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Judoists' tactical and technical efficiency during the World Championships in 2014 and 2015

Marek Adam

Gdansk University of Physical Education and Sport, Poland, marek.adam@awf.gda.pl

Piotr Klimowicz

Technical School of Bialystok, Poland

Ryszard Pujszo

Centre of Education in Physical Culture and Sport, Kazimierz Wielki University, Bydgoszcz, Poland

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Authors' Contribution:

- A Study Design
- B Data Collection
- C Statistical Analysis
- D Data Interpretation
- E Manuscript Preparation
- F Literature Search
- G Funds Collection

Marek Adam¹ ABCDEFG, Piotr Klimowicz² ABCDEFG, Ryszard Pujso³ ABCDEFG

¹ Gdansk University of Physical Education and Sport, Poland

² Technical School of Bialystok, Poland

³ Centre of Education in Physical Culture and Sport, Kazimierz Wielki University, Bydgoszcz, Poland

abstract

- Background** The paper presents an analysis the technical-tactical preparation of judoists competing in men's individual World Championships in 2014 and 2015. These tournaments were held in accordance with the new provisions which will also apply during the Olympic Games in Rio de Janeiro in 2016.
- Material/Methods** A classification was made of the national teams prevailing in these competitions. The analysis of technical-tactical preparation was based on efficiently performed attacks, for the execution of which athletes received judges' points.
- Results** The registered attacks allowed for an evaluation of the efficiency of particular groups of throws and holds used in a judo fight and for a classification of techniques that prevailed during these competitions.
- Conclusions** The collected material allows predicting the efficiency of judoists' technical-tactical preparation during subsequent tournaments and adjusting individual training programs adapting them to the current requirements and regulations of sports combat.
- Key words** combat sports, groups of techniques, dominant attacks

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- Corresponding author:** Prof. nadzw. dr hab. Marek Adam; Gdansk University of Physical Education and Sport, Dep. of Combat Sports 80-336 Gdańsk, Poland, str. K. Górskiego 1; Phone: +4858 554-71-72, e-mail: awfadammarek@wp.pl
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INTRODUCTION

The growing interest in and the number of participants in judo competitions necessitates searching for factors that may determine an increase in its efficiency. Registering and analysing the World Championships and the Olympic Games in judo allow determining the most efficient elements of judoists' technical and tactical preparation which influence their success during sports competitions [1, 2, 3]. Changing rules of competition require an objective assessment of the current elements of this preparation [4, 5, 6]. The World Judo Championships held in 2014 and 2015 were important qualifiers for the Olympic Games in Rio de Janeiro in 2016. The tournaments were held in accordance with the new sports and refereeing rules that will also be in force during the upcoming Olympics. The athletes' individual successes during these Championships will put them in the role of favourites also during the Olympic competition. The dominant teams at the World Championships in 2014 and 2015 are also expected to be successful during the Olympic Games in Rio de Janeiro in 2016. Groups of techniques that judoists performed the most efficiently during the World Championships in 2014 and 2015, and the techniques that dominated then, should define the efficient attacks during the upcoming Olympic Games.

The aim of the paper was to define the prevailing judo techniques and to evaluate the efficiency of the applied groups of throws and holds after the introduction of the new rules of sports competition.

MATERIAL AND METHOD

The research material consisted of video recording of 1,092 efficient attacks with a total of 8,115 points, registered during 846 fights at the World Championship in Chelyabinsk (RUS) between 25-30 Aug. 2014 and at the World Championships in Astana (KAZ) between 24-29 Aug. 2015. The analysis included only men's individual competitions in which 812 judoists' from 130 national teams participated. An attack was rendered efficient if it was assessed by the judge as: *ippon* - 10 points, *waza ari* - 7 points or *yuko* - 5 points [7]. The classification of techniques was based on the Kodokan Judo [8]. While registering the techniques, it was assumed that a throw defined by the Kodokan Judo [9, p.23] as *seoi otoshi* would be analysed in the paper as *seoi nage* [11, p.88,100]. In identifying throwing and grappling techniques, a use was made of materials prepared by professionals and outstanding judoists which describe ways to execute attacks using these techniques [10, 11, 12, 13, 14, 15, 16].

The spelling and naming was adopted according to the Kodokan Judo Japanese-English dictionary [17]. Registration of fights was made using standard video and audio means, and then the efficient elements were recorded with a graphic method [18].

The classification of places taken by the leading teams was drawn up having regard to the three criteria determining their order, according to the adopted formula:

$$k = k1 + k2 + k3$$

where:

k - classification of the national team based on individual athletes' achievements

k1 -classification of medals

k2 -classification of points, in which the sum of points determined the order of places (1st place - 9 points, 2nd place - 5 points, 3rd place - 3 points, 4th place - 2 points and 5th place - 1 point)

k3 - classification specifying the mean number of points per one representative

The order of prevailing judo techniques was defined by three criteria, as determined by the formula:

$$K = K1 + K2 + K3$$

where:

K - classification of dominant judo techniques during the competition

K1 - classification of techniques based on the number of scored *ippon* assessments

K2 - classification of techniques based on the number of efficient attacks (given a score by a judge)

K3 - classification of techniques based on points awarded for efficiently executed techniques

The efficiency of attacks index (Ea) was determined on the basis of the following formula:

$$Ea = (n \times I + n \times W + n \times Y) / N$$

where:

Ea - efficiency of attacks index

n - the number of attacks: I - assessed as *ippon* (10 pts.),

W - assessed as *waza ari* (7 pts.), Y - assessed as *yuko* (5 pts).

N - the number of analysed bouts

RESULTS

During the World Championships in 2014 and 2015 representatives of Japan dominated in all criteria of individual achievements: in the classification of medals - k1, in the classification of points - k2, and in the mean number of points per one representative - k3. Further places were taken by representatives of France and Korea and the representatives of Russia, who had a low place in the classification of medals (k1), while in the other qualifying criteria (k2 and k3), they were only behind Japanese athletes (Tab. 1).

The competitors used throwing techniques more than three times more efficiently (*nage waza* - 77%) than holds (*katame waza* - 23%) - Fig. 1. Also in the group of throws athletes executed throws from a standing position (*tachi waza* - 76%): foot throws (*ashi waza* - 36%), hand throws (*te waza* - 29%) and hip throws (*koshi waza* - 11%) three times more efficiently than "sacrifice" throws with a tactical fall (*sutemi waza* - 24%), such as: side sacrifice (*yoko sutemi waza* - 14%) and back sacrifice (*ma sutemi waza* - 10%) - Fig. 2. In the group of holds, athletes most efficiently performed pinning techniques (*osaekomi waza* - 65%) and then, with similar efficiency, joint lock techniques (*kansetsu waza* - 18%) and chokes (*shime waza* - 17%) - Fig. 3.

While assessing all groups of judo techniques efficiently used by athletes with a use of the efficiency of attack index "Ea", it was found that the most efficient attacks were throws from the group of foot techniques (*ashi waza* - Ea = 2.629) and hand techniques (*te waza* - Ea = 2.178), next pinning techniques (*osaekomi waza* - Ea = 1.407) and throws from the group of side sacrifice (*yoko sutemi waza* - Ea = 1.054). In terms of the efficiency of attack, the next group of techniques were hip throws (*koshi waza* - Ea=0.810) and back sacrifice throws (*ma sutemi waza* - Ea = 0.734). The lowest values of this index were obtained in groups of holds, such as joint locks (*kansetsu waza* - Ea = 0.402) and chokes (*shime waza* - Ea = 0.378) - Fig. 4.

During the analysed World Championships, athletes skilfully and efficiently used sixty-one techniques (including 47 throws and 14 holds) classified by the Kodokan Judo [2, 3]. Thirty dominant techniques registered during these competitions are presented in Table 2. The first criterion (K1) allowed classifying the techniques that most frequently ended a bout before the regular time (assessed as *ippon*). They included: modified scarf hold (*kuzure kesa gatame*), inner thigh reaping throw (*uchimata*), cross armlock (*ude hishigi juji gatame*), shoulder throw (*seoi nage*), sliding collar strangle (*okuri eri jime*), etc. In contrast, the frequency of efficiently executed attacks, as well as their point values (K2, K3), indicted the dominance of such techniques as: shoulder throw (*seoi nage*), inner thigh reaping throw (*uchimata*), modified scarf hold (*kuzure kesa gatame*), one-armed shoulder throw (*ippon seoi nage*), small inner reap (*kouchi gari*), etc. Taking into account all three criteria of efficiently executed attacks (K1, K2, K3), the sequence of techniques that dominated during the analysed World Championships was defined, and these were: inner thigh reaping throw (*uchimata*), shoulder throw (*seoi nage*), modified scarf hold (*kuzure kesa gatame*), small inner reap (*kouchi gari*), one-armed shoulder throw (*ippon seoi nage*), etc. - Tab. 2.

Table 1. Men's judo teams dominant during the World Championships in 2014 and 2015

| k | National team | k1 | k2 | k3 |
|----|----------------------|----|----|----|
| 1 | Japan | 1 | 1 | 1 |
| 2 | France | 2 | 3 | 4 |
| 3 | Korea | 3 | 4 | 3 |
| 4 | Russia | 9 | 2 | 2 |
| 5 | Georgia | 5 | 5 | 5 |
| 6 | Kazakhstan | 4 | 6 | 8 |
| 7 | Mongolia | 5 | 7 | 10 |
| 8 | Greece | 7 | 10 | 6 |
| 9 | the Czech Republic | 7 | 9 | 11 |
| 10 | Germany | 10 | 8 | 12 |
| 11 | North Korea | 12 | 13 | 9 |
| 12 | United Arab Emirates | 15 | 13 | 6 |
| 13 | Canada | 11 | 11 | 13 |
| 14 | Brazil | 15 | 11 | 14 |
| 15 | Cuba | 12 | 16 | 15 |
| 16 | Ukraine | 15 | 13 | 18 |
| 17 | Hungary | 12 | 16 | 19 |
| 18 | Israel | 18 | 18 | 16 |
| 19 | Belgium | 18 | 20 | 17 |
| 20 | Uzbekistan | 18 | 18 | 20 |

Table 2. Judo techniques dominant during the World Championships in 2014 and 2015

| K | Name of the technique | K1 | K2 | K3 |
|----|--|----|----|----|
| 1 | Uchimata (inner thigh reaping throw) | 2 | 2 | 2 |
| 2 | Seoi nage (shoulder throw) | 4 | 1 | 1 |
| 3 | Kuzure kesa gatame (modified scarf hold) | 1 | 3 | 3 |
| 4 | Kouchi gari (small inner reap) | 7 | 5 | 5 |
| 5 | Ippon seoi nage (one-armed shoulder throw) | 10 | 4 | 4 |
| 6 | Ude hishigi juji gatame (cross armlock) | 3 | 12 | 6 |
| 7 | Ura nage (back throw) | 6 | 10 | 11 |
| 8 | Sode tsurikomi goshi (sleeve lift-pull hip throw) | 13 | 9 | 9 |
| 9 | Okuri eri jime (sliding collar strangle) | 5 | 15 | 12 |
| 10 | Tai otoshi (body drop) | 10 | 10 | 12 |
| 11 | Uki waza (floating throw) | 20 | 6 | 7 |
| 12 | Osoto gari (large outer reap) | 10 | 13 | 14 |
| 13 | Hikkomi gaeshi (pulling-down sacrifice throw) | 27 | 6 | 7 |
| 14 | Tate shiho gatame (straight four-corner hold) | 7 | 19 | 15 |
| 15 | Ouchi gari (large inner reap) | 27 | 6 | 10 |
| 16 | Kuzure kami shiho gatame (modified upper four-corner hold) | 9 | 21 | 17 |
| 17 | Soto makikomi (outer wrap-around throw) | 20 | 13 | 15 |
| 18 | Sumi otoshi (corner drop) | 16 | 16 | 18 |
| 19 | Kosoto gake (small outer hook) | 16 | 20 | 19 |
| 20 | Uchimata sukashi (inner thigh reaping throw slip) | 20 | 16 | 20 |
| 21 | Kata gatame (shoulder hold) | 13 | 25 | 23 |
| 22 | Kosoto gari (small outer reap) | 20 | 22 | 22 |
| 23 | Deashi harai (forward foot sweep) | 16 | 28 | 26 |
| 24 | Osoto otoshi (large outer drop) | 20 | 25 | 25 |
| 25 | Koshi guruma (hip wheel) | 25 | 22 | 24 |
| 26 | Harai goshi (hip sweep) | 13 | 32 | 28 |
| 27 | Yoko shiho gatame (side-locking four-corner hold) | 19 | 28 | 27 |
| 28 | Tani otoshi (valley drop) | 40 | 16 | 21 |
| 29 | Ogoshi (large hip throw) | 27 | 32 | 31 |
| 30 | Hon kesa gatame (scarf hold) | 31 | 31 | 29 |

61 efficiently performed judo techniques were registered

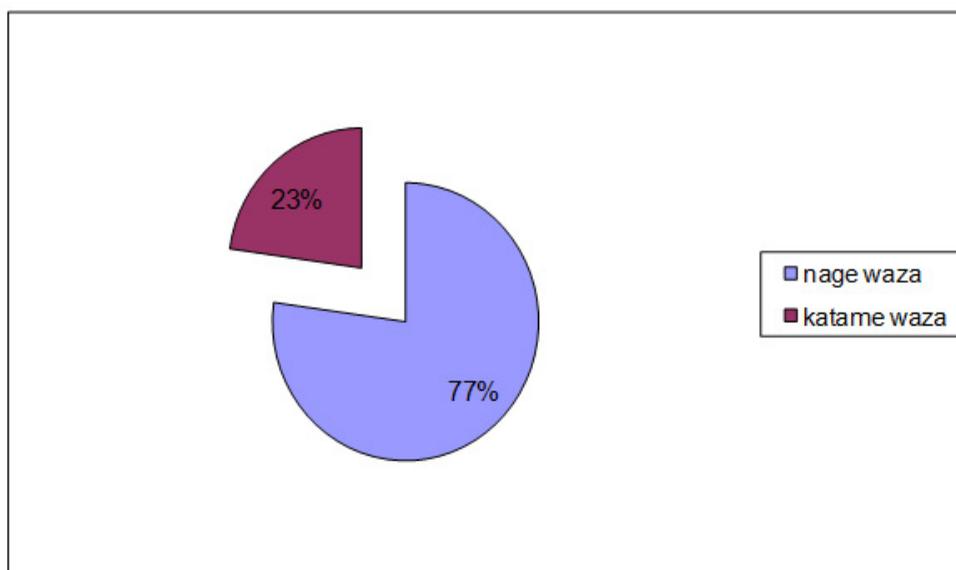


Fig.. 1. Points earned using the techniques of throws (*nage waza*) and holds (*katame waza*) during the World Championships in 2014 and 2015

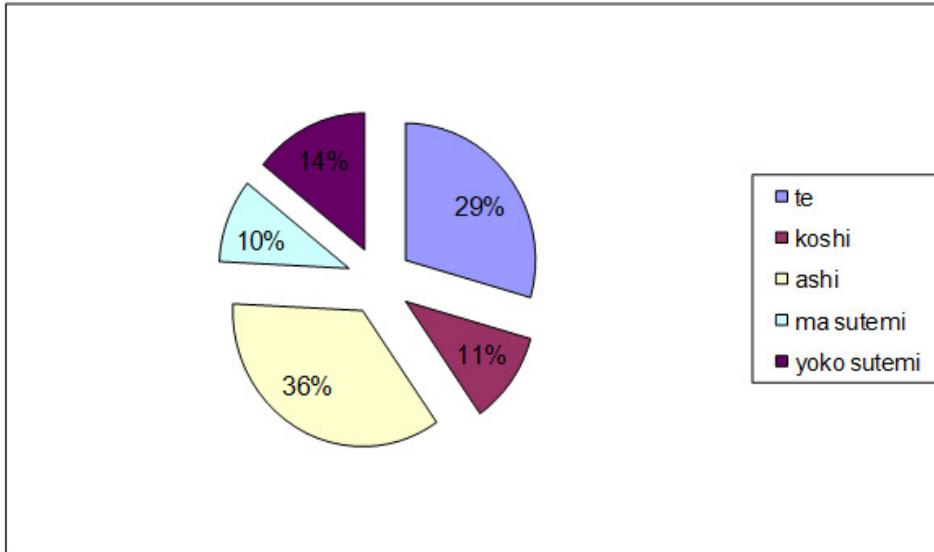


Fig. 2. Points earned using throws during the World Championships in 2014 and 2015

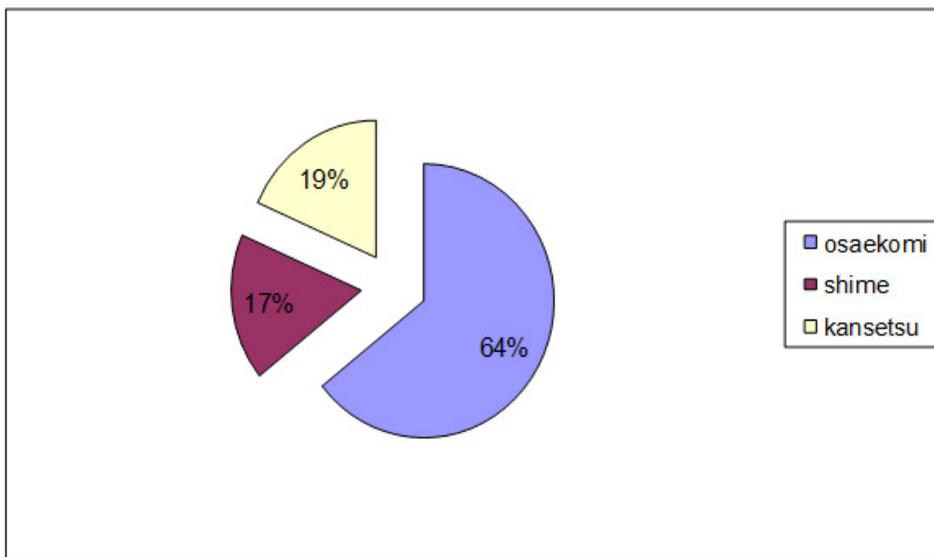


Fig. 3. Points scored using holds during the World Championships 2014-2015

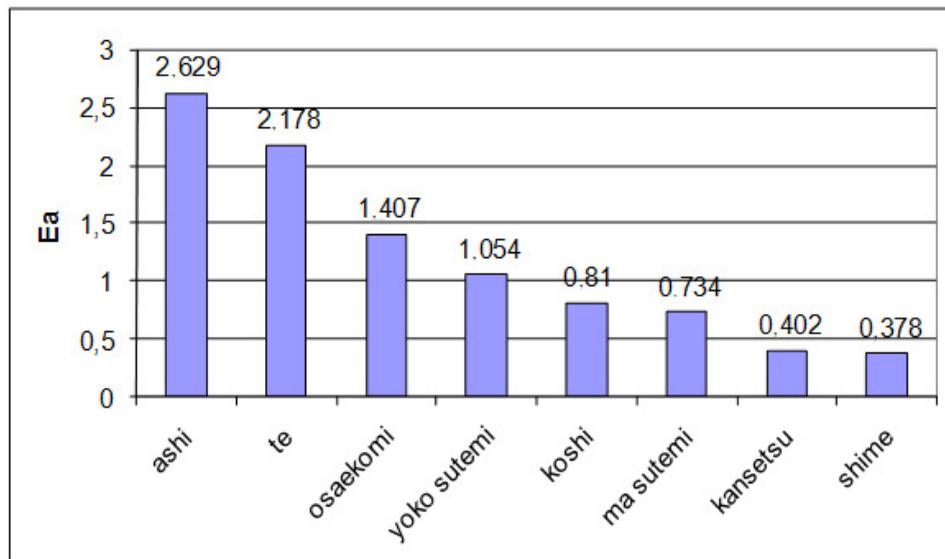


Fig. 4. The efficiency of attack (Ea) of groups of judo techniques during the World Championships in 2014-2015

DISCUSSION

During the World Judo Championships in 2014 and 2015 in men's competition, medals were won by athletes from 20 countries, who fought 313 bouts having a significant impact on the value of the obtained index of tactical and technical preparation. The results obtained during the past Olympic Games and the World Championships allow concluding that the dominant male judo representations were and still are: Japan, Korea, France and Russia (until 1991 USSR) [19, 20]. Taking into consideration the hitherto sports scores and Olympic qualification, one should believe that competitors from Georgia, Germany, Mongolia, Brazil and, little visible during the last World Championships, contestants from the Netherlands and Azerbaijan will also strive to achieve the highest sports successes during the Olympic Games in Rio de Janeiro in 2016 [21]. Probably, they will also be joined by athletes from the national teams which won single medals during the World Championships preceding the Olympics (Tab. 1).

Analyses of athletes' technical-tactical preparation during the major sports competitions allow determining the efficiency of using techniques of throws (*nagewaza*) and holds (*katame waza*), usually maintaining the proportion of 70-80% to 30-20%. While assessing the efficiency of the application of successive groups of throws (*nage waza*), the advantage of hand throws (*te waza*) and foot throws (*ashi waza*), representing about 70-80%, was found over other groups of throws: hip ones (*koshi waza*) and sacrifice ones (*ma* and *yoko sutemi waza*), whose efficiency was around 20-30%. In the group of holds, pinning techniques (*osaekomi waza*) contributed to about 60-70% efficiency, while joint lock and choking techniques (*kansetsu* and *shime waza*) accounted for 30-40% of the efficiency. Other authors' research also confirms similar values of the indices of judoists' technical-tactical preparation [22-27]. Despite repeatedly implemented major revisions to the sports rules of judo fight, the analysis conducted here also confirms similar proportions of the efficiency of

groups of techniques used during the World Championships in 2014 and 2015. In comparison to previous research, one may notice a certain increase in the efficiency of attack with a use of techniques from the group of side sacrifice throws (*yoko sutemi waza*), but confirmation of this trend requires further analysis (Fig. 1-4).

The changes of the regulations introduced during sports competition would prevent the use of many judo throws which are classified by the Kodokan Judo. Also the limited time of ground fight (*ne waza*) during sports competitions would limit opportunities for an efficient use of the techniques, especially from the group of *shime* and *kansetsu waza* (chokes and joint locks). The Kodokan Judo classification of judo techniques identifies 67 throwing techniques and 27 hold ones; however, the existing registration of judo sports fights suggests that, as a result of the restrictions imposed on athletes, they use only 70-80% of the classified techniques [2,3]. The registration of judo techniques conducted during the analysed competitions allowed identifying 47 throws (*nage waza*) and 14 holds (*katame waza*). Table 2 lists thirty dominant techniques which were most efficiently used by judoists. The techniques that most often contributed to resolving the fight before the end of the regular time (K1) included: varieties of the modified scarf hold (*kuzure kesa gatame*), inner thigh reaping throw (*uchimata*), cross armlock (*ude hishigi juji gatame*), shoulder throw (*seoi nage*) and sliding collar strangle (*okuri eri jime*). Assessing the frequency of efficiently executed attacks (K2), it was found that throwing techniques were more often efficiently executed than holds - with the exception of the varieties the modified scarf hold (*kuzure kesa gatame*). There was also a high frequency of efficiently performed techniques such as: floating throw (*uki waza*), pulling-down sacrifice throw (*hikkomi gaeshi*) and large inner reap (*ouchi gari*), which less frequently contributed to resolving the fighting before the end of the regular time. High frequency of an efficient execution of techniques (K2) was simultaneously correlated with receiving a considerable number of secondary points (K3). However, techniques such as: cross armlock (*ude hishigi juji gatame*) and sliding collar strangle (*okuri eri jime*) gave a substantial number of secondary points, thus affecting the higher values of the "K3" indicator.

In assessing the efficiency of attack of five groups of throws and three groups of holds with a use of the "Ea" index, it was found that during these competitions there was a certain gradation of techniques. There was a visible advantage of efficiently performed foot (*ashi waza*) and hand throws (*te waza*). The next most efficient techniques included pinning (*osaekomi waza*) and throws from the group of side sacrifice (*yoko sutemi waza*). The next group of techniques were hip throws (*koshi waza*) and throws from the group of back sacrifice (*ma sutemi waza*). The lowest values of this index were obtained with a use of the technique of holds, such as joint locks (*kansetsu waza*) and chokes (*shime waza*) - Fig. 4.

Analysis of this research area allows predicting the efficiency of judoists' technical-tactical preparation during subsequent tournaments and adjusting individual training programs with a view to the current requirements and regulations of sports fight.

CONCLUSIONS

The World Championships preceding the Olympic Games suggest athletes and teams that will be prospective victors during the upcoming Olympic Games in Rio de Janeiro in 2016.

1. Analysis of competitors' technical-tactical preparation allows specifying the elements of special training that will contribute to success during the Olympic competition.
2. During the analysed competition, the most efficient attacks included foot throws (*ashi waza*), in which the *uchimata* technique dominated, and hand throws (*te waza*), in which the *seoi nage* technique dominated.
3. The next group of the most efficient techniques were pinning techniques (*osaekomi waza*), in them *kuzure kesa gatame*.
4. These observations allow defining the correct direction of preparation to ensure success in the competition during the upcoming Olympic Games in Rio de Janeiro and major sporting events.

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