

Differences in gripping configurations during the execution of throwing techniques between male and female cadets at the European Judo Championship

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Abstract

Background & Study Aim: Gripping (*kumi kata*) constitutes a very important segment of judo fights and fist contact in said fights, based on which the opponent is controlled and dominated during the fight. The goal of this research is the knowledge about differences in gripping configurations between male and female cadets during the execution of throws at a competition.

Material & Methods: The analysis included 470 gripping configurations of male cadets and 350 gripping configurations of female cadets at the 2008 European Judo Championship, held in Sarajevo. For the purpose of establishing differences in frequencies, a Chi-square test with a statistical significance of $p \leq 0.05$ was used.

Results: By analysing the application of different gripping configurations during the execution of throws among male and female cadets, statistically important differences were identified ($p < 0.05$). Male cadets dominate in the same grip and sleeve end grip, whereas female cadets dominate in the opposite gripping configuration. *Sukui nage* is the most frequent technique in the case of male cadets, from the same, 11.3% and opposite grip, 6.0%, and in the case of female cadets, from the same grip, 6.0%. The *ippon seoi nage* throw technique is a technique that was mostly used by both groups (6.4% – 5.4%) in the case of the sleeve end grip, whereas the *uchi gari* technique 6.3% was mostly used by female cadets in the opposite grip.

Conclusions: A well-developed effort to establish a grip may be one of the key factors in the final results of the fight. By learning the different configurations of grips and techniques that can be applied, the contestants have better possibilities of succeeding in competitions.

Key words: combat sport, kumite performance analysis, technique, tactics

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Performance analysis – objective recording and examination of behavioural events of one or more players during training or competition [8].

Technique – specific procedures to move one's body to perform the task that needs to be accomplished [29].

Tactics – decisions and actions of players in the contest to gain an advantage over the opposing players [29].

INTRODUCTION

Judo today, which has undergone a transformation making it a more dynamic sport in which the fight takes place in two main segments: *tachi waza* – fighting with the opponent in a standing position, and *ne waza* – fighting with the opponent on the ground [1]. Both fighting techniques require different approaches to training technology, and such an approach is crucial for further progress towards achieving success in judo. Gripping (*kumi kata*) constitutes the first contact between the opponents in judo fights and a technical and tactical component to be developed by male and female cadets. Grips are used in an attempt to control the opponent and to gain an advantage during fights. This advantage may be used in order to pacify the opponent, which is followed by a penalty, or in order to execute a certain throwing technique. The performance of a top contestant in judo [2] depends on the establishment of a good grip and on the imposition of one's own grip during the fight. Even if the fight is limited to only one gripping technique, experienced judo fighters can easily interfere with such a manner of gripping, impairing the balance of the opponent by preventing them from establishing their grip, and by recognizing the intentions of the opponent.

A well-imposed grip serves the purpose of controlling the opponent with one's hands. The opponent also tries to prevent you from imposing a good grip. When a dominant grip is imposed, it results in a good basis for impairing balance, establishing contact, and performing a throw [3]. The contestants that have good gripping techniques and the ability to use a certain grip in order to perform throws to the left and right side have an advantage over contestants that are unable to perform in this manner [4]. This, which is one of the most important and fundamental skills in judo, provides contestants with several possibilities during the fight to throw several opponents, in spite of some of them being better, to control opponents, and to annul their best skills and put pressure on them during the fight, which makes them more complete fighters [5]. Expanding knowledge on grips [6] is very important for developing the right throwing techniques. There are many grip variations, and they depend on the constitution of the contestants, their fighting style, relative strength, etc. Every contestant is trying to develop his/her own special grip, depending on the strategic approach to the fight and the capacity of the contestant to execute the throw under the dynamic conditions of a judo fight. In analysing judo fights, Ohlenkamp [7] states that keeping one's own balance is the first phase of a fight, in which one attempts to impair the balance of his/her opponent using gripping skills and knowledge.

The aim of this research is the knowledge about differences in gripping configurations between male and female cadets during the execution of throws at a competition.

MATERIAL AND METHODS

Subjects

The research was conducted based on an analysis of video recordings (n=390 fights) in the case of 470 performed throwing techniques of male cadets and (n=301 fights) in the case of 350 performed throwing techniques of female cadets at the European Judo Championship for U-17 Cadets, held in Sarajevo (Bosnia and Herzegovina) in 2008, in all seven weight classes.

During the performance of throwing techniques, three different gripping configurations were observed, namely: The same grip configuration – *tori* and *uke* perform the right vs. right or left vs. left grip; The opposite grip configuration – *tori* and *uke* have established the right vs. left or left vs. right grip, and sleeve end grip configuration, in the case of which *tori* holds the sleeve ends of *uke* with his/her hands or holds one sleeve end of *uke* with both of his/her hands.

Reliability

Data from the European Cadet Championship was gathered by means of intra-observers and inter-observers based on a percentage error. Two well-educated judo experts with extensive international competition and training experience were hired for data gathering and analysis, and they gathered data under the same conditions and by means of the same equipment as the intra-observers. The reliability of intra-observers was based on the concept of a repeated analysis of 30 fights of male cadets and 30 fights of female cadets. The repeated analysis was completed a year after the collection of the original data. The reliability of inter-observers was ensured by means of an analysis of all matches using another analytic. Based on original V_1 data and data of the repeated test V_2 , the percentage error was calculated in compliance with the formula (1) [8, 9].

$$\text{Total \% error} = (V_1 - V_2) / (V_{\text{mean}}) \times 100\% \quad (1)$$

The percentage error of reliability in the case of intra-observers varied between 0.00% and 1.01%, and in case of inter-observers, reliability varied between 0.00% and 1.8%, which is acceptable up to the error limit of 5%.

Statistical analysis

All observed variables are expressed in frequencies and percentages. The Chi-square test with a statistical significance of $p \leq 0.05$ was used in order to determine differences between observed and expected frequencies, i.e. gripping configurations during the execution of throwing techniques, as well as standard residuals (SRs). Contingency coefficient C was calculated in order to establish the possible existence of dependence [10]. A comparison of the analyzed frequencies was presented by means of a 2x3 contingency table. All data were processed by means of SPSS 20.0 IBM Corporation, USA [11]. In order to establish the efficiency of individual throwing techniques (TE) from different gripping configurations, the following formula was used (2):

$$TE = \frac{\text{number of individual throwing techniques}}{\text{total number of throwing techniques}} \times 100 \quad (2)$$

RESULTS

The obtained data underline different behaviors during fights applied by male and female cadets in three different gripping configurations and individual throwing techniques used in the case of such grips (Table 1). A significant statistical difference ($\chi^2=8.46$; $df=2$; $p=0.015$; $C=0.10$) was established between the frequencies of executed throwing techniques using same grips in which male cadets dominate with 49.4%, as opposed to female cadets with 42.6%. However, female cadets dominate in throwing techniques using opposite grips with 48.8%, as opposed to male cadets with 38.9% of throws using opposite grips. The efficiency of executed throwing techniques using sleeve end grips is dominant in the case of male cadets with 11.7% as compared to female cadets with 8.6%. The value of residuals (SRs) is below 2 in all cells, which indicates that there are no abnormalities in individual cells that would point to something special happening in one of the cells in relation to the set goal.

By analysing the most efficient individual throwing techniques using different gripping configurations between the male and female cadets (Table 2), it was perceived that certain throwing techniques are used equally at competitions, namely the *sukui nage* technique in the case of male cadets using same or opposite grips, whereas in the case of female cadets, it was performed using same grips. The most successful sleeve end grip technique in case of both male and female cadets is *ippon seoi nage*. In both groups, the most dominant techniques using different gripping

configurations belonged to the group of hand (*te-waza*) and foot throwing techniques (*ashi-waza*), whereas hip throwing techniques (*koshi-waza*) and sacrifice throwing techniques (*sutemi-waza*) were less used.

DISCUSSION

Considering the analysed data and profiles of gripping configurations applied by male and female cadets during fights, this research project has achieved its goal – to identify differences in the application of different gripping configurations between male and female cadets. This type of research is a good basis for future analyses in relation to judo techniques and tactics, especially since it is research on different sexes. This statement has also been confirmed by previous research [12] on activities during judo fights from the Olympic games that led to results that, in essence, contain key information on judo and differences between sexes. Women used more control grips, whereas men used more risky throwing techniques.

Some authors [13-15] believe that the successfulness of a grip during a fight and the very throwing after the use of a grip depend on the hand-grip strength and stamina because fighters have to develop the ability to maximize their potential in relation to the grip by pushing and pulling the opponent during a fight, which are high ranking attributes of top judo fighters. Due to these facts, we believe that the training process needs to be supported by adequate tests that can individually support every contestant in terms of grip. In addition to strength and stamina in developing a grip, it is very important to develop a quick frequency of hand movements in synergy

Table 1. Frequencies, percent and standard residuals (SRs) of different gripping configurations of male and female cadets at the 2008 European Judo Championship.

	Same grip	Opposite grip	Sleeve and grip	TOTAL
Male	232 49.4%	183 38.9%	55 11.7%	470 57.3%
	.9	-1.4	.9	
Female	149 42.6%	171* 48.8%	30 8.6%	350 42.7%
	-1.1	1.6	-1.0	
TOTAL	381 46.5%	354 43.2%	85 10.3%	820 100%

* Significant difference at a level of < 0.05

Table 2. The most frequent throwing techniques using different gripping configurations between male and female cadets in percent values.

MALE				FEMALE		
Same grip	Opposite grip	Sleeve and grip	Rank	Same grip	Opposite grip	Sleeve and grip
SUK 11.3	SUK 6.0	ISN 6.4	1	SUK 6.0	OUG 6.3	ISN 5.4
UMA 6.0	TNO 6.0	STO 1.7	2	OSG 5.9	TNO 5.7	SMK 2.9
OUG 4.0	KGU 4.5	SMK 1.1	3	OUG 4.3	UMA 5.4	STO 2.0
KGU 4.0	SUG 3.4	KUG 0.4	4	TNO 4.3	SUK 4.0	OUG 0.6
SON 3.8	UMA 3.2		5	UMA 4.0	OSG 2.9	
TNG 3.2	ISN 1.9		6	ISN 3.7	DAB 2.9	
ISN 2.6	OUG 1.9		7	KGU 3.7	HRG 2.6	
SUG 2.6	DAB 1.9		8	KUG 2.9	KGU 2.3	
KUG 2.3	KUG 1.5		9	SON 2.3	ISN 2.0	

International Judo Federation (IJF) codes of throwing techniques: SUK – *sukui nage*; UMA – *uchi mata*; OUG – *o uchi gari*; KGU – *kata guruma*; SON – *seoi nage*; TNG – *tomoe nage*; ISN – *ippon seoi nage*; SUG – *sumi gaeshi*; KUG – *ko uchi gari*; TNO – *tani otoshi*; DAB – *de ashi barai*; STO – *sode tsurikomi goshi*; SMK – *soto maki komi*; OSG – *o soto gari*; HRG – *harai goshi*.

with eye-hand coordination, especially in the case of younger generations.

Grips are the key for efficiency in the standing position, and every judo fighter has his/her “own manner” of performing the grip with the intention to execute his/her most efficient throwing technique. Previous studies provide extensive information on the development of speed, strength and endurance of young judokas in the course of their years of initial training [16-18]. Undoubtedly a difficult research task is to determine issues that are depending on the dynamics of changes in the area of motor skills of young judokas with the effectiveness grips in the course of the fight judo (training and championship) in next periods of the long-term practice.

It is obvious that male and female cadets display different behaviours when it comes to grips, which is also in accordance with previous research [19] focused on the analysis of the establishment of first contact and achieving domination during the fights at the 2007 World Championships. It is seen as very important, but men and women demonstrate completely different approaches when it comes to choosing the area of first contact. Most first contacts are established by

men and women in the judogi lapel area, whereas the second most frequent area of first contact in the case of women is the leg area (new regulations of the fight exclude such a possibility), and in the case of men, the hand wrist area.

A similar piece of research [20] on Kumi Kati during the junior and senior British championship show that contestants first establish a right-hand grip (56%) rather than a left-hand grip (36%) and very few of them use both hands (8%). An interesting piece of information is the fact that juniors use the right-hand grip (72%) rather than the left-hand grip (21%). However, in the case of seniors, the dominant grip is the left-hand (60%) as compared to the right-hand grip (37%), which clearly shows that seniors have evaluated in terms of applying grips during fights due to the experience gained in long-term trainings and competitions. Based on the two aforementioned pieces of research, it is clear that the training process in judo should contain a segment in which first contact is attempted, whether through the dominant or the non-dominant hand, and that throwing techniques should be developed in compliance with the established attitude. This claim has also been confirmed by previous research projects [21] focusing on

the relations between the manner of grip maintenance and techniques used by contestants during the execution of throws. It confirms the existence of two gripping positions, namely hanging and pulling, which show their respective characteristics when it comes to how one holds by the leading hand, and holding by the dominant hand. In the case of both of these types of gripping positions, the throwing techniques that are the most prevalent are *uchi mata*, *osoto gari*, *seoi nage*, *ippon seoi nage*, *o uchi gari*, *kouchi gari*, and *tomoe nage*.

The authors are of the opinion that the change of rules by IJF in the period of 2010, 2013, and 2014 [22] will certainly change the area of first contact, considering that it is no longer allowed to grab the judogi in the leg area.

Research [23] focusing on different gripping configurations as strategic segments in judo fights during the 1996 Olympic Games in Atlanta (USA) shows that in case of both men (45%) and women (50%), the opposite grip is dominant, as compared to the same grip and sleeve end grip. There is also a formless grip that aims at establishing contact with the opponent with both hands. The reason for this is the fact that configurations of the opposite grip increase the distance between contestants, and the fact that those contestants for whom the throw was applied were not able to resolve the issue of the dominant hand of the attacker. That opened up the possibility of applying certain throws.

Research findings [24] focused on five hand techniques – *sukui nage*, *kata guruma*, *kuchiki taoshi*, *kibisu gaeshi* and *morote gari* – that were applied during competitions before and after the change of rules in 2010 in the context of the grip position as both a normal attack and a counter-attack when using a cross-grip. The research points to the fact that the execution of the *sukui nage* techniques increases when using the cross-grip as a counter-attack, as compared to the other four techniques. However, the results obtained in the case of cadets show similar results in the application of hand throwing techniques, in which case the most dominant technique is the *Sukui nage*, the application and efficiency of which were obviously not influenced by the change of rules. It is thus necessary to develop the *Sukui nage* technique as the counter technique.

Data presented by Marek [25] based on the analysis of the technical and tactical profile of the double Olympic champion from Poland, Waldemar Legin,

show that he evenly used both the right and left side to gain points and win and that there were no differences in the throwing techniques.

We believe that the reason for this is the fact that top judo fighters have highly developed abilities to apply throwing both from left and right grip in an efficient way and that this is the direction in which trainers should focus in the development of younger contestants so that the one-sidedness of throws may be minimized. By analysing three different levels of competitions [26] (Olympic Games, German Championship and German University Championship) based on configurations during fights, it was established that there is a relative influence of the left gripping configuration as compared to the right gripping configuration during fights: contestants with the left gripping configuration and left grip were dominant as compared to university competition contestants. The reason for this is the fact that most people are right-handed, and we believe that the contestants who have the left gripping configuration and grip have an advantage over people who are right-handed. It is thus necessary to create different situations in trainings based on relevant information from competitions in order to enable them to fight against contestants who have both the left and right configuration.

For this reason, some research [27] clearly suggests that in the case of top female and male judo fighters, attacks from the same gripping configuration have more chances for successful pointing and winning, independently from sex and category, and are at the same time the most efficient ones in lighter weight categories.

The results of the change of rules in 2013 [28] have shown that the most efficient techniques after three changes of grip have led to an increase in the efficiency of attacks as compared to 2012. If we compare the efficiency index of throwing techniques with the most efficient techniques of male and female cadets, it is clear that both of these groups still use the main techniques such as *seoi nage*, *sukui nage*, *ippon seoi nage*, *o uchi gari*, and that this information should be used in trainings in order to find possibilities to train the contestants in preventing the application of these throwing techniques and at the same time developing their attacking capacities based on an adequate use of certain grips.

It is clear that grips in judo may be analysed and observed from several aspects, and research focusing

on judo grips has been insufficient. There is evidently a huge potential for future research focusing on this extremely important segment of judo sport, depending on sex, category, fighting configuration, etc.

Cadets gain experience during international competitions with regards as to how to establish their grip without being prevented from doing so by the opponent. This control of the opponent and space in judo is very dynamic and involves establishing one's own proper grip or consciously interrupting or blocking the grip of the opponent, who is also trying to establish his/her own grip in order to maximize the potential for the execution of a throw, and also in order to defend themselves from the dominantly imposed grip by the opponent. The quickness of the contestant's reaction, hand-eye coordination, the tactile sense, the anticipation of a possible attack, and the speed of hand movement frequencies are crucial for successful grips during fights. The authors are of the opinion that the *sukui nage* technique, which is the most dominant technique applied by both male and

female cadets using different types of grips, is a result of weak preparation in the context of balance impairment (*kuzushi*), which exposes it to use for very successful counter-attacks.

CONCLUSIONS

The obtained research findings about different gripping configurations of male and female cadets may be used by trainers and sportsmen to find new training methods for the establishment of grips, as well as for defending themselves against different gripping configurations. They thus model the fight based not only on their own approach to fights, but also on the opponent's approach to fights. Finally, the new change of judo rules in 2014 will surely lead to a new dimension in the application of new techniques regarding the establishment of grips, which will require new research over the coming period at different competition levels and involving different samples of contestants.

REFERENCES

- Seisenbacher P, Kerr G. Modern JUDO „Techniques of East and West“. The Crowood Press; 1997
- Yamashita Y. The Fighting Spirit of Judo. Fighting Films; 1991
- Adams N. Grips. Fighting Films; 1990
- Angus R. Competitive judo: Winning training and tactics. London: Human Kinetics; 2006
- Pedro J. Grip like World Champion. Fighting Films; 2007
- Sacripanti A. Advances in Judo Biomechanics Researcs „Modern Evolution on Ancient Roots“. VDM Verlag Dr. Muller, Sarbrucken; 2010
- Ohlenkamp N. Judo Unleashed: Essential Throwing & Grappling Techniques for Intermediate to Advanced Martial Artists. Black Belt; 2006
- Hughes M, Franks I. Notational Analysis of Sport-Systems for better coaching and performance in sport. 2nd ed. London: Routledge; 2004
- McGarry T, O'Donoghue P, Sampaio J. Routledge Handbook of Sports Performance Analysis, Routledge Handbooks; 2013
- Thomas J, Nelson J. Research Methods in Physical Activity. 4nd ed. London: Human Kinetics; 2001
- Field A. Discovering Statistics Using SPSS. 2nd ed. Sage; 2005
- Sterkowicz S. Differences in the specific movement activity of men and women practicing judo. J Hum Kinet 1999; 1: 99-113
- Heinisch D, Knoll K, Kindler M et al. Development and evaluation of a judo-specific grip-strength-test. [accessed 2013 Sep 1]. Available from URL: <http://judoresearch.org/wp-content/uploads/2013/10/Heinisch-et-al.png>. 8th International Judo Research Symposium; 2013 August 25; Rio de Janeiro, Brasil
- Franchini E, Miarka B, Matheus L et al. Endurance in judogi grip strength tests: Comparison between elite and non-elite judo players. Arch Budo 2011; 7:1-4
- Sanches G, Dominguez S, Turpin P et al. Importance of hand – grip strength as an indicator for predicting the results of competitions of young judokas. Arch Budo 2011; 7:167-172
- Jagiello W, Kalina RM, Tkaczuk W. Age peculiarities of speed and endurance development in young judo athletes. Biol Sport 2001; 18(4): 281-295
- Jagiello W, Kalina RM, Tkaczuk W. Development of strength abilities in children and youth. Biol Sport 2004; 21(4): 351-368
- Jagiello W, Kalina RM. Properties of Motor Development in Young Judokas. J Hum Kinet 2007; 17: 113-120
- Pierantozzi E, Nerozzi E, Piras A et al. Analysis of the Fighting Phase Before the First Grip in the Finals of the Judo World Championship 2007“. Annals of the 1th European Judo Federation Scientific Congress, Lisbon 10 April 2009
- Collins N, Challis DG. An analysis of Kumi Kata at the Junior and Senior British Championships 2013. [accessed 2013 Sep 1]. Available from URL: <http://judoresearch.org/wp-content/uploads/2013/10/Natasha-Collins.pdf>. 8th International Judo Research Symposium; 2013 August 25; Rio de Janeiro, Brasil
- Seta Y, Kawasaki I, Takahashi M et al. Relations Between Gripping Methods and Favorite Tricks in Judoists. [accessed 1997 Jun 9]. Available from URL:<http://judoinfo.com/new/alphabetical-list/research/463-relations-between-gripping-methods-and-favorite-tricks-in-judoists>
- International Judo Federation IJF. Refereeing New rules for the period from 1/01/2013. <http://www.ijf.org/> (accessed 2013 Jan 29)
- Weers G. Gripping Strategies. [accessed 1997 Jan 18]. Available from URL: <http://www.judoamerica.com/coachingcorner/weersgrip.shtml>
- Kiyoshi I, Nobuyoshi H, Mitsuru N et al. The transformation of technical-tactical behaviors for hand techniques used in attacking below the belt after the 2010 International Judo Federation rule revision. Arch Budo 2013; 1: 1–6
- Marek A, Smaruj M, Laskowski R. A Technical and Tactical Profile of the Double Olympic Judo Champion: A Case Study. Int J Sports Sci Coa 2014; 9: 123-138
- Tirp J, Baker J, Weigelt M et al. Combat stance in judo – Laterality between and within competition level. Int J Perf Anal Spor 2014; 14: 217-224
- Courel J, Franchini E, Femia P et al. Effects of kumi-kata grip laterality and throwing side on attack effectiveness and combat result in elite judo athletes. Int J Perf Anal Spor 2014; 14: 138-147
- Ito K, Hirose N, Nakamura M et al. Judo Kumi-te Pattern and Technique Effectiveness Shifts after the 2013 International Judo Federation Rule Revision. Arch Budo 2014; 10: 1-9
- Martens R. Successful Coaching. 3nd ed. London: Human Kinetics; 2004

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