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PEDAGOGY

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Techniques utilised at 2017 Judo World Championship and their classification: comparisons between sexes, weight categories, winners and non-winners

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Abstract
Background. *Judo* throwing techniques are traditionally classified as *ashi-waza* (leg techniques), *te-waza* (arm techniques), *koshi-waza* (hip techniques) and *sutemi-waza* (sacrifice techniques). However, this classification has recently been criticised, and instead a 9-group classification system based on action characteristics (movement type, base of support, throw direction, and position of attack) has been proposed.
Problem and aim. To determine the throwing techniques that resulted in score using this classification and compare weight categories, sexes and medal/non-medal winners during the 2017 Senior Judo World Championship.
Method. The analysis included 756 throwing techniques that resulted in a score (over 601 matches) across the competition.
Results. There was an association between technique classification and sex ($c^2 = 15.64$; $p = 0.048$; Cramer`s $V = 0.144$): females scored more frequently using the techniques from group 3 compared with males ($c^2 = 6.93$; $p = 0.009$), whereas males scored more often using the techniques from group 8 compared with females ($c^2 = 5.55$; $p = 0.019$). A significant relationship between technique classification and weight category ($c^2 = 106.19$; $p < 0.001$; Cramer`s $V = 0.153$) was observed, but there was no association between technique classification and World Championship classification ($c^2 = 9.55$; $p = 0.298$; Cramer`s $V = 0.112$). Additionally, a limited number of throwing techniques resulted in more than half of all scoring situations during this competition.
Conclusions. Techniques types utilised by athletes differed according to sex and weight category, and that a few number of techniques were utilised in this top-level judo competition.

Introduction

In *judo* competitions, athletes can score by throwing, pinning or submitting their opponents (via strangle or elbow joint lock techniques) [Brousse, Matsumoto 1999]. Of these techniques, throwing techniques are most commonly utilised due to athletes spending more time in a standing position [Franchini *et al.* 2013]. Information relating to the techniques that are most likely to result in scoring can be utilised to direct the focus of judo ath-

letes' technical training. By simplifying the information, it can be utilised as part of the skill acquisition process to enhance learning of new judo athletes [Miarka *et al.* 2010].

Previous literature has studied a range of different aspects of judo matches in order to gather information pertaining to the ways in which athletes score and how judo matches are won or lost. The typical techniques applied by high-level judo athletes have been previously investigated [Adam *et al.* 2011] alongside the variation in the direction of attacks across different age groups [Calmet, Ahmaidi 2004] and in elite level athletes [Franchini *et al.* 2008]. Additionally, the system of attack [Calmet *et al.* 2006], the time structure of judo matches performed by different age groups for each sex [Miarka *et al.* 2012; Miarka *et al.* 2014], the match duration and its scoring and penalties actions [Calmet *et al.* 2017a, Calmet *et al.* 2017b], the impact of penalties on match outcome [Escobar-Molina *et al.* 2014], the pattern of grip dispute by judo athletes from different levels [Calmet *et al.* 2010] and its impact on a match result [Courel *et al.* 2014], and even the actions executed during wins and defeats have been investigated previously [Miarka *et al.* 2016]. Thus, much knowledge about judo matches pattern has been accumulated, especially in the last decade. Nevertheless, only few studies have focused on judo throwing techniques utilised in high-level competitions [Adam 2007; Adam *et al.* 2011]. This information is valuable for judo coaches, as they can train their athletes to master these skills and simultaneously develop counter-attacks to such techniques for athletes to use.

An important aspect of throwing technique execution in high-level judo matches that has not been thoroughly explored is the technique classification [Dopico *et al.* 2014]. Traditionally, judo throwing techniques are classified as *ashi-waza* (leg techniques), *te-waza* (arm techniques), *koshi-waza* (hip techniques) and *sutemi-waza* (sacrifice techniques) [Brousse, Matsumoto 1999], although some other classifications have been proposed [Geesink 2000; Gleeson 1967; Koizumi 1960; Sacripanti 2010]. However, recently, Dopico *et al.* [2014] have reasoned that the use of the judo traditional classification is limited, as it does not consider motor patterns of the techniques, meaning that, under this old system, different techniques are classified in the same category. To address this problem a new technique classification system was developed, containing nine different categories [Dopico *et al.* 2014]: 1) movement type – rotation, pushing or pulling, (2) base of support – standing on one or two feet, kneeling or lying on the back, (3) direction in which the opponent is thrown – backwards or forwards, (4) movement of the attacking leg – ipsilateral or contralateral, and (5) position of the attack on the opponent's body – inside leg or outside leg. This classification system is yet to be utilised in a high-level competition. Such an analysis could provide further information on the differences in the techniques utilised by medal winners and non-medal winners. Additionally, differences in techniques across sexes and weight categories can be further investigated. Therefore, the objectives of the present study were to analyse elite-level judo matches to: (1) determine which throwing techniques resulted in a score and classify these under the new system proposed by Dopico *et al.* [2014], and (2) compare results across weight categories, sexes and medal winners vs. non-medal winners.

2. Methods

2.1. Sample

Data were collected from www.judobase.org, which included all matches during the 2017 Senior Judo World Championships. A total of 799 matches were performed by 386 athletes, and there were 999 scoring situations. Within these, 756 throwing techniques resulted in a score (over 601 matches). The remaining 243 scoring situations were discarded as they were when athletes opponents sustained penalties, or scores obtained via strangle *(shime-waza*), joint-lock (*kansetsu-waza*) or immobilization (*osae-waza*) techniques. In the majority of the included matches, only one score occurred (78.9%). Other matches contained two scores (17.5%), three scores (3.0%), four scores (0.3%), and five scores (0.3%).

2.2. Ethical Issues

The results published on the International Judo Federation official website for the Judo World Tour statistics (www.judobase.ijf.org) were retrieved on 4th November 2017, after searching for the 2017 Senior Judo World Championship.

Previous research has drawn from this public video database [Calmet *et al.* 2017a; Calmet *et al.* 2017b]. There were no ethical issues related to the analysis and interpretation of these data, due to the video being housed on an open access website. In the present study, athletes' individual identification is not reported, as only the technique executed, and the results of the 2017 Senior Judo World Championship were collected.

2.3. Technique classification

The technique classification in the present study followed that which was proposed by Dopico *et al.* [2014], and is as follows:

(1) Techniques with turning action, forward throw, and two supporting feet (e.g., *o-goshi, koshi-guruma, seoi-nage, sode-tsuri komi goshi, seoi-otoshi*);

(2) Techniques with turning action, forward throw, and one supporting foot (e.g., *uchi-mata, harai-goshi, hane-goshi, ashi-guruma, o-guruma*);

(3) Techniques without turning action, ipsilateral leg direction, external zone, backward throw, and one supporting foot (e.g., o-soto-gari, o-soto-gake, o-soto-otoshi, o-soto-guruma, o-soto-gaeshi);

(4) Techniques without turning action, ipsilateral leg direction, inner zone, backward throw, and one supporting foot (e.g., *ko-uchi-gari, ko-uchi-gake, ko-uchi-makikomi*);

(5) Techniques without turning action, contralateral leg direction, inner zone, backward throw, and one supporting foot (e.g., *o-uchi-gari, o-uchi-gake, o-uchi-makikomi*);

(6) Techniques without turning action, contralateral leg direction, external zone, backward throw, and one supporting foot (e.g., *ko-soto-gake, de- ashi-harai, yoko-gake, o-uchi-gaeshi, tani-otoshi*);

(7) Techniques without turning action, contralateral leg direction, external zone, forward throw, and one supporting foot (e.g., *sasae-tsuri-komi ashi, hiza-guruma, harai-tsuri-komi-ashi*);

(8) Techniques without turning action, forward or backward throw, and two supporting feet (e.g., *ura-nage, ushiro-goshi, yoko-otoshi, sumi-otoshi, daki-wakare*);

(9) Techniques of supine position, forward throw, and back support (e.g., *tomoe-nage, sumi-gaeshi, hikikomi-gaeshi, yoko-tomoe-nage, uki-waza*).

2.4. Statistics

The frequency of each technique was determined and percentages for each of the 9 classification groups was calculated in relation to all scoring techniques. Chi-square (c^2) tests were utilised to verify any association between technique classification, sex, weight category and podium position in the competition followed by Cramer's – V effect size for the main comparisons. Corrected chi-square (c_c^2) values were used when necessary. Significance level was set at 5%. Data were analysed using the Statistica for Windows software (version 10, StatSoft Inc., Tulsa, USA).

3. Results

The top ten most used techniques were: *seoi-nage* (65 scoring executions, 8.6% of the total), *o-uchi-gari* (61 scoring executions, 8.1% of the total), *uchi-mata* (61 scoring executions, 8.1% of the total), *ko-uchi-gari* (48 scoring executions, 6.1% of the total), *ippon-seoi-nage* (35 scoring executions, 4.6% of the total), *ko-soto-gake* (31 scoring executions, 4.1% of the total), *sode-tsuri-komi-goshi* (31 scoring executions, 4.1% of the total), *sumi-otoshi* (29 scoring executions, 3.8% of the total), *o-soto-gari* (25 scoring executions, 3.3% of the total), *sumi-gaeshi* and *tai-otoshi* tied in the 10th position (23 scoring executions each, 3.1% of the total).

Table 1 presents the frequency of techniques that resulted in scores during the competition for each weight category and sex.

An association was observed between technique classification and sex ($c^2 = 15.64$; $p = 0.048$; Cramer`s V = 0.144). Specifically, females scored more frequently using the techniques from group 3 compared with males ($c^2 = 6.93$; $p = 0.009$), whereas males scored more often using the techniques from group 8 compared with females ($c^2 = 5.55$; $p = 0.019$).

There was a significant relationship between technique classification and weight category ($c^2 = 106.19$; $p < 0.001$; Cramer`s V = 0.153), however a significant relationship was not found between technique classification and tournament classification ($c^2 = 9.55$; $p = 0.298$; Cramer`s V = 0.112; Table 2).

As detailed above, the profile of scoring techniques was significantly different across males and females. For males, athletes from the 66kg weight category scored more frequently using type 1 techniques than athletes from the 73kg ($c^2 = 4.27$; $p = 0.039$), 81kg ($c^2 = 5.24$; $p = 0.022$), 100kg ($c^2 = 5.34$; $p = 0.021$), and +100kg ($c^2 = 6.65$; $p = 0.006$) weight categories. For type 2, athletes from the +100kg weight category scored more frequently compared with 60kg ($c^2 = 5.69$; $p = 0.017$), 66kg ($c^2 = 8.26$; $p = 0.004$), 73kg ($c^2 = 8.25$; $p = 0.004$), and 100kg ($c^2 = 3.85$; $p = 0.050$). The 60kg weight category did not score using the type 3 techniques and differed from the 66kg ($c_c^2 = 4.24$; $p = 0.039$), and +100 kg ($c_c^2 = 5.75$; $p = 0.016$) weight categories. Athletes from the 81kg weight category also did not score using type 3 techniques and differed from the 66kg ($c_c^2 = 5.23$; $p = 0.022$), 73kg ($c_c^2 = 4.13$; $p = 0.042$) and +100kg ($c_c^2 = 7.01$; $p = 0.008$) weight categories. The 81kg weight category scored more frequently using the type 4 techniques than the 73kg weight category ($c_c^2 = 5.12$; $p = 0.024$). The +100kg weight category did not score using the type 5 techniques and differed from the 90kg weight category ($c_c^2 = 5.06$; $p = 0.024$). For the type 7 techniques, the +100kg weight category presented a higher frequency of scores than the 60kg ($c_c^2 = 7.44$; $p = 0.006$), 66kg ($c_c^2 = 6.53$; $p = 0.011$), 73kg ($c_c^2 = 9.09$; $p = 0.014$), 81kg ($c_c^2 = 9.03$; $p = 0.003$) and 90kg ($c_c^2 = 4.04$; $p = 0.037$) weight categories. The 60kg weight category scored using the type 8 techniques more frequently than the 66kg ($c^2 = 7.42$; $p = 0.006$), while the 90kg weight category scored using them more often than the 66kg ($c^2 = 9.12$; $p = 0.003$) weight category. No association ($p > 0.05$) between weight category and scoring actions classification were observed for type 6 and 9 techniques for males.

For females, the 57kg weight category did not score using type 3 techniques and differed from 63kg ($c_c^2 = 7.072$; $p = 0.008$), 70kg ($c_c^2 = 3.93$; $p= 0.048$) and +78kg ($c_c^2 = 9.20$; $p = 0.002$) weight categories. The +78kg weight

Table 1. Frequency of technique classification and percentage of the total of technique scoring executions (value in parenthesis in percentage for the total for each weight category), during the 2017 Judo World Championship, for each weight category and sex.

	F48kg	F52kg	F57kg	F63kg	F70kg	F78kg	F+78kg	M60kg	M66kg	M73kg	M81kg	M90kg	M100kg	M+100kg
1	7 (23.3)	12 (29.3)	16 (34.8)	8 (18.2)	16 (26.2)	6 (17.1)	5 (16.7)	17 (27.9)	33 (44.0)[c]	26 (28.6)	19 (26.0)	21 (28.8)	14 (24.6)	7 (17.9)
2	4 (13.3)	8 (19.5)	7 (15.2)	7 (15.9)	6 (9.8)	6 (17.1)	7 (23.3)	6 (9.8)	6 (8.0)	8 (8.8)	10 (13.7)	11 (15.1)	7 (12.3)	11 (28.2)[d]
3[a]	2 (6.7)	4 (9.8)	0 (0.0)[k]	8 (18.2)	7 (11.5)	2 (5.7)	7 (23.3)[l]	0 (0.0)[e]	7 (9.3)	7 (7.7)	0 (0.0)[f]	3 (4.1)	3 (5.3)	5 (12.8)
4	5 (16.7)	2 (4.9)	3 (6.5)	5 (11.4)	4 (6.6)	3 (8.6)	0 (0.0)	3 (4.9)	7 (9.3)	2 (2.2)	9 (12.3)[g]	6 (8.2)	4 (7.0)	1 (2.6)
5	1 (3.3)	4 (9.8)	8 (17.4)	5 (11.4)	3 (4.9)	4 (11.4)	1 (3.3)	3 (4.9)	3 (4.0)	10 (11.0)	7 (9.6)	4 (5.5)	8 (14.0)	0 (0.0)[h]
6	2 (6.7)	3 (7.3)	5 (10.9)	4 (9.1)	8 (13.1)	7 (20.0)	8 (26.7)	11 (18.0)	10 (13.3)	12 (13.2)	10 (13.7)	6 (8.2)	5 (8.8)	2 (5.1)
7	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.3)	1 (1.6)	1 (2.9)	2 (6.7)	0 (0.0)	1 (1.3)	2 (2.2)	0 (0.0)	2 (2.7)	2 (3.5)	6 (15.4)[i]
8[b]	6 (20.0)[m]	5 (12.2)	4 (8.7)	5 (11.4)	5 (8.2)	5 (14.3)	0 (0.0)	14 (23)	5 (6.7)[j]	15 (16.5)	12 (16.4)	18 (24.7)	9 (15.8)	5 (12.8)
9	3 (10.0)	3 (7.3)	3 (6.5)	1 (2.3)	11 (18.0)	1 (2.9)	0 (0.0)	7 (11.5)	3 (4.0)	9 (9.9)	6 (8.2)	2 (2.7)	5 (8.8)	2 (5.1)

F = female; M = male; a = higher utilisation by females compared to males ($p < 0.05$); b = higher utilisation by males compared to females ($p < 0.05$); c = higher utilisation than M73kg, M81kg, M100kg and M+100kg for the same technique classification ($p < 0.05$); d = higher utilisation than M60kg, M66kg, M73kg and M100kg ($p < 0.05$); e = lower utilisation than M66kg, and M+100kg ($p < 0.05$); f = lower utilisation than M66kg, M73kg and M+100kg ($p < 0.05$); g = higher utilisation than M73kg ($p < 0.05$); h = lower than M90kg ($p < 0.05$); i = higher utilisation than M60kg, M66kg, M73kg, M81kg and M90kg ($p < 0.05$); j = lower than M60kg and M90kg ($p < 0.05$);k = lower than F63kg, F70kg and F+78kg ($p < 0.05$); l = higher than F78kg ($p < 0.05$); m = higher than M+78kg ($p < 0.05$).

category also scored more frequently using type 3 technique compared with 78kg ($c_c^2 = 4.20$; $p = 0.040$) weight category. The athletes from the 48kg weight category scored using type 8 technique more often than those from the +78kg ($c_c^2 = 4.963$; $p = 0.031$) weight category. No significant associations ($p > 0.05$) were observed between weight categories and type 1, 2, 4, 5, 6, 7 and 9 for female athletes.

Table 2. Frequency of technique classification and percentage of the total of technique scoring executions (value in parenthesis in percentage of total for each group), for female and male athletes, during the 2017 Judo World Championship, for medallists and non-medallists.

	Female		Male	
	Medallists	Non-medallists	Medallists	Non-medallists
1	16 (17.0)	54 (28.0)	42 (29.2)	95 (29.2)
2	22 (23.4)	24 (12.4)	15 (10.4)	49 (15.1)
3	12 (12.8)	18 (9.3)	9 (6.3)	16 (4.9)
4	7 (7.4)	15 (7.8)	11 (7.6)	20 (6.2)
5	12 (12.8)	14 (7.3)	15 (10.4)	21 (6.5)
6	9 (9.6)	28 (14.5)	16 (11.1)	40 (12.3)
7	2 (2.1)	3 (1.6)	4 (2.8)	9 (2.8)
8	8 (8.5)	21 (10.9)	24 (16.7)	49 (15.1)
9	6 (6.4)	16 (8.3)	8 (5.6)	26 (8.0)

4. Discussion

The main findings of the present study were: (1) the top 10 most frequently used techniques represented around 50% of all scoring techniques; (2) the techniques which male and female judo athletes scored with differed, with females scoring more frequently using type 3 techniques than males, and males scoring more frequently using type 8 techniques than females; (3) no association was observed between technique classification and World Championship classification; (4) in general, male judo athletes from the lightest weight categories used type 1 techniques more frequently, and type 2 and 7 less frequently than athletes from the heavier weight categories. No association between weight category and scoring actions classification were observed for type 6 and 9 techniques for males; (5) for females, athletes from the lightest weight category (48kg) scored more frequently using type 8 techniques than those from the heavier (+78kg), and no associations were observed between weight categories and type 1, 2, 4, 5, 6, 7 and 9 for female athletes.

The athletes analysed in the present study appeared to specialise in limited number of throwing techniques. Results showed that only eleven techniques contributed to 52% of all scoring actions. This is similar to previous literature which indicated that judo athletes typically utilise between five [Calmet 2010; Weers 1996] and 10 different techniques on competition [Franchini *et al.* 2008]. It is relevant to emphasise that they presented this level of specialisation despite the fact that the Kodokan recognises a total of 68 throwing techniques [Brousse, Matsumoto 1999] and that an even higher number was suggested when variations and innovative techniques were considered [Inman 2008]

Our results indicate that female judo athletes scored more frequently using techniques from classification 3 compared to male judo athletes. Classification 3 techniques are frontal attacks, which have been associated with ACL injury. Generally, female athletes are more prone to anterior cruciate ligament (ACL) injuries compared to male athletes [Akoto *et al.* 2017; Takahashi, Okuwaki 2017]. The knee is a common region for injury in judo and relationships between ACL injury and certain throws has been found previously [Akoto *et al.* 2017; Bromley *et al.* 2018; Koshida *et al.* 2010; Takahashi, Okuwaki 2017]. Specifically, it has been reported that receiving an *o-soto-gari* (a type 3 technique) attack is more commonly associated to anterior cruciate ligament injury in judo [Koshida *et al.* 2010]. The results of the present study show that frontal attacks are one of the most used techniques in high-level competition. It is not currently clear whether frontal attacks are more strongly linked to ACL injury incidence due to how often they are utilised, or whether the technique of the throws themselves put the ACL specifically at risk.

In the present study, it was found that males utilised more Type 8 techniques than did females. Previous literature shows that male typically have greater upper-body muscle mass, maximal strength and muscle power compared to female judo athletes [Callister *et al.* 1991; Ichinose *et al.* 1998; Sbriccoli *et al.* 2007]. Type 8 technique require a strong upper-body action to unbalance an opponent, therefore it is likely that male judo athletes are more efficient at executing these types of throws than their female counterparts. A large number of techniques in the type 8 category (e.g., *ura-nage* and *ushiro-goshi*) can also be utilised as counterattacks to other techniques which involve rotation. Overall, it appears that males are utilising throws with more rotation and females are utilising throws that are more linear.

Lightweight male judo athletes utilised more type 1 techniques than their heavier counterparts. This may be due to the requirement of a fast turning action, which is associated with higher chance of success in these techniques [Ishii *et al.* 2018]. Also a decrease in the centre of mass is typically observed in the main technique of this group (*seoi-nage*) [Blais *et al.* 2007]. Thus, this type of technique has been considered well-suited for shorter judo athletes with higher levels of agility [Imamura *et al.* 2006]. Interestingly, height does not typically differ between athletes in 60kg and 66kg weight categories [Franchini *et al.* 2014]. This may result in a mechanical advantage for those utilising type 1 techniques in the 66kg category, as greater impulse would be created by a

66kg athlete during type 1 techniques.

The heaviest male athletes (100+kg) athletes typically utilised type 2 techniques more often than their lighter counterparts. Techniques in this category (*harai-goshi*, *uchi-mata* and their *makikomi* versions) require high impulses to unbalance opponents and the creation of momentum prior to contact [Imamura *et al.* 2006]. This result is in line with previous research, which shows these techniques are favoured by large judo athletes [Imamura *et al.* 2006].

The 60kg weight category did not score using the type 3 techniques and differed from the 66kg and +100kg weight categories. Athletes from the 81kg weight category also did not score using type 3 techniques and differed from the 66kg, 73kg and +100kg weight categories. The fact that these groups did not use this type of technique, compared to the +100kg weight category may be associated with the need of higher impulse during unbalance (*kuzushi*) and technique execution (*tsukuri*) phases, creating a greater momentum collision in techniques as the *o-soto-gari* (a main representative of this group). However, the differences between these two weight categories and the 66kg, and the difference between the 81kg and 73kg weight categories, are harder to explain.

The +100kg weight category did not score using the type 5 techniques and differed from the 90kg weight category, which can be explained by the difficulty found by the heavier athletes to get closer to their opponents when performing an inner attack, while maintaining their own balance [Dopico *et al.* 2014].

For the type 7 techniques, the +100kg weight category presented a higher frequency of scores than the 60kg, 66kg, 73kg, 81kg and 90kg weight categories, which can be explained by the higher stability provided by these techniques and the fact that a pulling action is made. As these techniques do not involve rotation heavier athletes would present a higher stability and feel less threatened while attacking.

The athletes from the 60kg and 90kg weight categories scored using the type 8 techniques more frequently than the 66kg, which can be due to the fact that these techniques are normally used as counterattacks to type 1 techniques. As the 66kg athletes are more efficient when applying these techniques, they were less counterattacked compared to these two other categories.

There was no association between weight category and scoring actions for type 6 and 9 techniques for males. This could be due to the type 6 main technique (*de-ashi-barai*) being typically employed as a feint technique to make an opponent react a certain way [Franchini *et al.* 2008]. Also, type 9 techniques are frequently used to transition from standing to ground fighting (*ne-waza*). Moreover, these techniques involve a considerable degree of skill much more than being influenced by morphological components, which can explain the similar scoring actions across the different weight categories.

For females, the 57kg weight category did not score using type 3 techniques and differed from 63kg, 70kg and +78kg weight categories, while the +78kg weight category also scored more frequently using type 3 technique compared with 78kg weight category. This type of technique requires a higher impulse during unbalance (*kuzushi*) and technique execution (*tsukuri*) phases. This higher impulse creates a greater momentum, and may explain why athletes from the heaviest female weight category scored more frequently using type 3 techniques [Imamura *et al.* 2006]. However, the explanation for the difference between the 57kg and 63kg and 70kg weight categories is harder to establish.

Female extra-lightweight athletes scored using type 8 techniques more often than their heavyweight peers. The main techniques in this classification are used as counterattacks (e.g., *ura-nage* and *ushiro-goshi*), therefore it is not unexpected that lightweight judo athletes scored more frequently using type 8 techniques.

Finally, no association was observed between technique classification and winning or not a medal in the World Championship, which suggests that differences in the efficiency of the athletes are more related to their success than the use of a specific group of techniques.

5. Conclusions

The purpose of this paper was to provide a description of elite competition, thereby informing scientists and practitioners as to the main techniques that athletes are utilising. The main finding of the present study is that a limited number of throwing techniques resulted in more than half of all scoring situations during the 2017 Judo World Championships. This is the first study to apply the new judo technique classification system proposed by Dopico *et al.* [2014]. Using this system, differences were identified between male and female athletes, with females scoring more frequently using type 3 techniques than males, whereas males scored more frequently using type 8 techniques than females. Moreover, male judo athletes from the lightest weight categories used type 1 techniques more frequently, and type 2 and 7 less frequently than athletes from the heavier weight categories, whereas female athletes from the lightest weight category (48kg) scored more frequently using type 8 techniques than those from the heavier (+78kg). However, no association was observed between technique classification and tournament classification.

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Techniki wykorzystywane podczas Mistrzostw Świata w Judo 2017 i ich klasyfikacja: porównanie dokonane ze względu na płeć zawodników, kategorie wagowe, między medalistami i nie-medalistami

Słowa kluczowe: sporty walki, analiza wyników, zawody

Abstrakt

Tło. Techniki rzutów w judo są tradycyjnie klasyfikowane, jako *ashi-waza* (techniki nóg), *te-waza* (techniki ramion), *koshi-waza* (techniki bioder) i *sutemi-waza* (techniki poświęcenia). Ta klasyfikacja została jednak ostatnio skrytykowana, a zamiast tego zaproponowano 9-grupowy system klasyfikacji oparty na charakterystyce działania (typ ruchu, podstawa wsparcia, kierunek rzutu i pozycja ataku).

Problem i cel. Celem badania było określenie punktowanych technik rzucania, stosując stworzoną klasyfikację i porównanie zawodników ze względu na kategorie wagowe, płeć oraz medalistów i nie-medalistów podczas Mistrzostw Świata Seniorów w 2017.

Metoda. Analiza obejmowała 756 punktowanych technik rzucania (ponad 601 pasujących wyników) w całej konkurencji.

Wyniki. Stwierdzono związek między techniką a płcią (c^2 = 15.64, p = 0.048, współczynnik Cramera V = 0.144): kobiety w porównaniu z mężczyznami częściej zdobywały punkty używając technik z grupy 3 (c^2 = 6,93, p = 0,009), podczas gdy mężczyźni w porównaniu z kobietami częściej zdobywali punky używając technik z grupy 8 (c^2 = 5,55, p = 0,019). Stwierdzono istotny związek między klasyfikacją techniki a kategorią wagową (c^2 = 106,19; p <0,001; współczynnik Cramera V = 0,353), ale nie było związku między klasyfikacją techniki a klasyfikacją mistrzostw świata (c^2 = 9.55; p = 0.298 współczynnik Cramera V = 0,112). Dodatkowo ograniczona liczba technik rzucania spowodowała ponad połowę wszystkich sytuacji punktowych podczas tej konkurencji.

Wnioski. Techniki stosowane przez sportowców różniły się w zależności od płci i kategorii wagowej, a kilka technik wykorzystano w czasie zawodów *judo* na najwyższym poziomie.