

# Technical fitness training of judokas – finalists of top world tournaments in the years 2005-2008

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## SUMMARY

**Introduction.** The goal of the study was to determine the effectiveness of offensive actions during judo combats. The frequency and effectiveness of different elements of attack were studied in competitors of different genders and weight categories who were finalists of the most important world tournaments.

**Material and methods.** DVD records of the final World Championships (Cairo 2005), Olympics (Beijing 2008) and World Cup tournaments from 2005 to 2008. The total of 56 combats were analysed (with the accuracy to 10-second time segments). 69 male and female competitors were subjected to analysis.

**Results and Conclusions.** Based on the data from observation it was found that the competitors most often applied hand techniques (throwing forms, te-waza constituted 44% of all actions). The effectiveness of these throws, however, was not high (8% in females and 10% in males). Relatively rarely (5% of all actions) the judokas made attempts to perform groundwork using grappling forms. Conversely, the efficiency of katame-waza was high (18% in women and 27% in men). Champions, more often than vice-champions tried to win using grappling in a horizontal position. Katame-waza (grappling) turned out several times more effective than nage-waza (throwing). The judges' scores included 40% of penalties, which indicates the competitors chose alternative methods to gain superiority over their opponents. Most often, the first competitor who gained superiority was the winner.

## Introduction

Success in combat sports depends on multiple components. Optimal level of motor fitness, often discussed in literature on the topic, is necessary in such sports [1]. Body constitution and composition [2] are other important factors and mental training is essential [3]. The most important, however, is technical and tactical training, involving the ability to adjust the competitor's own actions to his/her opponent's actions, knowledge of strong and weak points of the opponent and proper selection of methods and elements of combat. As confirmed by research, higher levels of motor fitness are not absolutely necessary to win in a direct bout [4].

Like other combat sports, judo involves the application of different methods to gain points. The competitors are scored for throwing (nage-waza), standing techniques (tachi-waza) and groundwork (ne-waza), holding or pinning techniques (osaekomi-waza), joint locks (kansetsu-waza) and chokeholds (shime-waza).

The competitors may also win when penalties are scored for the opponent. This way of scoring is quite common, particularly during the most important tournaments with the best competitors [5]. Therefore, a detailed analysis of the initial actions performed by the best judokas may be helpful while planning the training [6]. Although evaluation of the competitors' actions is subjective and the rules and interpretation of rules change [7], trainers often seek model solutions in combat [8,9].

The main cognitive goal of the study was to determine the effectiveness of attacks during judo matches. An attempt was made to compare offensive actions of male and female judokas, silver and gold medalists and the competitors from different weight categories, according to the accepted classification [10]. The application goal involved formation of training hypotheses and methodological directives as for optimization of strategies and tactics for each competitor to apply them combat with his/her potential opponents during international events.

## Material and methods

The study involved a review of video and DVD recordings of final Olympics in Beijing (2008), World Championships in Cairo (2005) and World Cup tournaments in Warsaw (2005-2008). The actions of the male and female competitors were analysed in 54 combats (with the accuracy to 10-second time sequences). The total time of all combats was 3 hours, 17 minutes and 33 seconds.

According to the method of combat dynamics developed by Kalina [11] all actions performed within the 10-second periods of each combat were recorded (on observation sheets): attacks and counterattacks (throwing, holding, chokeholds and joint locks), and defence without counterattack. The effectiveness of these actions, preparation, breaks and judges' decisions were evaluated.

As sometimes the match ends before the settled time and no party has a chance of counterattack – particularly when the contest is resolved several seconds after starting the combat, the score in such extreme cases may be 1:0. "The basic descriptive criteria of judo include: the applied elements of combat (e.g. soei-nage), attacks preceded by feints, kinds of feints, the score, current result in a given sequence of the match, the method of combat applied (in a given sequence or during several consecutive sequences), penalties and violation of rules, contusions and causes of contusions, other incidents, the time of longer breaks and the final result of the match" [11, p. 73].

For the analysis and presentation of attacks, Kodokan Judo rules were accepted involving the division into throwing techniques (nage-waza) in a vertical position, throws with falls, sacrifice techniques (sutemi-waza) and grappling forms (katame-waza) in a horizontal position [12].

The throwing techniques include: te-waza (hand throws), goshi-waza (hip throws), ashi-waza (leg throws), sutemi-waza (sacrifice throws). According to Kodokan Judoclassification, the sutemi-waza group includes ma-sutemi-waza (simple sacrifice throws, the thrower falls directly backwards) and yoko-sutemi-waza (sacrifice throws, the thrower falls onto his side); however, due to the limited number of the registered throws

belonging to both categories, they are jointly presented as sutemi-waza.

The grappling techniques include: osaekomi-waza (holding or pinning), shime-waza (chokeholds) and kansetsu-waza (joints or joint locks).

Officially, Japanese terms are used for the techniques.

Video or DVD recordings of judo matches allow to freeze the image and repeat combat sequences, which is an additional advantage of secondary observation.

96 world leading judokas were subjected to analysis. Most of them were Japanese (n=14), others were Russian (n=9), French (n=8) and Chinese (n=7).

For each category of action, an arithmetic mean was calculated with standard deviation (SD), the number of successful actions, the number of undertaken actions and the effectiveness of different combating methods (the ratio of successful to undertaken actions). The between-group differences were calculated using chi-square and Student-*t* tests.

## Results

628 actions (throws or holds) were observed in 54 combats, including 58 (9.23%) successful actions. The most often applied techniques included throws (nage-waza) in a vertical position (tachi-waza). Grappling forms (katame-waza) and groundwork (ne-waza) were rarely used (5.72% of all noted attacks). The ne-waza techniques were more effectively performed, with almost every fourth (23.53%) action scored, while 8.42% of the throws were assessed by the judges. Right-sided techniques were more often used, however, the differences turned out insignificant.

Hand throws (te-waza) were the most often used (both by the male and female competitors) offensive techniques. These techniques are usually performed by the competitors who have strong arms and are well trained in terms of strength. The second most often applied techniques were leg throws (ashi-waza), especially by the female competitors ( $p < 0.05$ ). They require mainly speed training. Hip throws (goshi-waza) and sacrifice throws (sutemi-waza) were relatively rare. Groundwork (ne-waza) was very rare (Fig. 1), but its effec-

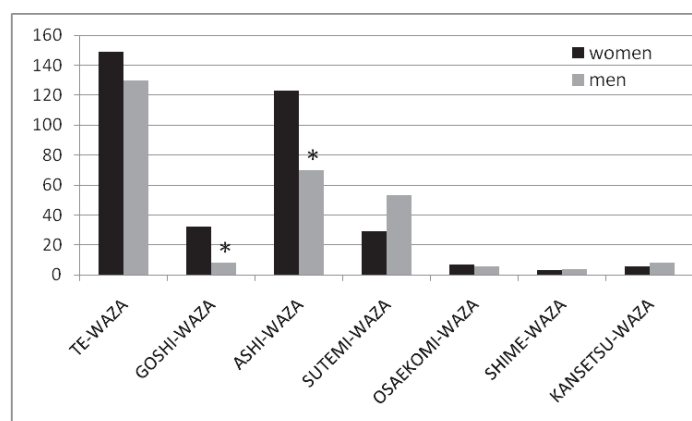


Fig. 1. The number of offensive actions used by the judokas (male and female)

tiveness was higher (statistically significant differences were noted between the frequency of throws and grapples at  $p < 0.001$  and between the effectiveness of throws and grapples at  $p < 0.001$ ). Holding or pinning techniques (osaekomi-waza) proved most effective, both for the male and female judokas. No significant differences were noted between the male and female competitors as for the effectiveness of their actions (Fig. 2).

After having accepted the division into light (48, 52 and 57 kg for women and 60, 66 and 73 kg for men), middle weight (63 and 70 kg for women and 81 and 90 kg for men) and heavy (78 and +78 kg for women and 100 and +100 kg for men) weight categories, it was found that hand throws were most often performed by the competitors (both male and female) belonging to light weight category and most seldom by the heaviest competitors. Leg throws were most often performed by middle weight competitors and hip throws – by heavy weight ones. The lightest female judokas turned out ineffective when performing ne-waza attacks. The females belonging to middle weight category most effectively performed leg throws, sacrifice throws and holding techniques while those belonging to heavy weight category most effectively performed hip throws.

It is of note that the judokas belonging to light weight categories effectively performed only hand throws and joint locks, the actions requiring substantial strength, especially of the upper limbs. Conversely, the middle and light weight competitors were in 100% effective in osaekomi-waza techniques.

The data obtained from the observation were next considered in relation to specific elements of attack, namely specific throws and grapples. 27 throws and 8 grapples that were most often used by the judokas were identified in the analysed combats (the actions performed at least twice). The most often performed techniques included: uchi-mata ( $n=72$ ), kuchiki-taoshi ( $n=66$ ), soei-nage ( $n=48$ ), obi-tori-gaeshi ( $n=45$ ) and te-guruma ( $n=44$ ). The women most often performed the throws: uchi-mata ( $n=55$ ), next kuchiki-taoshi ( $n=36$ ) and soei-nage ( $n=34$ ). The men most often performed: obi-tori-gaeshi ( $n=33$ ), kuchiki-taoshi ( $n=30$ ), te-guruma, kata guruma and o-uchi-gari (total –  $n=19$ ). As for grapples, kesa-gatame (by women) and joint-lock ude-hishigi-juji-gatame (by men) were most often performed.

The female judokas were most effective in o-soto-gari (leg throw technique). Among the hand throws, te-guruma was the most effective and among hip throws – sode-tsuri-komi-goshi (Fig. 3). Among the groundwork techniques (ne-waza) the

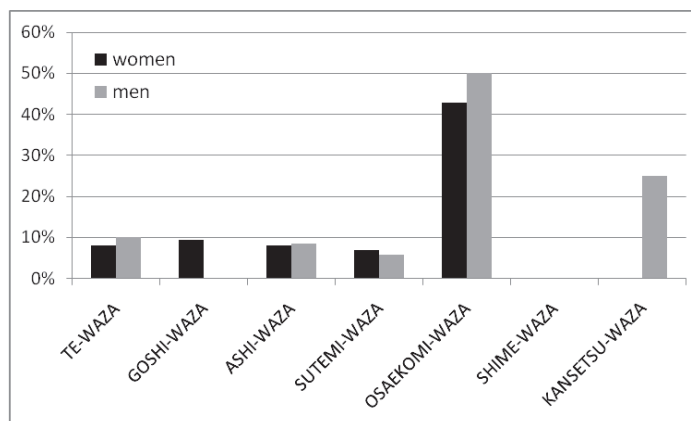


Fig. 2. The effectiveness of offensive actions used by the judokas (male and female)

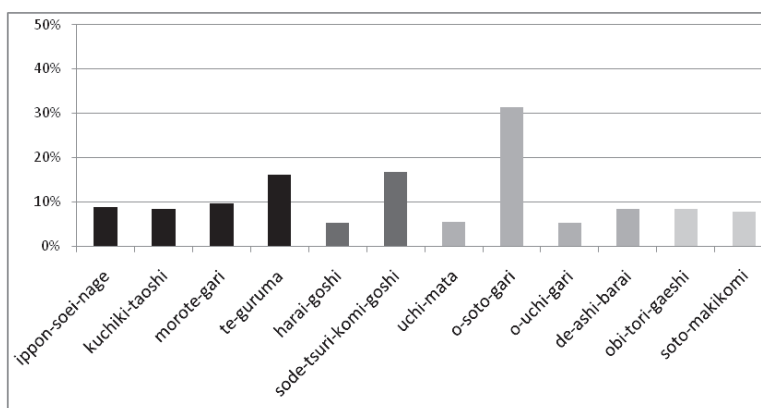


Fig. 3. Effectiveness of different throws performed by female judokas. The throws performed at least twice and at least once effectively performed are considered

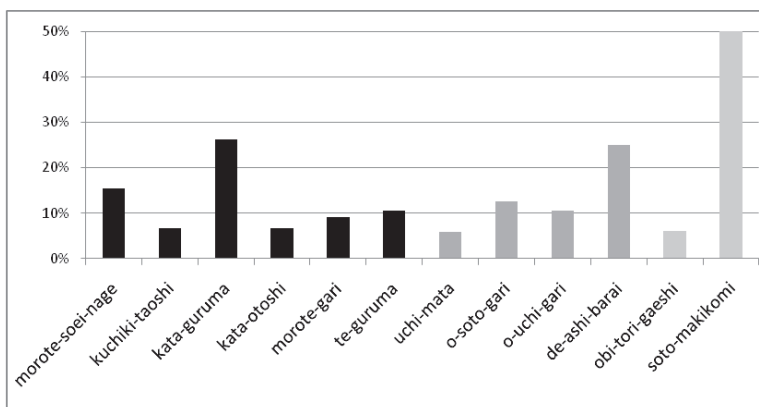


Fig. 4. Effectiveness of the throws performed by male judokas. The throws performed at least twice and at least once effectively performed are considered

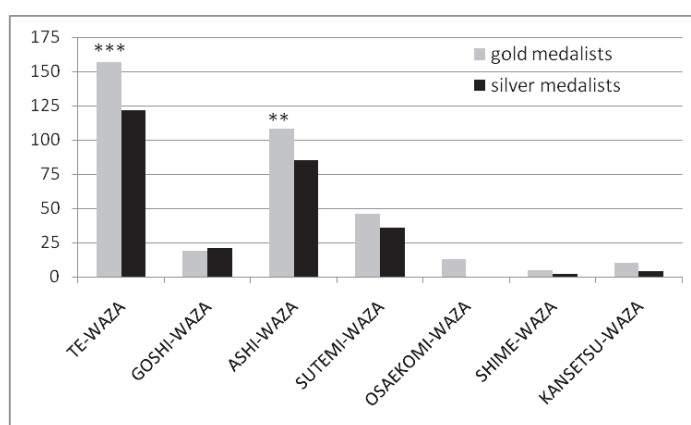


Fig. 5. The number of offensive actions performed by gold and silver medalists – world champions in judo

Tab. 1. The scores of male and female competitors

	koka	yuko	waza-ari	ippon	shido
women	7	12	4	12	25
men	4	13	3	13	21

female judokas most effectively performed kesa-gatame and kami-shiho-gatame. The most effective throw of the male judokas was soto-makikomi (sacrifice throw). High effectiveness was also noted in kata-guruma (hand throw) and de-ashi-barai (leg throw) (Fig. 4).

As for ne-waza, yoko-shiho-gatame, kami-shiho-gatame and ude-garami joint lock were most effectively performed by male competitors.

The comparison of gold and silver medalists during the analysed tournaments revealed the biggest differences in holding frequency ( $p < 0.01$ ). The champions significantly more often performed te-waza ( $p < 0.001$ ) and ashi-waza ( $p < 0.01$ ) throws and vice champions – goshi-waza throws, but the differences were statistically insignificant (Fig. 5). Gold medalists more effectively performed all kinds of actions, which seemed obvious. The biggest differences were noted in the effectiveness of hand throws ( $p < 0.001$ ).

Almost half (48%) of the reviewed combats did not exceed the period of five minutes, as they were won by ippon. The mean time of all combats was 3 minutes and 38 seconds. On average, the women fought longer (3 minutes, 56 seconds) than the men (3 minutes 20 seconds). Every tenth combat (9%) ended with tied score and was added the period up to the first point (gold score). Penalties (shido) made 42% of the judges' score. The penalties were given at the beginning and at the end of combat. The scores for technical actions included yuko and ippon, ending the fight (Table 1). In most of the combats, the competitor who first gained superiority, either by technical action or penalty given to the opponent, won the match. Bigger differences in scores of particular competitors were noted only in 9% of all studied combats.

## Discussion

It has been confirmed by research that judokas are more effective in ne-waza offensive actions [13-15]. The effectiveness of grappling techniques was on average from 14% [13] to 86% [14] in some studies. Among the ne-waza techniques, the most effective ones included holding or pinning techniques (osaekomi-waza) [13-15]. The effectiveness of offensive actions involving standing techniques (tach-waza) was often presented considering throwing techniques (nage-waza), according to Kodokan Judo classification. During the All Poland Judo Classify Tournament in 2004 [15], the judokas most effectively performed sacrifice throws (sutemi-waza) and least effectively – leg throws (ashi-waza). A similar trend was observed during world tournaments [13]. During both tournaments, goshi-waza throws were the rarest and te-waza throws – the most frequent.

Currently, both during classify [13-16] and final tournaments, the most frequent throwing techniques included te-waza (47% of all throws in the studied sample) as well as leg grappling techniques (kuchiki-taoshi, morote-gari, kata-otoshi). Whereas during the Atlanta Olympics in 1996, kuchiki-taoshi made 5% of all throws [17], in the studied combats from 2005-2008, they made 11% of all throws. During recent twelve years, the frequency of leg and hip throws decreased [17,18]. This may change soon, as the new regulations [12] make it difficult to use hand throws.

Technical and tactical judo training is a complex process. It may be simplified by focussing on the effectiveness of throws applied during competitions. Preparatory training [8,9] and defensive actions [19] are essential. Numerous studies suggest that the competitors can effectively defend themselves against throws and grapples [19]. The alternative me-

thods of gaining superiority over the opponent include penalties. Even in younger age groups, they are the main reason of scores given to competitors [20]. Therefore, this aspect should not be ignored during training.

Combat methods and techniques, however, largely depend on the regulations [21]. Changes in regulations resulted in changes in the methods and techniques used by judokas. Sometimes, they contributed to winning matches by other competitors. During recent years, the frequently modified regulations entail some alterations of the training or methods used by practitioners. Recent modifications, not allowing to grapple below the waist exclude a large number of throws belonging to the canon of judo. The authorities of International Judo Federation explain these modifications by the necessity of making the combats more spectacular and gaining sponsors. This idea seems right. However, it is important to determine what factors affect the attractiveness of combat sports. Some utilitarian values of judo as martial art are also essential and therefore, should be presented.

## Conclusions

The effectiveness of ne-waza grappling techniques is several times higher than that of throws, therefore emphasis should be paid to these techniques during training.

The differences in the frequency and effectiveness of offensive actions between male and female judokas, especially hand throws, indicate a high correlation between technique selection and the judokas' physical condition and strength training.

The number of penalties given to the competitors indicates this may be an alternative way to throwing and grappling techniques, of gaining superiority or even winning.

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