basis of video and DVD recordings from final fights at the Olympic Games in Beijing (2008), the World Championships in Cairo (2005) and Rotterdam (2009), the Grand Slam in Paris (2010) and world cup tournaments in Warsaw (2005 and 2009). In total, the actions of male contestants from 40 fights were analysed (with 10-second time sequence accuracy). The total combat time was 2 hours 24 minutes and 33 seconds, 889 sequences.

Fights by 72 leading judokas from 32 countries were analysed. The majority of them represented Japan (n=8), Belarus (n=5), Korea (n=5) and the Netherlands (n=5).

According to the Kalina's method for measuring the struggle dynamics [4] all events were recorded (on observation sheets) in 10-second fragments of fights: attacks and counterattacks (throws, strangle grapples, chokes, locks), defence without counterattack – establishing their effectiveness, and preparatory actions, breaks, judge's decisions. In each category, events are recorded in the form of relations: the number of successful actions *vs.* the number of observed events belonging to this set, and which may be expressed with a 0 to 1 unit index. Since a considerable amount of judo fights end before their deadline and neither of the parties may perform a counterattack – particularly when a fight is concluded within only several seconds following its beginning, the record may, in extreme cases, be 1 for one party and 0 for the other party. The average value of particular components of actions taking place during a fight is the general fight dynamics index. Particular actions (occurring in 10-second sequences) are recorded with the use of arbitrary symbols in the form of a cohesive description. The following variables expressed in corresponding indexes are assumed as the basic criteria for the evaluation of dynamics during a fight:

1. Index of offensive and defensive activity that is the activeness index (AI). It is a proportion of the number of 10-second fight sequences, during which the contestant has undertaken at least one attack, counterattack, or defence without counterattack, to the number of 10-second fight sequences.
2. The index of effectiveness of offensive actions (EA) that is attack effectiveness index, which is a proportion of the number of attacks, for which points were granted, to the number of attacks undertaken.
3. Counterattack effectiveness index (EC) – which is a proportion of the number of effective counterattacks to the number of counterattacks undertaken.
4. Index of effective defences (ED) is the ratio of the number effective defences (without counterattack) to the number of offensive actions undertaken by the

opponent (not be included attacks on which contestant replied counterattack).

5. Global index of struggle dynamics (SDI) – which the average value of calculated partial indices.

Such versatile and detailed record of events taking place during a fight (on properly prepared sheets) is possible only after the fight has finished, thus with the use of the VHS or DVD technology. The calculated results may be compared to the results of tests and other laboratory observations, as well as to the volume and character of training loads applied in the preparatory period preceding the recorded contest. The record of events in a time function serves primarily for the purposes of secondary research and analyses of the course of fights, as well as the development of strategies and tactics for the next contests with particular opponents.

The analysis and presentation of offensive actions by contestants assumes the Kodokan Judo division into throw techniques (*nage-waza*), performed in the vertical (standing) posture, throws with falls, the so-called sacrifice throws (*sutemi-waza*) and grappling (*katame-waza*), performed in the horizontal posture [2].

1. In the group of throws, the presentation proceeds according to the following groups: *te-waza* (hand throws), *goshi-waza* (hip throws), *ashi-waza* (foot or leg throws), *sutemi-waza* (sacrifice throws) – in the Kodokan classification of Judo, the *sutemi-waza* group is divided into *ma-sutemi-waza* (supine sacrifice throws) and *yoko-sutemi-waza* (side sacrifice throws), however, due to a small number of recorded throws from both categories, they are presented together as *sutemi-waza*.
2. In the group of grappling techniques, the presentation proceeds according to the following groups: *osaekomi-waza* (hold down techniques), *shime-waza* (strangling techniques), *kansetsu-waza* (joint-locks).

The Japanese nomenclature is in force.

The analysis and presentation of defensive actions assumes an arbitrary division into 12 defence techniques: hand block, hip block, manoeuvring around, twist onto abdomen, hand and hip block, hand block and manoeuvring around, pulling back a leg, breaking a grapple, exit outside the mat, wrapping a leg, forming a bridge, return to *tachi-waza* [5].

The number of points (for technical actions) and penalties was calculated. In judo, one can acquire advantage over the opponent by performing a successful attack (in *tachi-waza* or *ne-waza*) or by making a complaint about the opponent (e.g. for inactivity, defensive position, simulating attacks, leaving the field, etc.). The

analysis also concerned the changeability of the results of fights. Changeability of advantage means that the contestant who won was in the so-called negative position for some time that is their opponent held formal advantage due to the points granted by the judges for the effectiveness of their actions or as a result of negative points granted to the final winner.

Arithmetic mean acknowledging standard deviation, number of successful actions, number of undertaken actions and effectiveness of particular techniques (relation of successful actions and undertaken actions) was calculated for each category of actions. Differences among particular groups were calculated by means of the chi-square and t-Student methods. The minimal essentiality level was established at  $p < 0.05$ .

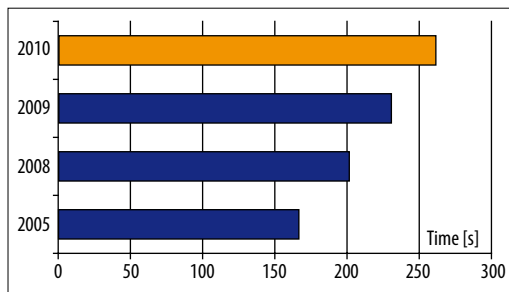
## RESULTS

In 2005 and 2009, fight ending before deadline (through *ippon*) exceeded 50%. In 2010 it was only 43%. The average duration of fights was longer from year to year (Table 1). In 2010, an average fight lasted for 4 minutes and 24 seconds, whereas in 2005, an average fight lasted only for 2 minutes and 54 seconds (Figure 1). This happened despite a shortening of the duration of a fight (in 2009) for the golden point from 5 to 3 minutes. Additional fights for the golden point took place in 2010 in 14% of all analysed contests. In preceding years, this rate was considerably lower. The frequency of granting technical points to contestants was successfully lower, and the number of penalties granted was successfully higher (Figure 2). In 2010, changeability of advantage – documented by points granted during fights – was recorded more rarely than five years earlier, which may influence the attractiveness of fights as shows (Table 1).

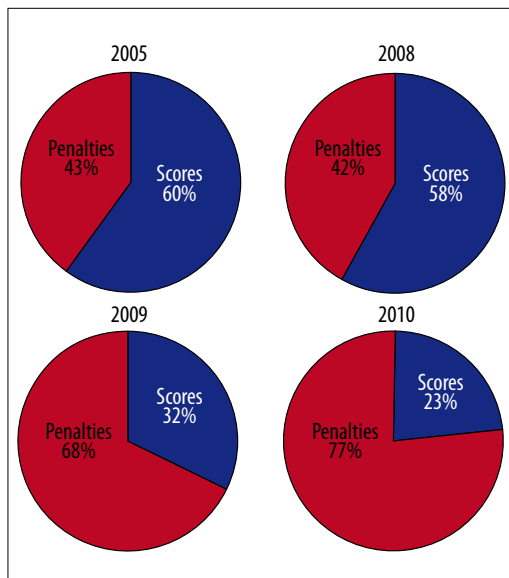
**Table 1.** Cause of the ending of fights and changeability of advantage [%] in the top world judo male tournaments in the years 2005, 2008–2010.

	Ippons	Golden scores	Changeability of advantage
2005	58.33	0	25.00
2008	42.86	0	0
2009	64.29	14.29	14.29
2010	42.86	28.57	14.29

Considerable changes in particular elements of dynamics were not recorded with respect to female and male contestants (hence data in diagrams is presented for both sexes together) and with respect to contestants of various group of weight categories: light (60, 66 and 73



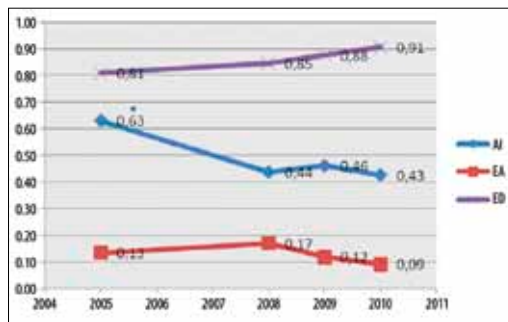
**Figure 1.** Average time of fights (in the years 2005, 2008–2010).



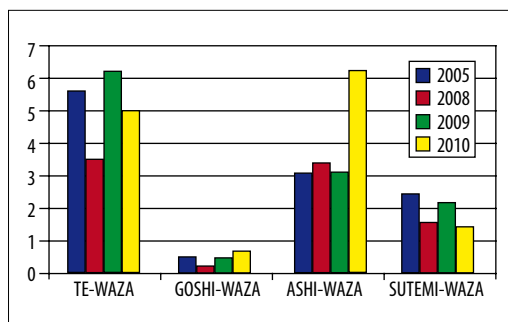
**Figure 2.** The ratio of scores to the penalties awarded to male athletes (in the years 2005, 2008–2010).

kg), medium (81 and 90 kg) and heavy (100 and +100 kg). Considerable differences were recorded with respect to the activeness of contestants in 2005 and in the following years (for 2008  $p=0.001$ ; 2009  $p=0.001$ ; 2010  $p=0.000$ ). In 2010, the activeness of judoists was lower by 0.20 in comparison to 2005 that is before the radical change in regulations. Offensive effectiveness has been decreasing successfully from 2005 to reach the less than 0.10 in 2010. Defensive effectiveness increased, which means that a smaller number of attacks were successful (Figure 3). In conclusion, in 2010, contestants attacked with lower frequency than in preceding years. Moreover, they attacked less effectively.

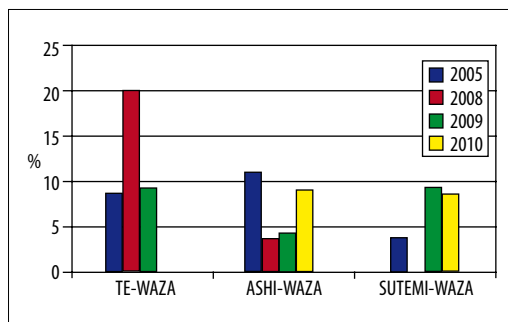
489 attacks (throws and grapples) were recorded in 40 fights, out of which 39 (that is 7.97%) were successful. Throws (*nage-waza*) in the vertical/standing posture (*tachi-waza*) were much more popular. Grappling techniques (*katame-waza*) applied in the horizontal/ground posture (*ne-waza*) were used rarely (only 5.52% of all recorded attacks). *Ne-waza* actions were more successfully performed. Almost every fifth (18.51%) *ne-waza*



**Figure 3.** Changes in the specific characteristics of elements of the struggle dynamics in analysed fights from male tournaments in the years 2005–2010.



**Figure 4.** The ratio of the number of attacks (hand, hip, leg and sacrifice throws) for use by male judokas to the number of fights.



**Figure 5.** Effectiveness of throws (hand, hip, leg and sacrifice) applied by male judokas.

action resulted in winning points, whereas only 7.35% of throws were pointed by the judges. The majority of judokas performed actions to the right side more often and more effectively, however the differences were not significant.

In the next analysed periods following the year 2005, the number of throws applied by contestants gradually increased (with the exception of 2008). Their effectiveness decreased however, giving 5.31% in 2010, whereas five years earlier, it hovered around 7.91%. A similar tendency (increase in the number of applied actions, and their lowered effectiveness) was recorded in the case of grapples (*katame-waza*), which reached the

**Table 2.** Effectiveness [%] of defensive actions.

	Hand block	Hip block	Maneuvering around	Twist onto belly	Leaving the mat	Stepping aside	Hand & hip block	Hand block & man. around	Separation from grasp	Leg entanglement	Bridge
2005	93.42	100	90.91	75.66	100	100			100		
2008	87.06	100		84.21	100	100	100	100	100	100	
2009	94.39	100	100	74.29	100	100	91.77	100	100	100	0
2010	94.74	100	100	85.71			90	100	100	100	

lowest effectiveness (0.00%) in 2010, however in 2005, it reached 22.22%.

A considerable lowering of changeability of hand throws was recorded in 2010. Some of them, such as e.g. *kuchiki-taoshi*, *morote-gari*, *kata-otoshi* were not applied. This resulted from a ban on direct below the belt grapples. The frequency of use of foot and leg throws increased considerably in 2010 and was over six attempts per fight – these were the most often executed actions in *tachi-waza* in the analyzed fights. The number of applied throws from the *sutemi-waza* group decreased (Figure 4).

The effectiveness of actions executed in the vertical posture did not exceed 10% in 2010. The most effective (9.09%) were leg throws and sacrifice throws. Leg throws were also the most effective in 2005 (10.81%), but sacrifice throws in 2009 (9.68%). In 2008, the most effective were hand throws (20.00%) (Figure 5).

The most popular defence techniques were hand block (5.18 events per fight, in average), twist onto abdomen (2.73) and manoeuvring around (1.25). However, they were at the same time the least effective defence techniques (after hand and hip block). One hundred percent effective techniques applied during fights were: hip block, leaving the mat, stepping aside, hand block & manoeuvring around, breaking a grapple and return to *tachi-waza*. In comparison to fights from preceding periods, 2010 was characterized by higher frequency of hand blocks and grapple breaking. Contestants applied fewer twists onto belly, which is the least effective technique. The effectiveness of hand blocks increased (Table 2).

## DISCUSSION

The analysis of starting actions of contestants should be an indispensable element of technical and tactical training planning for contestants. Data taken from analyses may be used by coaches for effective planning of technical and tactical trainings, as well as for planning combat strategies with respect to particular contestants and their potential opponents. It is a common phenomenon

that there is no cohesion between the sports activities of contestants and their exercises practiced during training [6]. It should be also emphasized that the effectiveness and frequency analysis for the execution of particular throws and grapples may not be sufficient. Attention must be paid to preparatory actions, which, in a judo fight, are executed for nearly a half of each fight [7–10]. Attempts were made to classify them in detail [11,12]. An alternative method of gaining advantage in a fight may also consider penalties [13], which may comprise the majority of points granted [9].

The results of research prove – although not directly – a considerable impact of regulations on the methods of conducting combats by contestants. Not only terms of regulations matter, but also their interpretation, which is changed even more often causing confusion among contestants, coaches and judges themselves.

The International Judo Federation and the European Judo Union continue their search for new solutions. The goal of the latest changes in regulations was to make judo more attractive as a sports show. However, were all of the changes properly prepared? Have the possible effects of particular terms been empirically tested? Do frequent changes in the regulations make it even more difficult for a spectator to understand judo fights? It's a pity that, with the following modifications, the highest judo authorities miss the utilitarian perspective of judo. As every sport, judo is a self-defence technique [4]. Maintained a five-minute effective duration, judo loses both its marketing goal (spectators are least interested in prolonged sports events), and, what is more important, its utilitarian aspect. It has been empirically proven that typical interventional actions last from 30 to 120 seconds. 75% of cases of arrest require the application of medium or maximal force, whereas interventional actions using force lasting for over 2 minutes require from 75% to 90% of maximal efficiency [14,15]. In my opinion, shortening the duration of fights to three minutes would be a revolutionary, but logically justified change in the regulations. After this change, judo would become a more recommendable formula for a training preparing

for interventional actions. This is, however, not the most important factor. Most interventions require the application of gentle or relatively gentle techniques [16], which is typical for judo. This would be a direct reference to the concept of judo in distance, recommended by the Jigoro Kano and developed by Kenji Tomiki [17].

## CONCLUSIONS

1. Changes introduced in the regulations for fights (e.g. the liberalization of interpretations concerning penalties) translated into a decrease in activeness and effectiveness of contestants, which proves a lack of sensible concept for adapting judo to the criteria of

effective sports marketing while preserving the utilitarian mission of judo.

2. In order to make judo a more attractive discipline expressing its utilitarian character, changes in the regulations aiming at increasing its dynamics should be introduced. The most reasonable solution seems to be a shortening of the duration of fights.

3. In the face of frequent, radical changes in the regulations and their interpretations imposed by the need to make judo a more media-friendly discipline, factors influencing the attractiveness of fights as sports events should be evaluated.

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